



Impact of Jigsaw Method of Cooperative Learning in the Subject of Science at Elementary Level

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Abstract: *The study was experimental, with a pre-test and post-test control group design, to determine the impact of the jigsaw technique on cooperative learning for science subjects at the elementary level. The population consisted of students from class 8 at Musa Kalan Government High School in the district of M B Din. Those who participated in the performance became members of both the traditional and experimental groups, with the experimental group receiving the same marks as the traditional group. Students were subjected to a post-test after the month-long course. Using the mean, standard deviation, and t-test regression analysis, we compared the scores from the pre-test and post-test. The most significant findings were that students exposed to the jigsaw technique performed significantly better than those exposed to the traditional teaching method. The results demonstrated that the jigsaw technique outperformed those who thought they were learning through a traditional teaching method.*

Key Words: Jigsaw Technique, Cooperative Learning, Intervention, Regression Analysis

Introduction

Jigsaw is a very famous method of cooperative learning which is most commonly used in classes for cooperative work of students. In this method, learners were distributed into five or six partner teams. A text material was given to the students, allotting a particular part of the textual material to particular students. Given the portion of textual material was narrated by the student and other students narrated their textual material in their turn. After this, group members with the same text material from skillful teams helped other team members for a thorough grip on the material. Then proficient participants joined their own groups again and supported other followers to accomplish the learning process on the material. Individual quizzes were given to the students after these discussions among group members. Aronson and his colleagues developed the jigsaw method of cooperative learning ([Aronson & Patnoe, 1997](#)). For example, periods of Biology subject, on the plant cell construction, as related material was provided to the pupils. Teams were designed, and a sub-topic was given to members (centriole, nuclear membrane, chromosomes, etc.) to grip it substantially. The pupils with the same issue, e.g., nucleus, formed skillful groups and completely sought the material related to the nucleus. Again the expert team scattered returned to home teams and helped other fellow students to accomplish the task which was given to the instructor. Individual quizzes were taken by the students at the end. Representational design of the Jigsaw method is presented on the next page:

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Home Groups

Six or Five Followers Gathered Heterogeneously

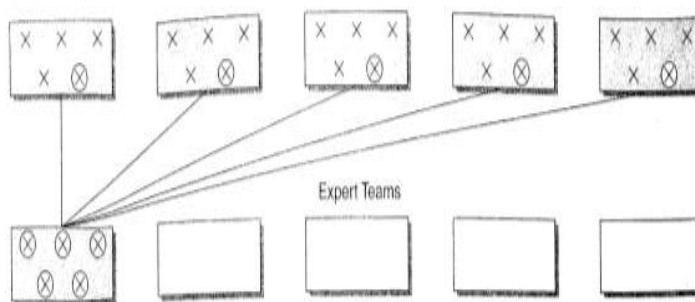


Figure 1: Every skillful group has one partner from every of the home groups

Jigsaw is a teaching technique that is used in cooperative learning. This technique facilitates every student to occupy a single portion of a topic. One aspect of the topic is given to one group, and another aspect of the topic is given to another group. For example, one group deals with the advantages of carbon dioxide, and other group struggles with disadvantages of carbon dioxide. The jigsaw is a technique of classroom management activity as were in which every student gets help from another student or group to complete the task. This technique divides the classes into small groups and divides assignments into portions. In this way, students complete jigsaw assignments or puzzles. Jigsaw provides assistance to students for working in a group with collaboration. Group partners distributed the responsibility for the accomplishment of the task. In this way, students used social abilities and critical thinking for the completion of their assignments. Jigsaw technique promoted communal, problem-solving, and listening abilities. In jigsaw strategy, students are given various portions of the same difficulty or with a similar issue for the accomplishment. Each group investigated varied but related material of the topic in the form of aspects. The topic remains the same, but different portions of the topic are given to the different groups ([Ariana Sutton-Grier, 2015](#)).

Every member of the group learns and understands his/her aspect of the task with full attention and interest. When each member of the group gets prepared fully about the aspect, then new groups are created, and one expert member goes to the new group and explains about his/her team's worked on the aspect. In this way, all students change the groups, and finally, each student learns about all aspects of the topic. In the jigsaw technique, every student changes his group after seeking knowledge about aspects and goes to other groups for the completion of other aspects of the topic. In this way, all aspects of the topic are covered by every student. Then each team uses their information about the aspect, and they prepare a summary about all aspect of the topic. The jigsaw technique produces knowledge, critical thinking, and social skills between the students due to cooperation and collaboration ([Tewksbury, 1995](#)).

