Scholarly Research Journal for Interdisciplinary Studies
Online ISSN 2278-8808, SJIF 2021 = 7.380,
http://www.srjis.com/issues_data?issueId=213
PEER REVIEWED & REFEREED JOURNAL, MAY-JUNE 2023, VOL- 11/77
https://doi.org/10.5281/zenodo.8174125

EFFECT OF 'JIGSAW' COOPERATIVE LEARNING STRATEGY ON QUALITY OF LEARNING OUTCOMES AMONG SECONDARY SCHOOL STUDENTS

Dr. Amit kauts[1] & Deepti Pandey[2]

[1]*Prof & Head, Department of Education, Guru Nanak Dev University, Amritsar, India*

[2]*Research Scholar, Department of Education, Guru Nanak Dev University, Amritsar, India*

Paper Received On: 21 JUNE 2023
Peer Reviewed On: 30 JUNE 2023
Published On: 01 JULY 2023

Abstract

The present study was undertaken to investigate the effect of teaching through jigsaw technique on the learning outcomes in science for Xth class. The data were obtained through pre and post tests from 120 (60 experimental and 60 control group) tenth class randomly selected students from Kendriya Vidyalaya, Amritsar district of Punjab (India). Experimental group was taught through jigsaw technique and the control group was taught through traditional teaching techniques. The result of the study revealed significant difference between the learning outcomes in Academic Achievement gain scores of the experimental and control group. Learning outcomes in academic achievement of the group taught through jigsaw technique were significantly better as compared to the group taught through traditional techniques.

Keywords: *cooperative learning, jigsaw-based cooperative learning, academic achievement.*

1. Introduction

Traditional lectures have been the norm for teaching and learning for decades because full access to the course's essential materials was practically unavailable to students. However, in today's technologically advanced world, access to information rarely poses a barrier to a student's education. In addition to the changes in how information is accessed and delivered, numerous studies have shown that active, student-centred learning strategies outperform traditional lectures that are based on passive learning. Cooperative learning, a method of instruction that enables students to continue and build their own knowledge and understanding through peer discussions and tutors, can be introduced by a teacher to avoid monotony and boredom and to make learning more appealing (Azmin, 2016). Additionally, according to Bhandari et al., (2017), subsequent presentations helped the student's overcome hesitation and

shyness. The main goal of Jigsaw teaching is to create a meaningful learning experience for students and teachers.

1.1 Cooperative Learning

It is explicitly stated in the context of our Indian Education System and with reference to our New Education Policy (2020) that the goal of education will not only be cognitive development but also character building and producing holistic and well-rounded people with the essential 21st century skills. Each subject's curriculum will be pared down to the essentials in order to make room for critical thinking and more all-encompassing, inquiry-based, discovery-based, discussion-based, and analysis-based learning. Important concepts, ideas, applications, and problem solving will be the focus of the required content. It can be characterised as an instructional strategy that makes use of motivational strategies to make learning more engaging and pertinent (Cornelius-Ukpepi et al., 2016). Johnson and colleagues (1991) presented six cooperative learning group characteristics, including positive interdependence, individual accountability, face to face promotive interaction, appropriate collaborative skills, group processing, and heterogeneous groups. Cooperative learning has been used for several years for enhancing students' achievement. Naomi (2013) suggests that students who undertake cooperative learning groups have higher academic test scores, higher self-esteem, a greater number of positive social skills and a greater understanding of content and skills that they learned.

1.2 Jigsaw cooperative learning strategy

Elliot Aronson created the collaborative learning strategy known as Jigsaw (1971). The strategy aims to study the course material in groups in order to accomplish particular goals. Aronson (2005) created a thorough set of procedures for carrying out the jigsaw teaching strategy. Through the use of this technique, each student can be seen as a piece of a jigsaw puzzle. Each student submits his or her assigned academic tasks to the assignments provided by the teacher by working with other students, much like the completed picture of a puzzle made by piecing together individual pieces.

