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Review article

Using the jigsaw cooperative learning technique for nursing students: A review

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Abstract

Instructional process is done by many educators today are likely to target curriculum materials, more emphasis on memorization rather than understanding concepts. It can be seen from the learning activities in the classroom that is always dominated by the teacher. In the delivery of content, typically teachers use the lecture method, where students just sit down, take notes, and listen to what it conveys and fewer opportunities for students to ask questions. Thus, to be non-conducive learning environment so that students become passive. Efforts to increase student achievement are inseparable from the various factors that influence it. Classroom atmosphere needs to be planned and constructed in such a way by using appropriate learning model for students to have the opportunity to interact with each other so that in turn can be obtained optimal learning achievement. Especially in the course of teaching learning strategies, students should be given a variety of teaching strategies that they can later use and modification according to the conditions they face in the field. The learning objectives will be achieved with effective and can simultaneously explore optimal potential in their students. Jigsaw is a cooperative learning technique that has been studied in various ways by a number of researchers and teachers in classes of different levels and subjects In this review we will discuss jigsaw as cooperative learning technique for nursing students. The following section reviews some of the important concepts about the Jigsaw method that helped guide this study.

Keywords: Jigsaw cooperative learning technique, nursing students.

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1. Introduction

Jigsaw cooperative learning is a learning strategy that promotes students motivation in learning, positive attitude, develop interpersonal skills, and enrich student's achievement. This strategy developed by Elliot Anderson with his students from the Texas and California University. Jigsaw is a strategy that emphasizes cooperative learning by providing students and

opportunity; actively help each other build comprehension. Each group member is responsible for becoming an "expert" on one section of the assigned material and then "teaching" it to the other members of the team Aronson, E. [1].

According to Aronson and Patnoe [2] Jigsaw, is a well-established method for encouraging group sharing and learning of specific content. This techniques used as an

instructional activity across several days and is best to use when there is a large amount of content to teach [3]. Furthermore, James [4] states that in small group work and cooperative learning, student learn best when they are actively involved in the process. Researchers report that, regardless of the subject matter, student working in small groups tend to learn more of what is taught and retain it longer than when the same content is presented in other instructional formats [5].

A study analyzed how students assigned as group leaders in the jigsaw helped motivate the rest of the group [6]. Result suggested that when given the title of "group leader" students worked to motivate other students to complete their work. It means that, this activity allows students to experience learning and contribute to their learning. Benefits in connection with the large number of students and the material that will be taught in this course, then researcher choose the jigsaw cooperative learning strategy in learning activities.

According to Mengduo and Xiaoling in Crist [7], the jigsaw classroom reduces students' reluctance and anxiety to participate in the classroom activities while increasing self-esteem and self-confidence. As well as Anderson stated that jigsaw has proved effective at raising the self-esteem of students while improving their performance and increasing their liking for school and their enthusiasm about learning. In addition to helping students learn new material, the jigsaw helps build social skills.

The jigsaw cooperative learning also provides a way to help students become active in classroom activities and/ or lessons. When students are anxious or sometimes even afraid to contribute, they are going to miss information that has needed fully understand the material [8].

Doing jigsaw cooperative learning strategy in learning activities, there are several advantages, as Tamah (2007) states [9], "Students are encouraged to learn from their fellow students in their expert team and when they go back to their home team they

are encouraged to teach one another the material they have worked on in the expert team" which describes exactly how the jigsaw approach should work in a classroom. This approach sounds ideas for teacher because it allows the students to be actively engaged in teaching one another. The jigsaw also allows the teacher to be a facilitator, not a director in the classroom, which is a trend in schools today.

The Steps that used for Jigsaw when using the jigsaw technique in the classroom, the some steps should follow as below: Information about this strategy is from the Muskingum Area Technical College (Zanesville, Ohio) Newsletter, September 14, 1994.