Jigsaw strategy is a form of cooperative learning which supports the students to create skills for acting effectively in a group. Working in a group or a team motivates the students to seek effectiveness and develops an interest in the accomplishment of aspects of the task. Many skills are produced by the jigsaw technique, especially socio-environmental synthesis ([Deutsch, 1949](#); [Johnson & Johnson, 2005](#)). Cooperative learning is a very famous and effective teaching method that has been supported by over 1200 research studies in the world ([Johnson & Johnson, 2009](#)). It is a great characteristic of cooperative learning that there is no competition among the students, but they engage in their task with the cooperation of their fellows, and each member of the group is exposed to all the aspects of the task with full attention. During cooperative learning, students work collaboratively for learning and accomplishment of the task. Characteristically, when students of undergraduate level are organized in groups for the accomplishment of a task, the group manages all the problems of the task itself with the help of other members of the group. When the interest of some group members is lost towards the work due to any reason, the seeking process effected and the group cannot produce the positive result during

the work. Cooperative learning is the best teaching strategy that provides all necessary features to the students working in groups like optimistic interdependence, distinct responsibility, and concurrent communication ([The Foundation Coalition, 2001](#)).

It is a great characteristic of the jigsaw technique that it provides encouragement to the students to work in the groups activities and offers help to the students to know the mastery of subject matter and to obtain maximum attainment in the process. It is a cooperative learning strategy that decreases cultural conflict between the school students, provides a better chance for learning, increases the motivation level of students, and improves interest in learning which shows a positive learning experience. This technique of cooperative learning was introduced by Elliot Aronson in the early 1970s at the University of Texas and the University of California. This effort went by Robert Slavin's theory. Mutual consultation paves the way for help which depends on constructive philosophy. Mutual consultation is a process of learning in which the students work in groups, help each other for the completion of the task by providing assistance to every member of the group in recognizing all aspects of the task broadly. Mutual consultation provides a friendly environment to the student in which they learn positively, and in this method of learning, no student of the group would be superior or intelligent than other students of the group, but all students stand equal work as a team for the achievement of a goal. The main goal of cooperative learning is the contribution of every member of the group in the task, and this strategy of learning is different from conservative grouping which stresses on the competition. Mutual consultation stresses the participation of each member of the group to solve the problem and effort of the group as a whole and not as the effort of a single member of the group (Slavin, 1995).

This method of teaching progresses into achieving the target stages. During this method, teacher plays the role of facilitator and motivates the students to achieve the goal positively. The teacher produces an environment in which the students work as a team, and every member takes an interest to get exposed to the task. This method is different from the traditional method because in the traditional method teacher is the center of all the teaching process, and students only look and listen to him, but in the jigsaw method of mutual consultation, students are the central body of all processes of the learning. In the jigsaw method, the teacher only maintains the rules of this method and motivates the student to work in groups with the help of other group fellows ([Johnson & Johnson, 2009](#)).

Since the merits of the Jigsaw method seep reed other methods, hence there was a need to test the reality of ground by adopting the Jigsaw method keeping it focused on the topic "Impact of Jigsaw method of Cooperative learning in the Subject of Science at Elementary level."

Jigsaw method of cooperative learning may be applied at all levels, grades, and topic domains the universe over. But its effectiveness by means of an alternate to traditional teaching method has not yet been tried upon in maximum of the schools of our country. Science at a lower level of learning is more a spot to go by the development of differential concepts allied with the scientific characteristics. The concept has been taken up and developed as a construct, ultimately merging into an elongation of the practicality of the conceptual network. This conceptual network strives to progress in coincidence with the latest research-based developments. Thus, an imperative study has been undertaken by the researcher as, "Impact of Jigsaw method of cooperative learning in the subject of science at the elementary level." The researcher may pick out the potential to utilize cooperative learning techniques in our elementary scenario with reference to science. The objectives of the study were; identify the elements of the Jigsaw method of cooperative learning more responsive to students learning, determine the effectiveness of the jigsaw method of cooperative Learning for students' academic achievement in the subject of science at the elementary level.

Research Questions

1. What way the elements of the jigsaw method of cooperative learning are more responsive to students learning of science at the elementary level?
2. How the jigsaw method supports students learning in the subject of science at the elementary level.

