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Effects of the Jigsaw Model on Students Academic Achievement at Primary School Level

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Abstract: The study was conducted to determine the effect of the Jigsaw model on students remembering and understanding ability. A quantitative research approach was adopted in this study. The research design of the study was experimental. All the students at Government Primary School Loralai Cantt constituted the population of the study. To ensure adequate representation of the population, eight students of class 5th were selected as a sample of the study. A science achievement test consisting of 30 items was developed. Fifteen items were associated with knowledge level, and 15 were associated with comprehension level. Students were pre- and post-tested in science achievement tests. The results of the pretest and post-test were analyzed with the help of SPSS using an independent sample t-test. The findings from the pretest, posttest, and student accomplishment score on the scientific achievement test showed that, following instruction using the Jigsaw Model, every student's posttest score increased. The gain score demonstrated the Jigsaw model's impact on students' academic achievement on the scientific achievement test. The knowledge level pretest and posttest results showed that, following Jigsaw Model instruction, every student's posttest score increased. The gain score demonstrated the Jigsaw model's impact on students' academic achievement on the scientific achievement test. The comprehension level pretest and posttest results showed that following Jigsaw Model instruction, every student's posttest score increased. The gain score demonstrated the Jigsaw model's impact on students' academic achievement on the scientific achievement test.

Key Words: Jigsaw Model, Recall, Comprehension, Primary School Level, Students

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Introduction

A student-centered teaching strategy where students participate actively is cooperative learning. One teaching strategy is cooperative learning, which calls for students to collaborate in small, set groups on a predetermined assignment. Common to all cooperative learning models are four basic elements. Cooperative learning, group discussions, hands-on exercises, conceptual mapping, conceptual change, problem-solving, inquiry-oriented approaches, experiential learning, writing assignments, speaking exercises, case-study techniques, role-playing, peer teaching, fieldwork, independent study, library assignments, computer-aided instruction, and homework are examples of student-centered teaching approaches (Caldwell et al., 1990).

Generally speaking, cooperative thinking is seen as a single approach with a single application strategy. Nonetheless, there are numerous variations of cooperative learning strategies. Students join the jigsaw groups that

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are created when the primary groups are divided into pieces, similar to a jigsaw puzzle. Members of various main groups who get together to study the same subject make up these jigsaw groups. Students return to their main groups after learning the material in a jigsaw group and impart what they have learned to their fellow members of the main group. For many years, individualized learning strategies have been used in classrooms of all sizes, from elementary school to graduate school. Both behaviorist and cognitive theories hold that an individual's intellectual capacity is a characteristic of them. Nonetheless, the importance of an individual's social development has increased recently. Studies indicate that social interaction in educational settings has a significant impact on cognitive development. Research over the years has demonstrated that cooperative learning strategies might improve students' academic achievement in relation to individualistic learning (Dysen & Casey, 2009).

This is one of the cooperative learning strategies where the lesson's content is divided into different informational parts, much like in a jigsaw puzzle, and then given to groups of students who would later explain to each other their parts, resulting in the completion of the jigsaw puzzle as a whole. Originally developed by Aronson, the Jigsaw educational strategy is a highly structured cooperative learning approach. When using the Jigsaw Method, the instructor presents the main topic as well as any subtopics. After that, the students are split up into "home" groups, where each member of the group is given a distinct subtopic. In order to form "expert" groups, where students focus on a single subtopic and conduct research and discussion, the students must break out of their "home" groups in the next stage. As a result, the pupils acquire expert knowledge on the designated subtopic. After their conversations, all of the "expert" group students have to go back to their "home" groups and instruct their peers using what they have learned and discussed. All of the participants in the "home" groups will eventually have gained knowledge from each expert group discussion and from one another. The effectiveness of the jigsaw cooperative learning method has been supported by a number of prior studies (Perkins & Tagler, 2011).

Statement of the Problem

The Jigsaw model supports students' thinking skills, increases their creativity, and prevents them from rote learning. Science subject is considered the most important subject in any field of education. Students learn science concepts only if their understanding level is enhanced. Therefore, the present study was designed and carried out to find out the effect of the Jigsaw Model on Students' Academic Achievement in Science at the Primary School Level in Loralai.

Objectives of the Study

The objectives of the study were

1. To determine how the Jigsaw Model affects students' recall of scientific ideas.
2. To ascertain how the Jigsaw Model affects students' comprehension of science concepts.

Research Hypotheses

H_{01}: The Jigsaw Model has no discernible impact on students' retention of science concepts.