1. Define the group project on which the class will be working.
2. Randomly break the class into groups of 4-5 students each, depending on the size of the class, and assign a number (1 to 4-5) to students in each group.
3. Assign each student/number a topic in which he/she will become an expert.
4. The topics could be related facets of a general content theme.
5. Rearrange the students into expert groups based on their assigned numbers and topics.
6. Provide the experts with the materials and resources necessary to learn about their topics.
7. The experts should be given the opportunity to obtain knowledge through reading, research and discussion.
8. Reassemble the original groups.
9. Experts then teach what they have learned to the rest of the group.
10. Take turns until all experts have presented their new material.
11. Groups present results to the entire class, or they may participate in some assessment activity.

Various teaching learning methods adopted by teachers to teach nursing students

A quasi experimental study was conducted to assess the opinion of nursing students about case-based teaching method and

compare it with lecture method in Zanjan. 30 senior nursing students were selected. First part of the content was presented with case-based teaching method and second part with lecture method. The results showed that (61/9%) of students agreed that case-based teaching have a better cover for objectives and retention of knowledge as compared with lecture [10].

A study conducted to compare the effect of lecture and e-learning methods on nursing students' learning outcomes. A crossover design applied with a sample size of 32 students who were in third semester of nursing bachelor program. The results showed that e-learning was perceived to be more effective on their "capability" ($P < 0.005$) and "independency" to use the method ($P < 0.005$), and jigsaw was reported to be better than e-learning in "effectiveness" ($P < 0.005$) and "motivation" ($P < 0.001$) [11].

A study conducted to "compare the effectiveness of two instructional methods on junior-level nursing students' cognitive skills and confidence". The content chosen to teach was acute myocardial infarction. By using human patient simulator (HPS) as a tool for experimental learning as compared with traditional classroom lecture, it was concluded that HPS method made a positive difference in the nursing students' ability to answer questions on a test of cognitive skills but the confidence levels were not found to be significantly enhanced by use of the HPS method [12].

Gobbi wrote [13] an article on "approaches to teaching, learning and assessment in nursing". The pedagogical knowledge includes concepts and research associated with andragogy, experiential learning, work based learning, organizational cultures and learning, decision making, development of leadership skills, social psychology of learning, values, ethical and emotional literacy.

Literature related to effect of activity based learning

E O'Shea [14] conducted a study to explore the concept of self-directed learning and its use in nursing education. Self-directed

learning is essential in assisting nurses to meet the challenges presented in today's health care environment. The results show that, the concept of self-directed learning based on the principles of adult education and can take many different formats.

Another study investigated the influence of cooperative learning methods of teaching on Senior Secondary School students' anxiety for learning chemistry. A 120 students (52 females and 68 males) randomly selected from the senior secondary schools in South-West Nigeria participated in the study. This implies that the design included two treatment groups – Cooperative learning method (Jigsaw II) and the conventional method (chalk-and-talk). Two lesson notes, one for cooperative learning method (Jigsaw) and the other for conventional chalk-and-talk method, and Chemistry Anxiety Scale (CAS) were the instruments used to collect the relevant data. It concluded that since cooperative learning methods of teaching reduced students' chemistry anxiety, chemistry teachers should be encouraged to incorporate cooperative learning in their methods of teaching [15].

Helena Kadueakova [16] wrote an article on "using of effective methods of education in nursing". The new methods and forms which help students to search new sources of information, to understand the importance of using the relationships between subjects, and make the students orientation in problems. From this article, it concluded that modern teaching methods join the theory with the practice and they lead students to independence, creativity, respect, self-discipline, responsibility and the sense for duty.

C.Y. Lai [17] reported implementation of a handheld wireless environment to support Jigsaw cooperative learning activities in a college setting. Quasi-experimental research designs were used. Research has shown that wireless handhelds offer new opportunities for innovative user interaction and communication both in and out of the classroom. Wireless handhelds have provided a unique opportunity for enhancing cooperative learning. A required component

of the Jigsaw method is frequent movement between the 'expert' and Jigsaw groups. Students are also required to share information with peers during group discussions.

