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Review

Effect of Jigsaw technique of Cooperative learning (JCL) on academic achievement of Secondary School Students

Gul Nazir Khan

University Of Peshawar Pakistan
E-mail: gulnazir515198@gmail.com

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The study is about the effect of jigsaw cooperative learning on the academic achievement of Students at secondary level in District Peshawar of Khyber Pakhtunkhwa, Pakistan. The objective of the study is to evaluate the effectiveness of Jigsaw on the academic achievement of chemistry students at secondary level. Jigsaw cooperative learning comprised the following steps. 1: Students works in small groups, each student is given separate topics. They studied it and discussed it. 2: Students then move to expert groups comprising student having assigned the same topic. At this stage student are completely proficient in their topic through peer tutoring and discussion. 3: The students then return to their home group where they present the topic to remaining members of the home group. Students of 9th grade were selected for the study because the diversification of science into branch subjects as physics, Chemistry and Biology starts from grade-9 in the Government school of Khyber Pakhtunkhwa province. Two Government schools located in the heart of Peshawar city were selected as a convenient sample for the study. The two Schools were named as School-1 and School-2. Chemistry subject was selected as the investigator is working as subject specialist in the aforementioned subject in one of the Government higher secondary school of Khyber Pakhtunkhwa province. At the onset of the study pre academic test were conducted from the students of both the experimental and control groups of both the schools. The students of the Grade-9 of both the schools were divided into control group and experimental group. Two teachers having almost equal qualification and teaching experience were selected for teaching to groups, i.e. control and experimental groups. To the control group traditional teaching were carried out in the presence of their own teacher. The experimental groups of both the schools were also taught by their own teacher with jigsaw cooperative learning in the presence of investigator. The investigator first gave some training regarding jigsaw techniques. The two groups of the two schools were taught for a period of 45 days. Efforts were taken to give both the groups' equal time of engagement. The time of engagement for each class i.e. control and experimental, were 45 minutes. Finally individual quiz was administered to assess the students' performance. The time duration applying for jigsaw method were 12 weeks. The data obtained through pre-tests and post-test were analyzed through spss. The study revealed that experimental group of both the schools outnumbered in academic achievement than control group. The implications were discussed.

Keywords: cooperative learning, jigsaw, self esteem, classroom life instrument, Khyber Pakhtunkhwa, Peshawar.

INTRODUCTION

Interaction among the students and the nature of perceiving themselves are often the neglected aspect of teaching learning environment in our system of education. Much of our training time is devoted to help the teachers in the selection of appropriate interaction between students and materials, and some time is spent on the interaction techniques between students and teachers. How students should interact with one another is relatively neglected area of our instructions (Johnson & Johnson 1994). There are three basic ways in which student can interact with each other as they learn. They can work independently without pay attention to other

students, they can compete with each other to find out who is the best or they can work cooperatively with a vested interest in each other learning as well as of their own. In our education system competition is the most dominant phenomenon. Cooperative learning has been defined as a dynamic instructional model that can teach diverse contents to students at different grade level. In cooperative learning students are divided in small groups in the class room or any other projects in this approach student's work together on an assigned concept or topic which lead them to perform task and action necessary for effective learning. Cooperative learning is in contrary to competitive or individualistic learning. This result in increase students' achievement and develop self-confidence of individuals. Johnson et al, (2000) reported the meta- analysis of 164 studies investigating the comparisons of eight cooperative learning methods with that of competitive learning. The result of this meta-analysis is that learning together is the most efficient and applicable cooperative learning technique. Besides learning together, the other cooperative learning techniques like academic controversy, students' team achievement division, Jigsaw, team assisted individualization, group investigation, team game tournament and cooperative integrated reading and composition are in the ranking order respectively. Koc et.al (2010), argued that as compared to traditional teaching method, Jigsaw techniques and group investigation were more successful in escalating scholarly outcomes. Doymus (2008) elaborated that cooperative learning develops communication skills and the students participate actively in this method. This method is applied with different techniques in education. The detail of these techniques is: Learning Together, Student Teams achievement division (STAD), Team Game Tournament (TGT), Group Investigation, Jigsaw and Reading-Writing-Presentation (RWP) technique. In this study, the Jigsaw technique was used.