1.3 Learning outcomes

The expected levels of learning that students are expected to achieve for a class are indicated by the learning outcomes, which are assessment standards. These outcomes can be used as benchmarks to gauge learning over time. The teachers' understanding of the individual and group learning levels of the students in their respective classes would be aided by the learning outcomes. This understanding can help teachers adjust their teaching methods and strategies to

better support student learning and achievement. According to Battersby (1999), Learning outcomes are statements that describe the knowledge or skills that students must acquire at the end of a particular task, class, course, or programme and help the students understand why knowledge and skills will be useful to them. According to Jenkins and Unwin (2001), Learning outcomes are statements of what is expected that the students will be able to do as a result of learning the activity. Learning outcomes are statements of what a learner is expected to know, understand, and be able to demonstrate after completion of the process of learning, as well as the specific and practical skills gained and demonstrated by the successful completion of a unit, course, or programme (UNESCO, 2004; ECTS User Guide, 2005). The integration and application of knowledge are the main goals of good learning outcomes. With six hierarchical levels, from lower-order thinking skills to higher-order thinking skills, Bloom's Taxonomy organises educational goals and objectives. These six levels are remembering, understanding, application, analysis, evaluation, and creation. Learning outcomes describe how students can use the material in both the context of the class and in a more general sense, as opposed to placing emphasis on the coverage of the material.

1.4 Jigsaw and academic achievement

Many researchers have suggested that jigsaw teaching technique is successfully used in teaching various subjects. Aydin and Biyikli (2017) found that jigsaw technique created an effective learning environment. The students were noted to express their ideas better as a result of a cooperative environment. Darnon et al., (2012) found that the jigsaw technique proved beneficial for increasing students' self-efficacy in vocational training courses. The strategy can also be used to improve the learning of teachers. According to Van Wyk (2015), "Teachers expressed positive attitudes towards jigsaw learning and enjoyed the group spirit". Sabbah (2016) suggested that the jigsaw strategy empowers the students to take charge of their learning, retention, peer tutoring, communication skills and retrieval of concepts. It was also found that this strategy decreases stress, tension and absent-mindedness. The Jigsaw teaching strategy is a collaborative learning strategy which can be extensively used at lower to a higher level of education. According to Bogam and Khan (2016), "the traditional didactic lecture method needs to be replaced by an interactive method like Jigsaw to facilitate learning among medical students". Thus, it can be inferred that jigsaw is effective for any subject and at any level of education.

Hidayah et al., (2017) concluded that cooperative learning strategies such as the jigsaw model and make a match can significantly increase the activeness of students in a third-grade

classroom. In support of this, Garcia et al., (2017) also found that students preferred non-traditional methods of teaching and collaboration as they resulted in effective learning. Adams (2013) reported that pupils developed an interest in working with other students. They also cultivated good habits. It was also found that students were able to answer the questions more confidently. In support of this, Garcia et al., (2017) also found that jigsaw is an effective strategy that allows students to learn through cooperation instead of rote learning and isolation. Several previous studies support the efficacy of the jigsaw cooperative learning method (Hollingshead, 1998). The majority of studies reported positive effects on students' performance. Most importantly, 50% of the improvements came from the implementation of jigsaw-based cooperative learning (Slavin, 1981). Jigsaw Cooperative learning has proven to be an effective method in all subject areas, including science. Science subject enables students to be involved in group work, where they have the opportunity to share ideas and be cooperative with each other in collaborative practical activities. According to Rutherford and Ahlgren (1990), the collaborative nature of scientific and technological work should be strongly reinforced by frequent group activity in the classroom. Scientists and engineers work mostly in groups and less often as isolated investigators. Dickens (2005) said that to model real science in the making, instructional activities and situations should engage students in more student-to-student discussion of scientific ideas and more cooperative group work. Cooperative learning has been the subject of numerous studies conducted abroad, and almost all of them have found that it improves students' understanding of science. Nevertheless, there haven't been many studies on cooperative learning in India. Even though the National Curriculum Framework (2005) emphasised the importance of group activities and teacher- and peer-led discussion in science pedagogy, cooperative learning has yet to take off as a popular science teaching strategy in our nation. This could be a result of teachers not being properly informed about cooperative learning and how to implement it in the classroom.

1.5 The objective of this research is to explore-

The effect of 'Jigsaw' cooperative learning strategy on academic achievement at different levels of cognitive domain i.e. Remembering, Understanding, Application, Analysis, Evaluation and Creation.