An animal physiology course was studied over a two-year period (Year 1, $n = 42$ students; Year 2, $n = 30$ students) to determine the effects of student-led seminar (andragogical) and lecture (pedagogical) teaching methods on students' retention of information and performance. For each year of the study, the course was divided into two time periods. The first half was dedicated to instructor-led lectures, followed by a control survey in which the students rated the efficiency of pedagogical learning on a five-point Likert scale from one (strongly disagree) to five (strongly agree). During the second period, students engaged in andragogical learning via peer-led seminars. An experimental survey was then administered to students using the same scale as above to determine students'

preferred teaching method. These results may indicate that integration of active and passive learning into undergraduate courses may have greater benefit in term [18].

Jigsaw cooperative learning

Another study was used to determine the effects of the Jigsaw method, a cooperative learning tool, on content knowledge and attitude toward learning science. A group of 64 students in an 8th grade physical science class located in rural western New York participated in this study. The achievement gain made by the control and experimental groups was essentially the same and in general, the attitudes towards learning were higher using the frontal method. However, the experimental group expressed they felt more important and had more opportunity to participate in class. It is recommended the intervention be repeated with one to two weeks of training students how to use the Jigsaw method before data is collected Table 1 shows steps taken to incorporate the

Table 1. Steps for Implementing the Jigsaw method

Day 1	
	Students were broken up into heterogeneous groups of 4 to 5 students per group. These were called the "home groups". These groups were diverse according to ethnicity, race, gender, and ability.
	A team leader was assigned from among the students in each group. Their function was to facilitate group discussions and sharing.
	A different sub topic was assigned to each student in the home groups. Each student received a card with their subtopic on it, as well as a few leading questions to help them learn about their topic.
	Students were given time to work independently to research their topics via the Internet. Each student was assigned a laptop with Internet access. Students were given a few websites to help them stay on task and guide them as to where to find the information they need. The websites that the students used were; www.chem4kids.com , www.visionlearning.com , and http://www.idahoptv.org/dialogue4kids/season7/matter/facts.html . The teacher was available to guide them in the right direction on these Internet sites.
	Students then formed temporary "expert groups" by having all of the students with the same sub topic get into one group.
	In the expert group students were given time to discuss their subtopics and decide how they would present this information to their home groups.
Day 2	
	Students combine to form their home groups.
	Students presented their subtopics to the other group members. Group members were encouraged to ask questions for clarification.

Jigsaw Method into the classroom as used in the experimental group [19].

A study conducted to assess the effect of peer group activity based learning on academic achievement of secondary school students in the subject of physics. Depending upon pre-test scores, 88 students in the class were divided equally into experimental and control group. The experimental group was taught with peer group activity – based method & the control group was taught by traditional lecture method for period of 4 weeks (40 minute period per day). The analysis of the data revealed that, experimental group performed better than control group in the domain of knowledge, comprehension and application, but no significant difference was found in both comparison groups in skill development. Hence ultimate results of the study indicated that peer groups activity –based learning was more effective for teaching of physics as compared traditional lecture method of teaching at secondary level [20].

A study conducted to assess the effect of activity based approach on achievement in Science of students at elementary stage. Activity based approach consisted of different activities for all around development of children at the elementary level in the field of science. Hence it was concluded that activity based approach is significantly effective than the traditional approach of teaching with regard to the achievements in science subject at the elementary stage of students [21].

A study was conducted to investigate the impact of activity based teaching on the student's achievement in Physics at secondary level. Samples of 50 students were randomly selected from Govt. Secondary School Kohat. A Two group Pretest Posttest design was selected for this research study. MCQs type written tests were developed for the collection of data. Pretest was developed from the first five chapters of 9th grade Physics keeping Blooms taxonomy in view. Out of 50 questions, ten of each domain i.e knowledge, comprehension, application, analysis, and synthesis were constructed. Reliability of the

Pretest and posttest was estimated at 0.86 and 0.89 by using split half method. The results showed that the mean score was 5.76(experimental group) and 5.48 (control group) wherein the calculated t value is less than the table value (calculated $t=1.00$ and table value= 2.01). Hence, it was concluded that there is no significant difference in the achievement of the students of experimental group and control group in the domain of knowledge. Hence, it is concluded that there was a positive impact of activity based teaching in developing cognitive skills in the students of physics at secondary level [22]. Dr.Martin Stoblein [23], conducted a study to assess the effectiveness of a course design using activity based learning among Young scholars. The researcher investigates the reaction of Ph D students and junior faculty to a 6 month course in a survey research methodology that used active learning experiences.

