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COMPARISON OF JIGSAW METHOD AND TRADITIONAL METHOD: STUDENTS' ACADEMIC ACHIEVEMENT IN FACTORIZATION

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Abstract

This research study aims to find the academic achievement of 8th grade mathematics students in factorization by the comparison of Jigsaw method and the traditional method. A quasi-experimental, pre-test/post-test research study with control and experimental groups was used to examine the effect of the Jigsaw method. The researchers selected two government institutions; one was taken as an experimental group with 41 students and the other school was considered a control group with 42 students. The mathematical achievement of students was measured through MCQs test. The duration of the experiment was eight weeks. There was no significant difference was found between control and experimental group students on the pre-test. Post-test data were analysed by using an independent t-test. A Significant difference was found between the groups of students taught through Jigsaw and traditional method in factorization. The results showed that the Jigsaw method increased the academic achievement of the students in factorization. So, it was suggested that Jigsaw method would be beneficial for the students of mathematics at grade 8.

Keywords: Factorization, Jigsaw method, Traditional method, 8th Grade, Mathematics

Introduction

Today's world rapidly moving more and more in the area of science and technology. It demands more Mathematical knowledge on the part of their people. So, it is the core responsibility of teachers to prepare our children with a strong foundation in mathematical knowledge, equipping them to face the challenges of modern education and a technologically driven society. However, the widespread anxiety about mathematics and the poor performance of students in the subject stem from multiple factors, with the role of teachers as the primary authority being a significant one.; they used autocratic, rigid, and critical language where they were often perceived as distinct or impersonal (Bosworth, 1995). As a result, the teacher is the only person in the classroom who is an expert in mathematics. Students were supposed to be passive and represented themselves only when the teachers asked the questions, which often prevented interaction with other students (Rojas-Drummond & Mercer, 2003).

Poor mathematical presentation causes failure for both the student and the teacher. Students usually realize mathematics is tough, boring, and difficult, which enhances the feeling of inadequacy, uncertainty, and complexity. A nationwide study conducted by the faculty at Aga Khan University revealed that more than 90 percent of primary and pre-secondary students in Pakistan have a weak or basic understanding of mathematics and science subjects. According to

reports published by the Express Tribune titled "Pakistani students below par in math's and science," the average scores in math's obtained by 8th-grade students in the National Education Assessment System (NEAS) exams conducted in 2014.

The national curriculum (2006) for mathematics examined the need to shift the focus of instruction from knowledge transfer to understanding and later application of mathematical concepts with a focus on student engagement. Teachers of mathematics use different kinds of teaching methods and techniques to involve the students in the teaching-learning process actively and to achieve the objectives of the academic session. It is important that today's mathematics instructor should use the jigsaw method to make math's concepts and understanding more concrete and realistic than abstract. Since math could not simply be learned from books, lessons, or tactics. When the instructor had given the fundamental instruction, the Jigsaw teaching method placed emphasis on group work as an easy approach for students to work together and solve problems with the teacher's assistance. The students collaborated to debate the difficulties and find solutions as they worked as a team. Pair work aims to develop in students the critical thinking abilities required for both future math problems and everyday life.

Cooperative learning, also known as collaborative learning, has changed how we teach and learn in the current educational environment (Johnson & Johnson, 2009). Collaborative setting teaching with many benefits can be a better alternative to the traditional deductive method of teaching mathematics (Iqbal & Shams, 2018). Students collaborate in small groups during education to minimize both their own and other's learning (Johnson & Johnson, 1993). When putting their courses into reality, teachers all over the world used a variety of teaching techniques, each of which was based on a unique set of guidelines for how contact and interaction were to be handled in the classroom (Iqbal, Shams & Nazir, 2020). The Jigsaw teaching method is a type of cooperative learning (Formal cooperative learning group) Concern over the cognitive development approach was raised by Piaget's (1965) and Vygotsky's (1926) work (1978). Jean Piaget, proposed that people create new knowledge from their experiences by assimilation and adaptation processes and the students learn by interpersonal interaction. The concept of ZPD is interrelated with a range of skills a person can execute under the supervision of an expert but is still unable to perform alone is known as the zone of proximal development (ZPD), also known as the zone of prospective development.

Due to the traditional tendency of teaching students unable to overcome their learning difficulties in math class, usually, one instructor uses the deductive approach of instruction in the classroom, which involves knowledge transmission rather than concept development. In general, formulas were dictated at the beginning of classes, and students were expected to memorize them in order to answer questions (Mirza & Iqbal, 2014). As a low achievement, unable to understand and transfer math's concepts, lack of attention, boredom, lack of collaboration to discuss concepts and applications, anxiety, misunderstanding of mathematical symbols, confusion in operations and presentation of math's topics, etc. There was a dire need to teach mathematics with a method that overcomes learning difficulties and enhances achievement. The Jigsaw method of teaching could enhance the mathematical proficiencies of students studying in diverse settings. In that research study, the researcher checked the math's student's academic achievement in factorization by comparison of Jigsaw method and traditional method. Jigsaw method was created by American social psychologist Elliot Aronson and was based on the idea of team learning. It was also known as the interdependent group method (Satchwell, 2002). It comprised establishing work groups in the classroom. Each group assigned a study task to one member, who must become an authority on the topic before introducing it to the rest of the group. The theme must be established, and broken down into 4-5 subheadings, learning groups must be formed, expert groups must be formed, the original learning team must be reassembled, and evaluation must be conducted. Interdependence between group members was crucial to this teaching-learning approach. As a result, team members were encouraged to work together because the group project cannot be completed without the participation of all students. Students must comprehend that solving an issue benefits both the group and each individual, and that

method strives to strengthen effective teamwork by encouraging thought, active listening, cooperation, and creative thinking.