2. Methods

The design of the present study, sample, tools, procedures, and data analysis strategies are explained below under appropriate subheadings.

2.1 Design

The current study is experimental in nature and is built upon a 2x2 factorial design. A 2x2 factorial Design was used to examine how the Jigsaw Technique affected the quality of learning outcomes in science in relation to gender. In the present study, Instructional Strategies and Gender were taken as independent variables. Here, the classifying variable was Gender, which varied at two levels: Boys and Girls. The manipulative variable was Instructional strategies, which vary at two levels: The treatment group was taught by the Jigsaw method of teaching, and the control group was taught by the traditional method of teaching. In the current investigation, Learning Outcomes in science, i.e., Academic achievement, were taken as the dependent variable. The efficiency of different treatments was assessed in two phases: before the experiment, designated as a pre-test, and immediately after the experiment, designated as a post-test. In order to see the effect of the treatment, the main factor that was taken into consideration was the score of the students. Although there were many extraneous variables that could be considered, e.g., nature of school, grade level, subject to be taught, duration of the period, etc., that were controlled experimentally.

2.2 Sample of the study

A random sampling method was used for the current study. Kendriya Vidyalaya school served as the source of the sample. One section of class X students was chosen at random to form the treatment group, and the other section served as the control group. Both the treatment and control groups each included a minimum of 30–30 students from class X. Two sections from each class X of the school were chosen at random to make up groups I and II. There were 120 students total; 60 students in each of groups I and II. All of these students were enrolled in the same C.B.S.E. course or syllabus and were receiving their science instruction in the same official medium.

2.3 Tools used:

For the present study, the following tools are used:

1. Lesson plans were constructed to teach using the Jigsaw method by the investigator in order to collect Academic Achievement data from the students.

2. A test of academic achievement at different levels of cognition namely Remembering, Understanding, Application, Analysis, Evaluation and Creation was prepared by the researcher on the science topic of "Nutrition in Humans."

2.4 Pre and post tests

A pre test was administered to the students before the intervention was introduced. The aim of the pre test was to determine the students prior knowledge and evaluation skills based on what

the teacher had previously taught. After the intervention ceased, a post test was given to the students to determine whether the intervention had helped them improve or not. The pre test and post test contained objective type questions and short answer type questions as a part of each student's individual classwork based on the topic ''Nutrition in Humans''.

2.5 Procedure

Pre-test administration, instructional programme execution, and post-test administration comprised of the three phases of the experiment. In Phase I, the investigator interacted with the sample subjects to build rapport before introducing the Jigsaw method alongside traditional teaching techniques. All students in the treatment group and control group took the Academic Achievement Test as part of the pre-test. Response sheets were offered, and they were graded using the appropriate scoring keys. The instructional programme was carried out in Phase II, with the students being divided into six groups and given subtopics. To master the course's technical components, experts formed groups, and the home group was in charge of instructing the other four participants. Grades were given after the group's performance was assessed. Post-tests were administered as soon as the instructional programme was complete to gauge the subjects' responses to the Jigsaw method. All treatment and control groups received the Academic Achievement Test in Science.

2.6 Hypotheses

1. There is no significant difference in academic achievement gain scores in science at different levels of cognition namely Remembering, Understanding, Application, Analysis, Evaluation and Creation between the students taught through jigsaw & traditional method among secondary school students.
2. There is no significant difference between boys and girls in secondary school in terms of academic achievement gain scores in science at different levels of cognition namely Remembering, Understanding, Application, Analysis, Evaluation and Creation.
3. There is no significant interaction between students taught through jigsaw method and gender in academic achievement gain scores in science among secondary school students.

2.7 Data Analysis

In order to simplify the data and make it easier to understand, statistical techniques were used. Both the pre- and post-test quantitative data were analysed to determine the general nature of the data using descriptive statistics like Mean, Median, Standard Deviation, and the main and interaction effects using a two-way (2x2) analysis of variance. Following that, the data were analysed in light of the goals and hypotheses. The two-way ANOVA was used to determine

whether there was a significant difference between the groups in terms of the variations in their scores. Additionally, statistical software was used to determine whether there was a significant difference between academic achievement gain scores in each group using repeated measures of an ANOVA. The 0.01 level of significance was chosen as the statistical significance level.

