

Investigation of Use of Cooperative Learning Techniques for Mathematics In Elementary Level

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Abstract

This action research study employed a quantitative research method, to examine the effects of cooperative learning techniques for mathematics at elementary level students who faced difficulties in mathematics. All elementary level students enrolled in public schools of Lahore district were considered as the population. Researcher used convenience sampling technique. Sample of the study was 50 students of grade 6th in one public school. For four weeks, students were taught through the cooperative learning techniques. A paper-pencil pre-test & post-test after validating it through experts and the reflections of lesson plans were used as an instrument to collect the data. Pre-test & post-test consisted of 20 problems related to their math syllabus. The total score of the test was 20. Tests administered in the presence of class teachers by the researcher. Pre- and post-test results were compared using descriptive statistics and t-test. The post-test score was higher than the pre-test score, indicating that the researcher's cooperative learning techniques for mathematics in the classroom improved elementary students' performance in the assessed area.

Keywords: Cooperative Learning, Mathematics, Elementary School, Learning Techniques, Learning Difficulties

Introduction

Mathematics is an important subject that plays a significant role in the education system. It is a subject that requires logical thinking and problem-solving skills. However, many students struggle with math, and it is one of the most challenging subjects to teach effectively (Ridwan & Samsul, 2022). Traditional teaching methods often rely on lectures and individual work, which may not be effective for all students. This approach can lead to low student engagement, motivation, and retention of information. In a typical classroom, teachers may struggle to meet students' different needs. According to the different researchers finding like Sulawesi (2022), Indonesia, about teachers believes to develop and apply critical thinking skills especially in mathematics needed a range of sources involving a use of multi learning modals for sustainability, educators command on subject matter and their self-knowledge grip in critical thinking matter a lot (Ridwan & Samsul, 2022). As a consequence, learning practices alteration is going to become more complicated (Smets & Struyven, 2020).

Educators have tried cooperative learning to solve these issues. "Cooperative learning involves students working together to achieve a goal". Students collaborate, exchange ideas, and learn from each other via this strategy. Different researches were concluded after investigation about the factors which influenced students' higher academic performance, cooperative learning was considered prominent among all (Yulianto et al, 2023). Tasks of Cooperative learning permit

diverse grouping to achieve collective targets by working together instead of individually (Akbar & Akhtar, 2021). Numerous studies have shown that cooperative learning effects positively on student learning outcomes. For example, students who engage in cooperative learning tend to have higher academic achievement, better problem-solving skills, and improved social skills (Widiawati & Hidayat, 2023).

Overall, the use of cooperative learning techniques for math education at the elementary level is a gain more attention. So, it is crucial to expand the quality of education and aid students overcome the challenges associated with learning math. This research examined how cooperative learning improves arithmetic performance. The study also investigated how cooperative learning may motivate and engage math students. This study is important because cooperative learning can enhance primary math performance. Students with learning disabilities or varied cultural backgrounds might benefit from cooperative learning.

Methods and Design

The present experimental study was designed to examine the effects of cooperative learning techniques for mathematics on grade 6th students. The research was quantitative by nature. Action research provides teachers with a systematic way to study of their instructional practices on student teaching (Mills, 2003). Research study was designed to find out the cooperative learning techniques for mathematics on grade 6th. All elementary level students enrolled in all the government schools of the Lahore District were considered as the population. 6th grade students of Govt. Shahab-u-din Girl's High School, Lahore were selected as the target population.

Convenience sampling technique was used in this research study. This study focused on 50 students from grade 6th in Government Shahab-u-din Girls High School. A paper-pencil pre-test & post-test after validating it through experts, lesson plans and worksheets were also used as an instrument to collect the data.

Participants in the study from a Government Shahab-u-din Girls High School located in the Tehsil Lahore City. Students were between the ages of 11 to 12 years. The researcher provided cooperative learning techniques to improve mathematical learning. This took place for 4 weeks (5 days per week for 1 hour 30 minutes) in a classroom setting.

Different techniques were used for collecting data;

- Different kinds of activities that related to cooperative learning techniques for mathematics
- Student work samples
- Pre-test
- Post-test
- Worksheets

Descriptive Findings

Analysis of data is a procedure of converting data into valuable evidence. Multiple techniques can be opted for this purpose. Participants in this study included (n=50) 6th grade students from a public school located in Tehsil Lahore city. The most suitable instrument to collect the data was considered a paper-pencil Test. First the researchers conducted pre-test. Students were given 30 minutes to solve 15 multiple choices and 5 short questions related to their syllabus in the pre-test. The total score was 20. Then the researchers planned lessons and performed cooperative learning techniques and drew reflections on the basis of lesson plans. Then researchers administered same

post-test. To analyse the data, researchers used descriptive and inferential statistics. A t-test was used for the interpretation of scores of the groups in pre-test and post-test.