Delimitations

Parameters of study have been kept restricted to:

Urdu medium class 8 at Govt. Boys High School Musa Kalan District M.B.Din, enrolled for the session 2019-20, to administer MCQs devised out of 2 chapters (Chapter 3 and 4) of the Book developed by the Punjab Text Book Board.

It was determined that the study population included all of the students (140) who were enrolled for the 2019-20 school year in the subject of General Science in class 8 at Govt. Boys High School Musa Kalan District Mandi Bahauddin.

Because the study was experimental, it was divided into two groups of 30 students each, referred to as the experimental and control groups. Students selected as samples were subjected to a test to equalize the students into control and experimental groups. Those who scored more than 60 percent in general science were considered sample students.

In the first place, the researcher was able to secure official approval for the experimentation at the Govt. Boys High School in Mandi Bahauddin. The teacher used a test from the 7th grade General Science textbook to get things started to create a baseline data set. A test adapted from a seventh-grade textbook was administered to the selected group. The experimental and control groups were divided based on whether or not a participant received more than 60 percent of the possible points. All participants split into two 30-person groups, one for each group in the experimental and control groups. Participants in the study had to give their consent after being fully informed about the study's purpose and risks. All parties agreed that a schedule of research activities, including days, times, locations, and content, would be prepared with the cooperation of the research participants, and this was done. They addressed students who had earned at least 60% on a test and inquired as to whether or not they would be willing to participate in the study if they agreed to do so. The teacher collaborated with the school administration to create a new calendar of events, which was then distributed to students. Urdu was the primary language of instruction at the school. In order to complete chapters 3 and 4 in one month, they selected. Cooperative learning in the classroom covered two chapters in one month.

Recruited students were sorted into two groups: those who would receive instruction in the jigsaw approach and those who would receive instruction more traditionally. To get the pupils ready for their class 8 final, the teacher had them respond orally to questions and administer quizzes throughout the class period. Both chapters of the test were valid after they were thoroughly examined for both validity and reliability. According to the month's plan, the examinations for chapters 3-4 were given to the class on December 31.

Chapters 3 and 4 focused on the researcher's lessons for a month. The teacher in the experimental group used the Jigsaw approach while traditionally instructing the control group. After one month of training, students were given a post-test based on chapters 3 and 4 of the Punjab Textbook Board's general science class 8 textbook. The experimental and control groups were given a follow-up test, and the results were documented on the papers.

Testing and scoring of the tests resulted in achievement scores for both the control and experimental groups, allowing researchers to compare the two groups' results. The t-test was used to compare the achievement scores of the two groups on the scientific examination, and the mean, standard deviation, and range of scores were calculated.

Analysis of Data

Results

In this study, 60 participants were randomized into two groups of 30 each, using a randomization procedure. One was taught using the traditional approach, whereas the other used the jigsaw method. The groups were exposed to a list which was a post-test; data was organized and processed for the t-test. The computation follows

Table 1(a). Showing t-test results

Study Group	No	Mean	SD	Std. Error Mean	P-value
Experimental	30	43.3143	4.7140	.79681	.000
Control	30	28.9143	3.36392	.56861	

Table 1 (a) shows that the t-test was used to compute the results for the group that received the intervention and the usual group that did not. The data is presented in the Mean and Standard Error of the Mean. The p-value is 0.000, indicating a statistically significant difference between the group that received the intervention and the usual group that did not. The mean score of the experimental group is 43.79, while the control group's mean score is 28.56. The mean score of the experimental group is 43.79. These Mean ranges demonstrate the experimental group results are significantly better than those of the control group. Groups designated as experimental were studied using the jigsaw method procedure, while groups designated as control were studied using the traditional instruction process. Results show that the jigsaw method performs significantly better than the traditional teaching methods.

The Punjab Textbook Board administered a post-test following the collapse of two months and the coverage of two chapters of the General Science Book by the Punjab Textbook Board. There were 124 items on the test composed of chapters 3 and 4.

Table 1 (b). Showing Independent Samples t-test

Group	Mean Difference	SED	Sig. (2-tailed)	t value	df
Experimental group	14.40	.97889	.000	14.711	68

The mean difference between the two groups is shown in Table 1(b). The experimental group's mean is higher than the control group's mean, as shown in this table. The difference value is 14.40, which allows us to conclude a statistically significant difference between the groups exposed to the intervention and the usual group not exposed to the intervention. The p-value is 0.000, which is also statistically significant. These findings provide evidence that the jigsaw method positively impacts students' academic achievement levels.