3. Results

In the present study, the experiment was conducted to analyse the impact of Jigsaw method of teaching compared to traditional method of teaching on the learning outcomes of secondary school students. The results of the study are elaborated in the succeeding paragraphs along with tables.

TABLE 1: DIMENSION WISE MEANS AND S.Ds OF ACADEMIC ACHIEVEMENT GAIN SCORES IN REMEMBERING, UNDERSTANDING, APPLICATION, ANALYSIS, EVALUATION AND CREATION DOMAINS OF COGNITION

Instructional strategies	**Gender**	**Academic Achievement**						**Total**
		Remembering	**Understanding**	**Application**	**Analysis**	**Evaluation**	**Creation**	
Treatment group	**Boys**	Mean=1.800	Mean= 1.633	Mean=1.533	Mean=1.567	Mean=1.300	Mean=1.433	Mean=7.477
		S.D= 0.407	S.D=0.490	S.D=.0507	S.D=0.504	S.D=0.466	S.D=0.626	S.D=3.000
		N=30	N=30	N=30	N=30	N=30	N=30	N=180
	Girls	Mean= 1.867	Mean= 1.600	Mean=1.400	Mean=1.367	Mean=1.433	Mean=1.500	Mean=9.167
		S.D=0.346	S.D=0.498	S.D=0.622	S.D=0.615	S.D=0.504	S.D=0.509	S.D=3.094
		N=30	N=30	N=30	N=30	N=30	N=30	N=180
Control group	**Boys**	Mean= 0.833	Mean=0.833	Mean=0.800	Mean=0.833	Mean=0.700	Mean=0.700	Mean=4.699
		S.D=0.592	S.D=0.592	S.D=0.610	S.D=0.592	S.D=0.535	S.D=0.535	S.D=3.457
		N=30	N=30	N=30	N=30	N=30	N=30	N=180
	Girls	Mean=0.733	Mean=0.767	Mean=0.600	Mean=0.767	Mean=0.433	Mean=0.433	Mean=3.733
		S.D=0.583	S.D=0.626	S.D=.0675	S.D=0.626	S.D=0.568	S.D=0.568	S.D=3.646
		N=30	N=30	N=30	N=30	N=30	N=30	N=180
		Mean= 1.317	Mean= 1.233	Mean=1.167	Mean=1.200	Mean=1.000	Mean=1.067	Mean=6.984

Total	**Boys**	S.D=0.701	S.D=0.673	S.D=0.668	S.D=0.659	S.D=0.582	S.D=0.686	S.D=3.969
		N=60	N=60	N=60	N=60	N=60	N=60	N=180
	Girls	Mean= 1.308	Mean= 1.183	Mean=1.000	Mean=1.067	Mean=0.933	Mean=0.967	Mean=6.528
		S.D=0.719	S.D=0.701	S.D=.0759	S.D=0.686	S.D=0.733	S.D=0.758	S.D=4.356
		N=60	N=60	N=60	N=60	N=60	N=60	N=360

In order to analyse the analysis of the variance, 2×2 ANOVA has been calculated and are presented in the table 2 below-

TABLE 2 SUMMARY OF 2×2 FACTORIAL DESIGN ANOVA OF ACADEMIC ACHIEVEMENT GAIN SCORES (DIMENSION WISE)

Source of Variance	Remembering					Understanding					Application				
	df	SS	MSS	F-ratio	p-value	df	SS	MSS	F-ratio	p-value	df	SS	MSS	F-ratio	p-value
Main Effect (A) Group	1	33.075	33.075	**135.572***	.000	1	20.008	20.008	**65.013***	0.000	1	17.633	17.633	**47.941***	0.000
Main Effect(B) Group	1	0.008	0.008	0.034	.854	1	0.075	0.075	0.244	0.622	1	0.0833	0.833	0.066	0.135
Interaction on Group(A×B)	1	0.208	0.208	0.854	.357	1	0.008	0.008	0.027	0.870	1	0.033	0.033	0.091	0.764
Within Groups (Errors)	116	28.300	0.244			35.700	116	0.308							

*Significant at the 0.01 level of confidence

Continued….