H_{02}: The Jigsaw Model has no impact on pupils' comprehension of scientific ideas.

Significance of the Study

The study will highlight the importance of the Jigsaw model in the teaching-learning process. It will help build students' conceptual understanding. It will also be beneficial for teachers to improve their teaching. Researchers, Psychologists, Policymakers, and present schools will benefit from this study.

Literature Review

Jigsaw Model

Under the Jigsaw cooperative learning model, students work in small groups of five to six to teach each other subject matter that they have become "experts" in. The success of the program depends on the collaboration of the students. In general, cooperative learning refers to students collaborating to meet learning goals as well as the instructional strategies that organize these efforts.

Features of the Jigsaw Model

One method that has been used in education for a long time is cooperative learning. It was derived from constructivism theory. From its initial conception, which only required students to collaborate in small groups or with partners, it has grown. Cooperative learning has been shown in multiple studies to be an effective approach for improving students' comprehension. When teachers provide well-planned scaffolding for their cooperative learning activities, pupils' higher-order reading ability can be improved (Law, 2011).

Although general education classrooms have historically been the focus of cooperative learning, working with students who have special needs can also benefit from this approach. Cooperative learning is a broad category that includes many different tactics. The jigsaw approach is one evidence-based tactic that has shown promise in raising student comprehension. Because it enables students to collaborate to learn new material, the jigsaw falls within the category of cooperative learning (Jovanov, 2021). According to Bigg and Stump, "For cooperative learning to be effective, students need ample opportunities to solve problems as a group first and then resort to teacher assistance."

Göçer (2010) recommends that grammar and literature instruction be the primary areas of application for the jigsaw method. The jigsaw method is just one of several cooperative learning techniques that have shown promise, but it is not without flaws when it comes to helping special education and general education children.

Elliot Aronson first created the jigsaw method to assist pupils in enhancing their social and cooperative abilities. Although the initial goal was to address Texas' desegregation problems, it was found that kids were learning the material more effectively as it was being implemented. Since then, a number of studies have shown how successful it is at raising students' knowledge (Blaney et al., 1977).

Benefits of Jigsaw

The jigsaw's ability to teach pupils more than just academic stuff is another one of its strengths. It can encourage them and educate them to love education, which can boost their confidence and sense of self-worth. Students' fear and reluctance to participate in class activities are decreased in the jigsaw classroom, and their self-confidence and self-esteem are raised. Because students are preparing for their future and need to understand how to participate in group activities, it is crucial that they learn this in high school. Studies back up the jigsaw method by showing how it encourages kids to work together, share ideas, pursue common goals, and gain confidence. A multitude of positive attributes, such as subject matter expertise, teamwork abilities, and motivation from others, are necessary for success in the workplace. Students with and without disabilities can benefit from using the jigsaw to help them learn new material, build their self-esteem, and acquire motivational skills (Mengduo & Xiaoling, 2010).

The ability of the jigsaw to lower children's anxiety levels is its last strength. Throughout their academic lives, a lot of students struggle with anxiety—in one or more subjects, overall, or during tests. The results showed that children in the cooperative classroom had lower anxiety levels due to the jigsaw method's advantageous interdependence. Positive interdependence enables students to comprehend that both individual and group efforts are required for success (Oludipe & Awokoy, 2010).

Limitation of Jigsaw

There are a few other restrictions associated with using the jigsaw method. The teacher is involved in the first. A jigsaw's chances of success are restricted if the teacher does not provide clear instructions on how to apply the strategy.

Souvignier and Kronenberger (2007) investigated the effectiveness of the jigsaw approach at the primary level by comparing three educational conditions: jigsaw, jigsaw with added questioning training, and instructor-guided instruction. The results showed that the students' jigsaw method performance was only average. According to the authors, there are certain situations in which younger, elementary-aged students might benefit from the jigsaw.

According to the authors, "younger children's cooperative learning needs both implicit (fostering interdependence through appropriate learning materials) and explicit (training experts as teachers, questioning, and explanation)." Because it requires more specialized instruction for pupils before it can be used as well as it is for older students—which can be a discouragement due to time constraints and school demands—the jigsaw appears to have limited application with primary students.