The objective of this research study was to compare the effect of Jigsaw and traditional methods of teaching 8th grade mathematics on students' academic achievement in factorization.

H₀₁: There is no significant difference between student's academic achievement in factorization taught through Jigsaw and traditional teaching methods.

Research Methodology

This research was quasi experimental with pre-test and post-test and the objectives were pre-determined (Based on numerical facts and figures that could be checked with the help of quantitative study). It was non randomization so any intact class could be experimental or control group.

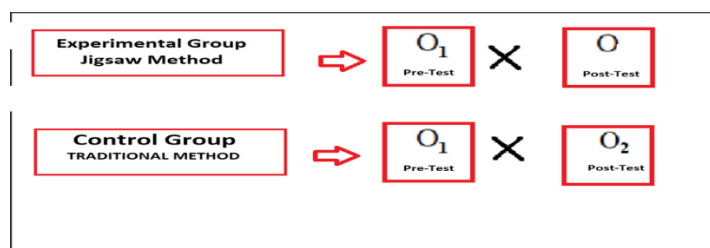


Figure #01

The researcher selected two schools as intact groups and they were in two different locations in the rural area of Islamabad, but no factors related to institutions or teachers affected the student's performance, as the design of the study ensured that both control and experimental groups had similar educational environments, resources and populations, also it helped to overcome or remove the threats of external validity. The necessary data was successfully obtained through pre-test and post-test. Initially, the pilot study was done at one of the public schools in the district of Islamabad. The instrument was once piloted in mathematics for Grade 8th students. Before the pilot test, the instrument had been slightly modified. Such changes were made on the elementary mathematics experts' advice.

The Federal Directorate of Education (FDE) oversees 423 schools in Islamabad capital territory (ICT) with over 220,000 students from prep to postgraduate level. The population of the study is 58978 students enrolled at the elementary level (comprises VI to VIII classes) in all the Islamabad district under the supervision of FDE in ICT, 275 institutions working in the federal area of Islamabad the enrolment in VIII classes are 21362 students in the year of 2023. The researcher selected two institutions conveniently from Islamabad's federal area, i.e. Islamabad Model College for Boys (F.A) Nilore with 41 students and Islamabad Model School for Boys (F.A) Sihala with 42 students of eight standards. IMCB, Nilore (41) students were assigned as the experimental group, and IMSB, Sihala (42) students were assigned as the control group without randomization.

Instrumentation

The Mathematics Achievement test (MAT) was the instrument utilized in this study to assess student's performance both before and after an intervention. The Mathematics Achievement test was once intended to assess student's performance in factorization. It was a multiple-choice question. The researcher developed a pre-test to check the existing level of understanding of mathematics students. The test was developed from the 8th-grade mathematics textbook of the federal board. The items of the test addressed textual topic included in textbook units and it was concerned with factorization. For each item, there were four possible choices provided. The MAT scoring was performed according to the correct and incorrect answers. A correct response was once given 1 mark, and an incorrect response was once given 0 marks.

Data Analysis

Table 01 Comparison of means, standard deviation, and t-test on students' pre-test scores in factorization

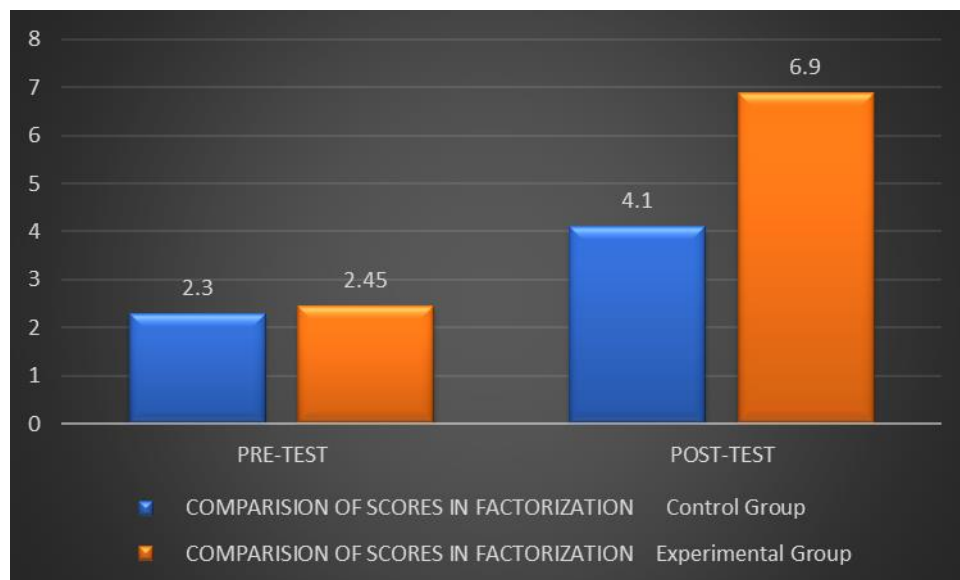
Groups	N	M	SD	df	t	Sig
Control group	42	2.30	0.6	81	1.58	0.117
Experimental group	41	2.45	0.8			