Source of Variance	Analysis					Evaluation					Creation				
	df	SS	MSS	F-ratio	p-value	df	SS	MSS	F-ratio	p-value	df	SS	MSS	F-ratio	p-value
Main Effect (A) Group	1	13.333	13.333	**38.796***	0.000	1	19.200	19.200	**71.081***	0.000	1	24.300	24.300	**77.157***	0.000
Main Effect(B) Group	1	0.533	0.533	0.155	0.215	1	0.133	0.133	0.244	0.484	1	0.300	0.300	0.153	0.331
Interaction on Group(A×B)	1	0.133	0.133	0.388	0.535	1	1.200	1.200	4.443	0.037	1	0.833	0.833	2.646	0.107
Within Groups (Errors)	116	39.867	0.344			116	31.333	0.270			116	36.533	0.315		

**Significant at the 0.01 level of confidence*

This indicates that the students in secondary school taught through Jigsaw cooperative learning strategy showed better results in all the six dimensions of achievement i.e. Remembering, Understanding, Application, Analysis, Evaluation And Creation domains as compared to the students who were taught through traditional method.

MAIN EFFECTS

GROUP (A)

3.1 Dimensions of Achievement Gain Scores

It may be observed from table 2 that the F- ratio for the difference in learning outcomes at the Remembering, Understanding, Application, Analysis, Evaluation and Creation dimensions of Achievement gain scores between students who were taught using Jigsaw cooperative learning strategies and students taught using traditional methods of teaching are 135.572, 65.013, 47.941, 38.796, 71.081 and 77.157 respectively which were *found to be significant at the 0.01 level of confidence* implying that there is significant difference in these dimensions of achievement gain scores of secondary school students who were taught using Jigsaw cooperative learning strategies compared to the students who were taught using traditional methods of teaching. Also it is clearly evident from the table 1 that the mean gain scores of the students taught through Jigsaw method is more than the students taught through traditional method. Hence the null hypothesis, *(Ho) "There is no significant difference in academic*

achievement gain scores in science at different levels of cognition namely Remembering, Understanding, Application, Analysis, Evaluation and Creation between the students taught through jigsaw & traditional method among secondary school students after intervention is rejected''. This indicates that the students taught through JIGSAW cooperative learning have more achievement gain scores than students who were taught through traditional method.

Gender(B)

3.2 Dimensions of Achievement Gain scores

It may be observed from table 2 that the F- ratio for the Remembering, Understanding, Application, Analysis, Evaluation and Creation dimensions of Achievement gain scores between students who were taught using Jigsaw cooperative learning strategies and students taught using traditional method are 0.034, 0.244, 0.066, 0.155, 0.244 and 0.153 respectively which were *not found to be significant at the 0.01 level of confidence* implying that Gender of the students do not contribute to the Achievement Gain Scores. *Hence. the null hypothesis (Ho) "There is no significant difference in boys and girls of secondary school students on gain scores of academic achievements at different levels of cognition namely Remembering, Understanding, Application, Analysis, Evaluation and Creation has been accepted".* It suggests that secondary school students on the basis of Gender do not contribute to the achievement gain scores.

TWO ORDER INTERACTION

Treatment X Gender (A×B)

3.3 Dimensions of Achievement Gain scores

It may be observed from table 2 that the F- ratio for the Remembering, Understanding, Application, Analysis, Evaluation and Creation dimensions of Achievement gain scores between students who were taught using Jigsaw cooperative learning strategies and students taught using traditional methods are 0.154, 0.027, 0.091, 0.388, 0.034 and 0.046 respectively which were *not found to be significant at the 0.01 level of confidence* implying that the effect of Jigsaw cooperative learning strategies on the Remembering, Understanding, Application, Analysis, Evaluation and Creation dimensions of Achievement gain scores are independent of Gender of the students of secondary school. Hence the *null hypothesis (Ho) "There is no interaction between instructional strategies & gender on the gain scores of academic achievements in Science among secondary school students" has been accepted.* This means that the effect of Jigsaw cooperative learning strategies on the total gain score is independent of gender of secondary school students.