Teaching with the jigsaw method continued for another two months, during which four chapters were covered. After completing these four chapters, a test was prepared with the format of multiple-choice questions (MCQs) and administered to both groups.

Table 2. Showing Percentiles for Groups without Intervention of Jigsaw Method

Study Group	5	10	25	50	75	90	95
Experimental group	35.80	37.60	39.00	43.00	48.00	50.00	52.00
Control group	23.80	24.00	26.00	29.00	32.00	34.80	35.20

Table 2 shows the percentiles of the intervention group and the control group in the test marks. It is 35.80 percentile and 52.00 percentile for the Experimental group. The control group's 5th percentile is 23.80, and its 95th is 35.20. The group receiving intervention outperforms the control group by a large margin, evidenced by the 95th percentile scores. According to the results, both groups are very distinct. The Experimental group outperforms the control. The Experimental group's percentiles outperform the Control group.

Table 3. Linear Regression Analysis for Jigsaw Technique in Groups

R	R Square	Adjusted R Square	F Change	df1	df2	Sig. F Change
.872	.761	.757	216.40	1	68	.000

In this study, the Jigsaw method's long-term influence on students' learning was determined using linear regression analysis (Table 3). The two variables were correlated using regression analysis. Cooperative

learning strategies have improved student test scores by 76%. R square is 0.76, indicating that the independent variable accounted for 76% of the variation in the dependent variable. The Experimental group outperforms the Control group by 76%. The p-value is 0.000, indicating a significant difference between the two groups. As a result, the Jigsaw method outperforms the traditional teaching method.

Table 4. Showing t-test Regarding Item Difficulty and Item Discrimination

		N	M	SD	Std. Error
Item Difficulty	Intervention Group	61	.7379	.1146	.02130
	Control Group	61	.4138	.1641	.03048
Item Discrimination	Experimental Group	61	.3621	.06719	.01155
	Control Group	61	.3357	.07310	.01381

The outcomes of the item difficulty and item discrimination tests were compared between the experimental and control groups, as shown in Table 4—the data presented in the mean and the standard deviation. Item difficulty of the Experimental group in the form of Mean is $.73 \pm .02$, and item discrimination is $.36 \pm .01$. Item difficulty of control group in the form of Mean is $.41 \pm .03$, and item discrimination is $.33 \pm .01$. Results show that the test was not tough for the students. The test was easy for the Experimental group and was not easy for the Control group. Item difficulty of Experimental group shows that items were moderate, and item discrimination of this group shows that items used in this test were good items. Item difficulty of Control group shows that test was difficult for the control group and item discrimination of this group shows that items used in this test were a good item. These results display that the jigsaw technique is better than the Traditional teaching method. The Experimental group discriminates and differentiates from the control group, so this test can be used in the future because items of this test were not tough and were moderate difficulty level.

Finding

The experimental group results (mean score=43.31, standard deviation=4.41) are significantly better than those of the control group (mean score=28.91, standard deviation=3.36) in all categories. According to the results of linear regression analysis, the experimental group's variance is explained to a level of 79 percent, which is a higher level of explanation than the control group—the p-value is 0.00000, which indicates that the difference between the two groups is statistically significant. The experimental group was exposed to the Jigsaw method of the cooperative learning methodology, which is a form of cooperative learning (Cooperative learning technique). These findings provide evidence to support the conclusion that the jigsaw method of the Cooperative Learning Technique is superior to the conventional teaching method.

Conclusion

It was decided whether or not there was a difference between the control group and a traditional approach of teaching general science at the elementary level by using a t-test. The Jigsaw technique was demonstrated to the participants in the experiment. The experimental group's mean score is greater than the control group's, proving the superiority of the jigsaw technique of teaching over the traditional method of teaching in the setting of general scientific education. The same proven trace was used to compute linear regression, item difficulty, and item discrimination for a test conducted after one month of teaching in chapters 3 and 4 conducted after one month of teaching in chapter 3 conducted after one month of teaching in chapter 3 conducted after one month of teaching in chapter 3.

Recommendations

1. The Jigsaw technique may improve educational achievement in general and science education in particular.

2. Though the major concentration of the Jigsaw method was on the struggle every member created to assist group evolution, it is suggested that students should be individually examined for a variety of diverse tasks.
3. Educational authorities should inspire elementary science educators to apply the jigsaw technique as a great teaching method. Government should provide rewards to instructors who enhance their capability in the usage of diverse Cooperative Learning techniques.

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