Table 01 showed the mean and well-known variance of the mathematical performance marks in the pre-test, as reasonable as the results of the separate t-test samples showed that there was no substantial difference in the mean mathematics achievement rankings between the experimental and control group for each student at $p > .05$, indicating that there was no sizable distinction in mathematics achievement between the experimental and control corporations for each school. It means both group control and experimental were on the same cognitive level in factorization.

Table 02 Comparison of means, standard deviation, and t-test on students' post-test scores in factorization

Groups	N	M	SD	df	t	Sig
Control group	42	4.1	1.0	81	6.52	.000
Experimental group	41	6.9	1.1			

Table 02 Included the outcome and common variance of the post-test ratings for Mathematical success as well as the reasonable conclusions from the independent assessments for both groups. The results of the independent sample t-test showed a significant difference in Mathematics academic achievement between the experimental and control groups ($P < .05$). furthermore, the experimental group's students found high academic achievement in factorization compared to control group as shown in the figure below



Conclusions

The use of Jigsaw method at the elementary level may aid students in learning mathematics standards at some stage with essential training which gives students gain in taking rigorous excessive mathematics and science courses. After this course of study many students of concerned research boosted their confidence in the subject of 8th standard math's particularly the topic factorization, they changed their negative perception about mathematics and became ready for advanced learning further in upcoming future and for better careers. The findings of the post-

test rankings revealed that in terms of ordinary achievement of mathematical principles, there had been considerable variation between the two groups in factorization.

Discussion

The advantages of Jigsaw method for teaching mathematical concepts have been demonstrated historically. Twenty-first-century theorists like Piaget, Bruner, and Dienes supported the idea that teaching and studying mathematics could benefit from cooperative learning. Teachers of mathematics believe that Jigsaw method has generally been successful in the classroom. Furthermore, there was an abundance of studies in the literature endorsing the use of Jigsaw method at various levels and providing advice on how to utilize it most effectively. This study verifies several scholars (Sabbah, 2016; Darnon et al., 2012; Iqbal & Rashid, 2020) studies that looked into how the Jigsaw method affects mathematical learning. Those research results showed that Jigsaw method improved the mathematical achievement of the students at the elementary and secondary levels. The results of this study aligned with the study of Khan (2015) "Effect of Jigsaw method on secondary-level chemistry students in District Peshawar" which revealed that Jigsaw method is an effective method. It has increased the academic achievement of the students in chemistry. The findings of this study verified the research conducted by Doymus and others (2010), indicating that Jigsaw method is more effective than control group. Doymus (2007) revealed that Jigsaw method is more powerful for student's academic achievement than individual learning. Another study was conducted by Thompson & Pledger (1998), titled "Cooperative Learning versus Traditional Lecture Format". The findings of their research study supported the present study, as they found the Jigsaw method makes mathematics engaging and pleasurable for students as it gives students the desire to solve mathematical problems cooperatively, fostering cooperation in the absence of competition. Academically, the Jigsaw method is likely to boost academic achievement, and at the same time, it motivates and inspires pupils to grasp and study mathematics cooperatively. Similarly, a study was conducted by Iqbal and Rashid (2020), titled "Impact of Jigsaw Method of Cooperative Learning in the Subject of Science at the Elementary Level." The study was experimental, with a pre-test and post-test with a control and an experimental group. The population consisted of eighth-grade students at Musa Kalan Government High School in the district of M.B Din. The results showed that the experimental groups performed better as compared to the control group, which means the Jigsaw method of teaching is better than traditional teaching. The results of this study verified by all the previously mentioned studies, which also demonstrated the beneficial effects of the Jigsaw method on academic achievement in factorization compared to the traditional method.

Recommendations

Based on the results and analysis of this experimental study as well as a review of the literature, it is recommended that Conventional teaching methods may not apply to all science subjects, like mathematics This research gave evidence that the usage of Jigsaw method helps to enhance the mathematical achievement of the students, so it may be part of the national curriculum at the secondary level as it is economical and easily applicable in the private and public sector. The Ministry of Education may conduct seminars and exhibits to educate teachers and students about the importance and usage of Jigsaw method in mathematics classes and to raise knowledge and interest among teachers and students about Jigsaw method. Due to the limited time, this study only covered the topic factorization, on behalf of this, teachers may not expect that the Jigsaw method was once exceptional for all students or all content. So it may be used with different content, subjects, or teaching methods to more clarify the impact of Jigsaw method in depth. Furthermore, due to limited time and resources, the researcher conducted this study only on male students in District Islamabad, so it is recommended that this study also be conducted on girls students.

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