Jigsaw Classroom (2000), argued that Jigsaw is a type of cooperative learning technique, in which each students of a group is enabled to specialize in some topic of a learning unit. In jigsaw techniques students are assigned to group, called base group having minimum 4 students and maximum 6 students. Students meet with the members of the other groups that have been assigned the same topic. These unions of the students of the same topic occur in the expert group. After mastering the topic in the expert, group students then return to base group and teach the materials to the other members of the group. These students were divided into eight "home groups". In this instance, each home group contained five students, taking the same subtopics; however, the number of home groups in a class can be increased or decreased so that every student in the class can participate in the jigsaw method. Each home group according to Doymus (2007), then prepared and presented their respective topic to the whole rest of the class.

Each student in the base/home group had first studied their topic. 30 minutes were given to each home/base group for presentation and 20 minutes were spared for discussion with the class. Answers were given by the home group if questions were posed by the class during this discussion. Like pieces of jigsaw puzzle the base/home groups then segregated apart (Mattingly and Van Sickle 1991; Doymus 2008b), and the movement of students to jigsaw group (JG) occurs in which students were assembled by other base/home group, who were given the same assignment. Formation of jigsaw groups started like JG1, JG2, JG3 and JG4 (see Fig. 1). The teacher asked the students to master their subtopic. After this students were summarized their respective topic. Jigsaw group then took 30 minutes for presenting their own topic to the whole class, after presentation, open discussion is started which will lasted for twenty minutes. The students then were return to the base/home group which were had one master trainer of his respective topic. The master trainer student was responsible of teaching his specific sub-topic to the remaining students in the entire class Doymus (2008), examined the effectiveness of jigsaw cooperative learning with non-jigsaw group at tertiary level in teaching chemical bonding. The study included 36 undergraduate students from two different classes enrolled in 2005-2006, in the general chemistry class at Ataturk University, Turkey. The result of the study was that the achievement of jigsaw group was higher than non-jigsaw group. Similarly in another study by Doymus, Karacop and Simsek (2010), investigated the effect of jigsaw cooperative learning and animation versus the traditional-teaching methods on students' understanding of electrochemistry in first year general chemistry course. The study was carried out in three different classes in the department of primary science education during the 2007-2008 academic sessions. The first class was randomly assigned to jigsaw group, the second class was randomly assigned to animation group and the third group was assigned to control group. The result indicated that jigsaw cooperative learning and animation group performed better than control group. In another study by Doymus (2007), this investigated the effect of jigsaw cooperative learning versus individual learning method on students understanding of chemical equilibrium in a first year general chemistry course. The result indicated that jigsaw cooperative learning group was more successful than non-jigsaw group (individual learning).

METHODS AND PROCEDURE

All the male students of the 9th grade of Khyber Pakhtunkhwa were taken as a population of this study. The students of two schools located in the heart of Peshawar city were selected as a convenient sample for

Tables showing the comparisons of pretest and posttest of Experimental group of School-2 of Paired sample statistics

Experimental group	N	Mean	Std: Dev	Correlation	Sig
Pre-test	41	10.78	3.953		
				0.451	0.003
Post-test	41	23.244	7.97		
Control group					
Pre-test	35	8.89	2.774		
				0.454	0.006
Post-t	35	11.03	2.537		

Table T-test Comparisons of School-2:

Experimental group	Mean	Std:dev	Std:Error.Mean	df	t-test	Sig
Pretest and posttest	-12.463	7.117	1.11152	40	-11.23	0.000
Control group						
Pre-test &posttest	-2.143	2.779	2.799	34	-4.530	0.00000

Tables showing the comparisons of pretest and posttest of Experimental group and Control group of School-1 of Paired sample statistics

Experimental group	N	Mean	Std: Dev	Correlation	Sig
Pre-test	38	9.71	3.279		
				0.228	0.168
Post-test	38	16.82	5.447		
Control group					
Pre-test	37	8.54	3.07		
				0.460	0.004
Post-t	37	13.3	3.307		