Table. 1

Pre-test performance of Grade 6

<i>Mean</i>	<i>N</i>	<i>Std. Deviation</i>
5.630	50	3.1957

The above Table 1 showed the descriptive statistics of grade 6. Here n represents the total number of students. The mean score of participants pre-test was 5.630 and the value of SD (3.1957).

Table. 2

Post-test Performance of Grade 6

<i>Mean</i>	<i>N</i>	<i>Std. Deviation</i>
13.970	50	3.4455

In above Table 2 showed that the mean score of the post-test is 13.970 and SD (3.4455) which is greater than pre-test after providing Cooperating learning techniques to the students and N represents the number of students. The total numbers of test was 20.

In data analysis, the mean score of the students refers to the average score obtained by a group of students on a particular test. The mean score is a measure of central tendency that provides a representation of the typical or average performance of the students in the given dataset. A higher mean score typically represents a higher average performance or achievement level in the given data set.

Table 3.

T-test

	<i>Mean</i>	<i>Std. Deviation</i>	<i>t</i>	<i>df</i>	<i>Sig (2 tailed)</i>
Pre-test / Post-test	-8.3400	2.8544	-20.661	49	.000

In the above Table 3 T-test compared pre- and post-test results. Negative sign indicates greater post-test marks compared to pre-test, with p-value < 0.05 (p-value = 0.000). The observed result is statistically significant at 0.05 if the p-value is less than 0.05. The null hypothesis is unlikely to have caused the observed result by chance, as there is strong evidence. Practically, a p-value below 0.05 indicates that random variation is less than 5% likely to produce the observed result or a more severe one. Thus, it supports an alternate hypothesis above the null hypothesis. According to the mean score and SD value of the students, researchers' cooperative learning techniques for mathematics in the classroom improved elementary students' performance or skills in the assessed area.

Conclusion and Discussion

Results showed that 6th grade students who received cooperative learning techniques perform better in mathematics. At the start of four-week study, students were given a mathematics pre-test according to their syllabus to measure their pre knowledge and to measure their ability to use their understanding in whole numbers, simplifications, ratios and proportions, number line, sets and subsets, linear equations and Integers. Most of the students showed difficulties in simplification, linear equations, ratios and proportions compared pre- and post-test results. Negative sign indicates greater post-test marks compared to pre-test, with p-value < 0.05 (p-

value = 0.000). The observed result is statistically significant at 0.05 if the p-value is less than 0.05. The null hypothesis is unlikely to have caused the observed result by chance, as there is strong evidence. Practically, a p-value below 0.05 indicates that random variation is less than 5% likely to produce the observed result or a more severe one. Thus, it supports an alternate hypothesis above the null hypothesis. According to the mean score and SD value of the students, researchers' cooperative learning techniques for mathematics in the classroom improved elementary students' performance or skills in the assessed area. After 18 days of implementation researcher took a post-test and in data analyzing there was a very clear difference between the mean scores of student's pre-test and post-test. The mean score of their pre-tests was 5.630 and the mean score of post-test was 13.970 which shows us that the performance of students to solve mathematical problem increased after pre-test. It is concluded that cooperative learning techniques were very helpful in for elementary level students to overcome their difficulties in mathematics and help them to solve difficult mathematical problems in a fun way as they showed greater knowledge of mathematics using more efficient strategies to solve problems in post-test than pre-test.

The findings of the study were consistent with the findings of Johnson (2000); McMaster & Fuchs (2002); Chiang et al (2014) & Hosseini et al (2017) that showed considerable differences between cooperative learning and traditional methods. Teachers can use cooperative learning approaches to engage students in learning activities and encourage interaction, as activities are intended to need teamwork to accomplish.

For the past over the last 30 years, cooperative learning techniques gained attention in education due to Slavin's studies (as cited in 2013) showing their positive impact on achievement across subjects. While there's an extensive body of literature on cooperative learning, the research specifically linking it to mathematics achievement in elementary students is limited. Unfortunately, there's a scarcity of studies focusing on cooperative learning techniques and their effects on math achievement, especially at the elementary level.

Recommendations

- The four week intervention on cooperative learning techniques for mathematics in elementary level showed good results. Better result can be gained if the duration of the intervention is extended. So, it is recommended to implement such interventions for a longer period in order to develop cooperative learning techniques for teaching mathematics at elementary level.
- Educators can ensure active participation from all group members to prevent one student from dominating the group.
- Instructions for the activity should be explicit and precise in guiding how the activity is conducted.
- Future research should benefit by expanding the study to include a greater number of participants.
- Schools should take initiatives regarding cooperative learning techniques for teaching mathematics intervention programs to help those students who are struggling with mathematics.
- Teachers can organize cooperative learning activities, classes, and resources with enough time and space.
- Teachers should frequently formatively assess their students to develop cooperative learning techniques for mathematics that is adaptive to student's needs to assist more effectively in enhancing their learning.

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