Another disadvantage of this tactic is the actual data that supports the implementation of the jigsaw method. As previously said, applying the jigsaw method can be difficult and time-consuming. Students who utilized the jigsaw method performed better than those who employed a more traditional teaching approach, according to a study that examined the technique. A third limitation concerns how younger students should appropriately complete the jigsaw phases in relation to Souvignier and Kronenberger's (2007) findings. Seventh graders who had previously utilized the jigsaw approach were notified by their science teachers about it in this study. The study set out to find out how students' learning was impacted by the jigsaw method and another cooperative learning technique. The results showed that neither technique enhanced students' understanding of certain scientific concepts. Cooperative learning initially appeared in the constructivist technique, which stresses the use of experience-based activities. The jigsaw method allows students to participate and experience learning. In the classroom, the jigsaw method should operate exactly as stated in this statement: "Students are encouraged to teach one another the material they have worked on in the expert team, and when they go back to their home team, they are encouraged to learn from their fellow students in their expert team." This method would be highly appreciated by teachers since it allows students to actively teach one another. The jigsaw also allows the teacher to function in the classroom as a facilitator rather than a director, which is in keeping with a contemporary trend in education (Zacharia et al., 2011).

Application of Jigsaw Model

Organizing a jigsaw activity is a five-step process:

1. Using as many of the same size groups as you can, divide the class into "expert" groups of four to six students. Assign a letter, color, or other designation to each group. Next, have each group of students number themselves from one to four (or from one to six). Assign a portion of text or information (which may be illustrated) to each group. The group should read the material together, have a discussion, and assist one another in understanding it. At this point, bilingual or English word banks and dictionaries could be helpful. The group could conduct more studies on a subtopic using reference books and ICT for a more in-depth project.
2. After becoming "experts" on a particular passage of text or set of facts, students establish "jigsaw" groups based on a shared number; for example, all number one students work in one group, all number two students work in another group, and so on.

3. Every "expert" learner then turns around and gives the knowledge or text segment they were initially given to their "jigsaw" group. To make sure everyone is understanding, the others enquire.
4. The "jigsaw" group works together to finish a job that necessitates their understanding of every detail that each "expert" has shared. This might be anything that calls for each student to provide their unique expertise, such as creating a role play, filling in a grid or table, finishing a diagram, or creating a poster. A great technique for differentiating Jigsaw activities is to assign easier tasks or shorter texts to select expert groups.

Methods and Procedure

Nature of Research Study

A quantitative research approach was adopted in this study. The research design of the study was experimental.

Population

All the students at Government Primary School Loralai Cantt constituted the population of the study.

Sample

To ensure adequate representation of the population, eight students from class 5th were selected as a sample of the study.

Research Instrument

A science achievement test consisting of 30 items was developed. Fifteen items were associated with knowledge level, and 15 were associated with comprehension level. Students were pre- and post-tested in science achievement tests.

Data Collection

The researcher carried out her experiment on the Jigsaw model in school. She distributed scientific achievements before intervention in the form of a pretest. After that, the researcher teaches science subjects to the students through the Jigsaw Model for a period of 4 weeks. After intervention, the results were compared.

Data Analysis

The results of the pretest and post-test were analyzed with the help of SPSS using an independent sample t-test.

Analysis of Data

Table 1

Pretest, posttest and gain score result

S. No	Name	Pretest	Posttest	Gain score
1	Amna bibi	25	30	5
2	Shukria bibi	15	20	5
3	Kainat	19	22	3
4	Razia bibi	11	22	11
5	Mairaj bibi	11	22	11
6	Zubaida	19	20	1
7	Muzdalfa	24	28	4
8	Javeria	15	23	8

Table 1 displays the student's gain score on the science achievement test as well as the results of the pretest and posttest. It stated that after using the Jigsaw Model to teach the kids, all the students' post-test scores increased. Additionally, the gain score demonstrated how the Jigsaw model affected students' academic performance on the science achievement test.

Table 2

Pretest, posttest and gain score result

	Group	N	Mean	SD	*t-value*	*p-value*
Score	Pretest	8	17.3	5.2	5	0.005
	Posttest	8	20.6	3.4		

Table 2 displays the values for t, p, mean, and standard deviation. The Jigsaw model has a considerable impact on student's academic performance in science, as evidenced by the t-value of 4.2 and the p-value of 0.005. Consequently, the null hypothesis was disproved.