A quasi-experimental study was conducted to assess the "Effect of Cooperative Learning Teaching Strategy on the Reduction of Students Anxiety for Learning Chemistry. 120 students (52 females and 68 males) were randomly selected. This study implies two treatment groups – Cooperative learning method (Jigsaw II) and the conventional method (chalk-and-talk). This result points to the fact that more students in the cooperative learning group had high chemistry anxiety before they were taught using the cooperative learning method but comparably less than students taught using lecture method. Such results suggest that more students in the cooperative learning method group had very low chemistry anxiety after being taught using the cooperative learning method but for the students in the lecture group they had high chemistry anxiety after being taught using the lecture method. Hence it is concluded that cooperative learning methods of teaching reduced students' chemistry anxiety and therefore chemistry teachers should be encouraged to incorporate cooperative learning methods of teaching [24, 25].

This field study investigated the effects of a cooperative learning environment and a Jigsaw classroom environment on academic

performance, self-esteem, liking of school, liking of peers, and racial prejudice. The subjects were 103 children in Grades 4-6, in two separate schools. The results reveal that Jigsaw produced significant improvements on measures of academic performance, liking of peers, and racial prejudice. In contrast, the effect of the cooperative condition was to exacerbate intergroup tensions [26].

A study conducted to determine the effects of student-led seminar (andragogical) and lecture (pedagogical) teaching methods on students' retention of information and performance. For each year of the study, the course was divided into two time periods. The first half was dedicated to instructor-led lectures, followed by a control survey in which the students rated the efficiency of pedagogical learning on a five-point Likert scale from one (strongly disagree) to five (strongly agree). During the second period, students engaged in andragogical learning via peer-led seminars. An experimental survey was then administered to students using the same scale to determine students' preferred teaching method. A majority of students (68.8%) preferred a method that contained peer-led seminars and instructor-led lectures [27]

“Activity based learning may be defined as a method of instruction, where activities of different types, suitable and relevant to specific subjects are integrated seamlessly into the regular instructional materials”. For learning to take place, it is necessary that the student understands and engages with the information to be learnt. It is also important that the student processes the information with higher level thinking such as comprehension, analysis, synthesis, application, and metacognition. When this happens, the student is able to relate the Activity Based Learning Methodology information to any of life situation, connect it with past learning, and build his or her own knowledge. An outcome of successful learning would be that the student has acquired the basic literacy skills and is able to apply this knowledge or skill learnt in a relevant situation [28].

Literature related Effect of jigsaw method of teaching on knowledge and attitude towards the subject

A study conducted to assess the effectiveness of the Jigsaw method, a cooperative learning tool, on content knowledge and attitude toward learning science. A group of 64 students in an 8th grade physical science class participated in this study. As an intervention for this research study, science content was introduced using the Jigsaw method. A quasi-experimental approach was used in the study. The results showed that control group students increased their scores by 9.7% and the students in the experimental group increased their scores by 10.6%. The difference between the learning growth of the control group and the experimental group was 0.9%. In addition, a teacher log was kept for observations throughout the experience. In this study it is recommended that the intervention must be repeated with one to two weeks of training students how to use the Jigsaw method before the data is collected [29]

M. N. Gömleksi [30] conducted a study to compare the effects of the cooperative jigsaw method and traditional teacher-centered teaching method on improving vocabulary knowledge and active-passive voice in English as a foreign language for engineering students and the students' attitudes towards learning English. Sixty-six engineering students participated in the study and a pre-test-post-test control group experimental design was employed. The results revealed statistical significant differences in favor of the experimental group on the dependent variables of improving vocabulary knowledge and learning active-passive voice in English and the attitude scale results showed that the cooperative learning experience had a significant positive effect on engineering students' attitudes towards learning English and promoted better interactions among students as well.