T-test Comparison of School-1:

Experimental group	Mean	Std:dev	Std:Error.Mean	df	t-test	Sig
Pretest and posttest	-7.105	5.680	0.921	37	-8.715	0.000
Control group						
Pre-test &posttest	-4.757	3.320	0.546	36	-7.772	0.0000

Table: Showing Correlation of School-1 & School-2

	N	Correlation	Sig
Control-experimental School-1 Posttest-comparison	37	- 0.097	.567
Control-experimental group School-2 Posttest-comparison	35	-.117	.503

Experimental (School-1)	Mean	Std:dev	Std:Error.Mean	df	t-test	Sig
Post-test comparison	3.514	6.707	1.103	36	3.187	0.003
Experimental (School-2)						
Post-test comparison	12.657	8.758	1.48	34	8.5520	0.0000

investigation. The 9th grade students of the Governments high school No -1 were divided by the school administration into six sections. The investigator was assigned the section of 9th D by the administration of the school. This 9th D was identified as experimental group. Similarly with consultation of Chemistry teacher who was teaching chemistry to class 9th A, were assigned as control group. Proper permission was granted from the parents of the students participating in the study. Two teachers having almost the same qualification and

experiences were selected to teach to control and experimental groups in each school. The two groups of both the schools were tested for academic achievement test. In Pakistan no standardized academic test is available in the subject of chemistry at 9th grade as described by Hussain, (1998). Academic test was prepared for the students of 9th class covering only chemistry subjects. The test include 30 items of multiple choice questions of one credit each and ten short items notes of two credits each. The total marks of the test were 50. The items were selected mostly based from the exercise of the text-book of grade-9 chemistry at the end of each unit. The data collected were analyzed through SPSS by paired students T test.

Table showed the correlation between the pre-test and post test of the experimental group was 0.451. Similarly in the control group correlation between the pre test and post test was 0.454. The correlation significant value for Experimental group in School-2 in both pre and post test is 0.003. Since the value is smaller than 0.005.In contrast to experimental group, in control group the significant value is 0.006 greater than 0.005 for control group in School-2.

The t-test result in the table revealed for both the groups show a significant difference in the achievement between the pre-test and post-test.

The correlation between the pre-test and post test in the experimental group is 0.228 and in the control group, it was 0.460.

Since the t test result for the two groups in the control is 0.0000 smaller than 0.05 and in the experimental group is 0.000 also smaller than 0.05 representing a marked significant improvement in the post test.

The T-test significant value for School-1 in the control and experimental group for posttest is 0.003 lower than 0.005, therefore we reject the null hypothesis that there is no difference between the control group and experimental group. Similarly the significant value for posttest for School-2 in the control and experimental group is 0.000 lower than 0.05, showing that there is a marked difference between the control group and experimental group in the posttest.

DISCUSSION AND CONCLUSION

The findings of the study revealed that jigsaw cooperative learning is the effective methods. The effectiveness of Jigsaw cooperative learning in the increased of academic achievement of the students of both the schools are in closed agreement with the various studies conducted by Doymus (2008). The findings of the study revealed that Jigsaw cooperative learning is more effective than traditional teaching. In another similar study, conducted by Doymus and others (2010) indicated that Jigsaw and animation techniques group is more effective than control group. Doymus (2007) revealed that Jigsaw cooperative learning is more powerful in students' achievement than individual learning. Doymus in 2007 exposed a study Effects of cooperative learning strategy on teaching and learning phases of matter and one component phase diagram. The findings showed that Jigsaw cooperative learning and teaching were found to be more effective in term of academic achievement than the traditional teaching and learning. Naomi and Githua (2013) argued that students taught mathematics with Jigsaw cooperative learning strategy performed significantly better than those students who were taught through the conventional or traditional teaching method. So on the basis of findings of the study, it is recommended that jigsaw cooperative learning is the effective method to enhance students' achievement. It is recommended that jigsaw technique of cooperative learning should be applied to wide varieties of subjects and grade levels so that the methods of cooperative learning could be generalized.

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