4. Educational Implications

Any study conducted on education is beneficial if its findings have practical applications. As far as the current inquiry is concerned, it can be asserted that the useful data gathered may contribute to the students' increased academic achievement. Jigsaw learning strategies are used in the classroom and lead to superior academic gains in science. Therefore, using the Jigsaw learning style is an effective teaching tool. The adoption of this approach in teaching science by teachers should be encouraged by curriculum developers. Jigsaw learning model should be highlighted by teacher preparation institutions and universities as a successful science teaching strategy.

References

Adams, F.H. (2013). Using Jigsaw as an Effective Way of Promoting Co-operating Learning among Primary Six Pupils in Fijai. International Journal of Education and Practice, 1(6), 64-74.

Aronson, E. (2005). The jigsaw classroom. Retrieved March, 27, 2014, from http://www.jigsaw.org

Aydin, A. and Biyikil, F. (2017). The Effect of Jigsaw Technique on the Students' Laboratory Material Recognition and Usage Skills in General Physics laboratory-I Course. Universal Journal of Educational Research, 5(7), 1073-1082.

Azmin, N.H. (2016). Effect of the jigsaw-based cooperative learning method on student performance in the general certificate of education advanced-level psychology: An exploratory Brunei case study. International Education Studies, 9(1), 91-106.

Bhandari, B., Mehta, B., Mavai, M., Singh, Y.R. and Singhal, A. (2017). Jigsaw Method: An Innovative Way of Cooperative Learning. Indian Journal of Physiology and Pharmacology, 61(3), 315-321.

Bogam, R.R. and Khan, A.S. (2016). Jigsaw technique: An Interactive Approach to Sensitize Medical students in Saudi Arabia about Type 2 Diabetes Mellitus. Journal of Education Technology in Health Sciences, 3(3), 103-107.

Cornelius-Ukpepi, B., Aglazor, G. and Odey, C. (2016). Cooperative Learning Strategy as a Tool for Classroom Management. Advances in Multidisciplinary & Scientific Research, 2(2), 67-76.

Darnon, C., Buchs, C. and Desbar, D. (2012). The Jigsaw Technique and Self-Efficacy of Vocational Training Students: A Practice Report. European Journal of Psychology of Education.

Garcia, A., Abrego, J. and Robert, R. (2017). Using the Jigsaw Method for Meaningful Learning to Enhance Learning and Retention in an Educational Leadership Graduate School Course. Global Journal of Human-Social Science (G), XVII(V).

Hidayah, N., Suharno and, Indriayu, M. (2017). The Use of Cooperative Learning of Jigsaw Type and Make a Match Type to Improve Student's Activity. International Journal of Recent Engineering Science, 4(1), 33-37.

Johnson, D.W., Johnson, R., Ortiz, A., & Stanne, M. (1991). Impact of positive goal and resource interdependence on achievement, interaction, and attitudes. Journal of General Psychology, 118(4), 341- 347.

Johnson, D.W., Johnson, R.T., and Smit, K.A. (1991). Active Learning: Cooperation in the College Classrom, Interaction Book, Edina, MN.

Naomi, M.W., & Githua, B.N. (2013). Effects of jigsaw cooperative learning strategy on students' achievement in secondary school mathematics in Laikipia East District, Kenya. Asian Journal of Management Sciences and Education, 2(3), 177-188.

Sabbah, S.S. (2016). The Effect of Jigsaw Strategy on ESL's Students Reading Achievement. Arab World English Journal, 7(1), 445-458.

Slavin, R. E. (1981). Synthesis of research on cooperative learning. Educational Leadership, 48(5), 655-660

Van Wyk, M.M. (2015). Using the Jigsaw Teaching Strategy for the Advance of Economic Teachers' Acquisition of Knowledge. International Journal of Science Education, 10(2), 338-346.

Cite Your Article as:

Deepti Pandey. (2023). EFFECT OF 'JIGSAW' COOPERATIVE LEARNING STRATEGY ON QUALITY OF LEARNING OUTCOMES AMONG SECONDARY SCHOOL STUDENTS. Scholarly Research Journal for Interdisciplinary Studies, 11(77), 235–245. https://doi.org/10.5281/zenodo.8174125