A study conducted on Modified Jigsaw Method: An Active Learning Strategy to Develop the Cognitive and Affective Domains through Curricular Review. The aim was to prepare doctor of physical therapy students in

their final semester for the curricular review and preparation necessary for autonomous practice. The results shows that Student performance on quizzes taken after the active learning components of the jigsaw activity was significantly higher ($P < .05$) than after independent study. Student comments revealed that they had integrated prior course work, benefited by learning from peers, applied their combined knowledge to complex cases, and gained perspective on their need for future review. From the study it is concluded that selecting an appropriate strategy to prepare graduates for autonomous practice require activities that develop both cognitive and affective abilities [31].

A study conducted to assess the effect of jigsaw method on the achievement and knowledge retention of 80 final-year Vietnamese Mathematics students, as well as reporting their attitudes toward this form of learning. In the experimental group, jigsaw learning was employed, while in the control group, lecture-based teaching was used. All analyses were tested for significance at the .05 level. Responses of the forty students to the two open questions on the attitude survey were analyzed qualitatively. The results of the ANOVA show no statistically significant difference in MAE pre-test scores ($F(1, 78) = .556$; $p > .05$) of the experimental group ($M = 6.61$, $SD = .88$, $N = 40$) and the control group ($M = 6.76$, $SD = .91$, $N = 40$) and hence it shows that students in both groups had similar academic knowledge before the experiment commenced.

The findings obtained from the one-way ANCOVA analysis on the MAE post-test scores, with MAE pre-test scores as the covariate, showed a significant difference ($F(1, 77) = 8.43$, $p = .005$). The magnitude of the pair wise comparison indicated that the adjusted means post-test of the experimental group ($M_{adj} = 7.84$, $SE = .11$) is significantly different ($p < .05$) from that of the control group ($M_{adj} = 7.38$, $SE = .11$), hence it shows that the experimental group, which had engaged in jigsaw learning produced a higher overall improvement in scores on the MAE post-test ($p = .005$) when adjusted for pre-test scores. And therefore from this study it is concluded that students in the experimental

group, who perceived their instruction as more cooperative and more student-centered, had significantly greater improvement on both achievement and retention measures than did the students in the control group [32].

A study conducted on "Cooperative learning in third graders' Jigsaw groups for mathematics and science with and without questioning training. Three conditions of instruction were compared: jigsaw, jigsaw with a supplementary questioning training and teacher-guided instruction. Nine third grade classes from three schools with 208 students participated in the study. All classes studied three units on geometry and one unit on astronomy using the assigned instructional method. The results show that in the math units, no differences between the three conditions could be detected. In the astronomy unit, students benefited more from teacher-guided instruction. Differential analyses revealed that 'experts' learned more than students in teacher-guided instruction, whereas 'novices' were outperformed by the students in the control classes. And therefore it was concluded that even third graders used the jigsaw method with satisfactory learning results [33].

A quasi-experimental study conducted to compare the jigsaw classroom method of cooperative instruction with traditional direct instruction. One hundred thirty-seven students in 12th grade physics classes participated in the study. Four aspects of students' personal learning characteristics (previous knowledge, academic self-concept in physics, academic goal orientation, and uncertainty orientation) were assessed. Method of instruction was found to interact with self-concept: students with low academic self-concept profited more from cooperative instruction than from direct instruction because they experienced a feeling of greater competence [34].

Jason M. Carpenter [35] "conducted a study to examine the effectiveness of five teaching methods (lecture, lecture/discussion combination, jigsaw, case study, team project) in a large class setting. The final sample included 109 students, with 82% as females. A repeated measures ANOVA procedure was

used to explore differences in the students' mean scores between the pretests and posttests for each of the teaching methods. The results of the repeated measures ANOVA omnibus test indicated highly significant differences between the teaching methods ($F=37.54$, $p<.001$). Multiple comparisons revealed that student performance improved under the lecture method as compared to the lecture/discussion ($p=.010$) and team project methods ($p<.0001$). In contrast, student improvement under the lecture method was not as positive as under the jigsaw method ($p<.001$). Results of the tests revealed that the students' scores improved between the pretest and posttest for all five of the teaching methods. However, significant differences between the teaching methods were found. Specifically, students' scores improved the most under the jigsaw method.