Table 3

Pretest, posttest, and gain score results at knowledge level

S. No	Name	Pretest	Posttest	Gain score
1	Amna bibi	11	15	4
2	Shukria bibi	4	10	6
3	Kainat	8	10	2
4	Razia bibi	2	11	9
5	Mairaj bibi	5	12	7
6	Zubaida	8	9	1
7	Muzdalfa	11	14	3
8	Javeria	6	10	4

Results of the pretest and posttest at the knowledge level are displayed in Table 3. Following instructions using the Jigsaw Model, all of the students' posttest scores increased. The gain score demonstrated the impact of the Jigsaw model on students' academic achievement in the science accomplishment exam as well.

Table 4

Pretest posttest results at knowledge level.

	Group	N	Mean	SD	*t-value*	*p-value*
Score	Pretest	8	6.8	3.2	4.2	0.005
	Posttest	8	11.4	2.1		

The results of the pretest and post-test at the knowledge level are displayed in Table 4. The Jigsaw Model significantly influences students' academic progress at the knowledge level in the scientific achievement test, as demonstrated by the posttest mean of 11.4 being greater than 6.8 and the ¬t-value = -3.2, p = 0.05.

Table 5

Pretest, posttest, and gain score result at comprehension

S. No	Name	Pretest	Posttest	Gain score
1	Amna bibi	14	15	1
2	Shukria bibi	11	10	1
3	Kainat	11	12	1
4	Razia bibi	9	11	2
5	Mairaj bibi	6	10	4
6	Zubaida	11	11	0
7	Muzdalfa	13	14	1
8	Javeria	9	13	4

The results of the comprehension level pretest and posttest are displayed in Table 5. It stated that by following instructions using the jigsaw model, every student's post-test scores increased. The gain score demonstrated the Jigsaw model's impact on students' academic achievement on the scientific achievement test.

Table 6

Pretest posttest results at comprehension level.

	Group	N	Mean	SD	*t-value*	*p-value*
Score	Pretest	8	10.5	2.5	-1.36	-.195
	Posttest	8	12	1.8		

It was demonstrated that the Jigsaw Model had no discernible impact on student's academic ability at the comprehension level in the scientific achievement test by the fact that the mean of the posttest 12 was more than 10.5 and that the ¬t-value = -1.36, p = -.195.

Findings

1. The results of the students' pretest, posttest, and gain scores on the science achievement test are displayed in Table 1. It stated that by following instructions using the jigsaw model, every student's posttest scores increased. The gain score demonstrated the Jigsaw model's impact on students' academic achievement on the scientific achievement test.
2. According to the t-value = 4.2 and p-value = 0.005, the Jigsaw model significantly affects how well science students perform academically. The null hypothesis was thus disproved.
3. The results of the pretest and posttest at the knowledge level are displayed in Table 3. It stated that by following instructions using the jigsaw model, every student's post-test scores increased. The gain score demonstrated the Jigsaw model's impact on students' academic achievement on the scientific achievement test.
4. The results of the pretest and posttest at the knowledge level are displayed in Table 4. The posttest mean of 11.4 is higher than 6.8, and the Jigsaw Model significantly affects students' academic progress at the knowledge level in the science achievement test, as demonstrated by the ¬t-value = -3.2, p = 0.05.
5. The results of the comprehension level pretest and posttest are displayed in Table 5. It stated that by following instructions using the jigsaw model, every student's post-test scores increased. The gain score demonstrated the Jigsaw model's impact on students' academic achievement on the scientific achievement test.

6. The pretest and post-test results at the knowledge level are displayed in Table 6. The fact that the posttest 12's mean was higher than 10.5 and that the Jigsaw Model had no discernible impact on student's academic ability at the comprehension level in the science achievement test is demonstrated by the ¬t-value = -1.36 and p = -.195.

Conclusion

The findings from the pretest, posttest, and student accomplishment score on the scientific achievement test showed that, following instructions using the Jigsaw Model, every student's post-test score increased. The gain score demonstrated the Jigsaw model's impact on students' academic achievement on the scientific achievement test. The knowledge level pretest and posttest results showed that, following Jigsaw Model instruction, every student's posttest score increased. The gain score demonstrated the Jigsaw model's impact on students' academic achievement on the scientific achievement test. The comprehension level pretest and posttest results showed that following Jigsaw Model instruction, every student's posttest score increased. The gain score demonstrated the Jigsaw model's impact on students' academic achievement on the scientific achievement test.

Recommendations

1. An attempt might be made to implement the Jigsaw model at every educational level.
2. In elementary schools, the medium of teaching may be Urdu or the student's mother tongue.
3. Textbook revision is required for the Jigsaw Model to be implemented successfully.
4. Teachers may be scheduled for refresher courses in order to acquaint them with the Jigsaw Model.

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