Grace L. Earl [36] conducted a study on "using Cooperative Learning for a Drug Information Assignment". The objective of the study was to implement a cooperative learning activity to engage students in analyzing tertiary drug information resources in a literature evaluation course. The assignment and final course grades improved after implementation of the activity. Students agreed that class discussions were a useful learning experience and 75% (77/102) said they would use the drug information references for other courses. Therefore the results showed that the activity had an impact on student performance during the immediate semester and may contribute to long-term retention of systematic searching skills hence it was concluded that the jigsaw technique was successful in engaging students in cooperative learning to improve critical thinking skills regarding drug information. It was recommended that the jigsaw technique could be applicable to other pharmacy courses to facilitate problem-solving skills.

Sedat Maden [37] "conducted a study to compare the effects of Jigsaw I technique from the cooperative learning methods and traditional teaching method on academic achievement and retrieval of Turkish teacher candidates in the matter of written expression. The sample of the study consists of 70

students. One of the classes was randomly specified as control group ($N=34$) to which traditional teaching method was applied while the other as test group to which the Jigsaw technique ($N=36$) was applied. Data about their academic success were collected through Success Test for Written Expression (STWE) applied as pre-test and post-test and views of students about Jigsaw I technique were collected through a form questioning students' views (SVF). According to the findings relating to the students' views about the Jigsaw I technique obtained at the end of the experimental process, it was seen that most of the students stated that Jigsaw technique increases success, encourages self-confidence, develop cooperation and interaction, makes students more active and encourage them to research.

Mahnaz Kazemi [38] conducted a study on the effects of jigsaw teaching method on the success of Iranian EFL learners in terms of their reading comprehension achievement. In the experimental class 38 students were exposed to jigsaw group. The results showed that the mean score of the experimental group in the post-test (30.3) condition was higher than in the pre-test (26.7). As the results of paired-samples t-test showed, the difference between the pre-test and post-test conditions was statistically significant ($p<0.05$), with the experimental group participants.

Literature related effect of jigsaw method of teaching on knowledge among nursing students

Lakshmi Renganathan [39] conducted a comparative study on effect of jigsaw puzzle method among nursing student's academic level of performance at Oman nursing institute, Muscat. Jigsaw Puzzle method is a CTL method was instituted for II year (162) and III year (127) General Nursing Diploma students. Quasi Experimental one group posttest design was adopted. After imparting jigsaw puzzle method, the quiz was conducted for both the groups at one week interval. The results show that only one student has scored grade A in II year where as 4 students have acquired grade A in III year. Considering the failure rate of the III

years, nearly 55 students (43%) of students had failed which is not a good indicator and 13 students (8 percent) are failed in II year which is slightly better than III year students.

Literature related opinionnaire of students about jigsaw method of teaching

Abdullah Sahin [40] conducted a study to explore the effects of a cooperative technique Jigsaw II (experimental group, n=42) and instructional teacher-centered teaching method (control group, n=38) on Turkish language of teacher education department students' attitudes, written expression course (a course in which writing skills were taught), their academic achievement, retention and their views. In this research experimental group pre-test/post-test design" was used. The data was collected through Attitudes to Written Expression Scale (ATWES) and Written Expression Achievement Test (WEAT), Students' View Form (SVF). The statistical analyses revealed that there were significant differences between the experimental and control groups in terms of their attitudes, academic achievement, and retention in favor of the experimental group. In addition, It was determined that the experimental group students had positive views on the use of Jigsaw II technique.

Conclusion

By using a jigsaw cooperative learning in teaching and learning activities, the students 'attention is more focused, and they can express the ideas they had in mind. For students who are shy, using the jigsaw cooperative learning will automatically respond to all assigned tasks, so they will issue their opinions more active, and they can also listen to the opinion of their friends and respond it immediately. Furthermore, students' confidence will show up and can also appreciate other opinion. For the group leader, the soft skills to work in groups will be honed, so by using cooperative learning jigsaw, it is not just improve academic achievement but self-confidence, listening skills and respect other people's opinions will be trained as well.

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