



RESEARCH PAPER

**Effect of Collaborative Learning on Conceptual Understanding ability
in Mathematics among 5th Grade Neglected Children**

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ABSTRACT

Conceptual understanding is a fundamental component of learning as it allows students to develop a deep and meaningful understanding of a subject. This is especially true in subjects like mathematics, where understanding the principles and logic behind formulas and equations is crucial particularly for neglected children. The objectives of the study were to investigate the effect of collaborative learning on the conceptual understanding ability of 5th grade neglected children in mathematics and to explore the beliefs of students about mathematics and the teaching of mathematics in collaborative learning settings. This study used both quantitative and qualitative methods. The study involved 60 students of fifth-grade from Child Protection School Lahore, divided into control and experimental groups. The experimental group received collaborative learning treatment, while the control group used traditional learning methods for two weeks. Quantitative and qualitative data were collected using pre and post-tests and structured interviews. Results showed that the experimental group performed better on mathematic achievement test than the control group, and their beliefs about mathematics improved. The research findings indicated that collaborative learning is a more efficient approach for enhancing the conceptual understanding abilities of 5th grade students compared to traditional learning methods. The study recommended the widespread adoption of this approach for educational rehabilitation of neglected children throughout the Punjab.

Keywords: Collaborative learning, Conceptual understanding ability, Neglected children

Introduction

Humans are social beings who naturally gravitate towards social environments for learning. Over the course of history, humans have learned by observing, discussing and collaborating with one another. Learning in a social setting offers individuals the opportunity to share ideas, receive feedback and build connections with others. Collaborative learning is a teaching method that encourages students to work together in small groups to solve problems and learn from each other. This approach enhances critical thinking, problem-solving, and communication skills while fostering a sense of community and belonging, which can lead to more motivation and engagement in the learning process.

Conceptual understanding is the ability to realize and apply the fundamental principles and underlying concepts of a subject rather than simply memorizing facts and formulas. In education, conceptual understanding is often associated with deeper learning and critical thinking, as it involves the ability to analyze, synthesize, and evaluate information to solve complex problems. In mathematics, conceptual understanding involves understanding mathematical concepts, structures, relationships, and the ability to apply this knowledge to new and unfamiliar problems. It also involves comprehending the logic and reasoning behind mathematical operations, rather than just memorizing procedures.

Developing conceptual understanding in mathematics requires an active learning approach where students are encouraged to explore mathematical concepts through hands-

on activities, real-world problems, and discussions. This approach helps students to build connections between different mathematical concepts and understand the relevance and applications of mathematics in everyday life.

Neglected children are those who have experienced neglectful or abusive parenting, lack adequate care and supervision, or are deprived of basic needs such as food, clothing, and shelter. Neglect can be physical, emotional, or educational, and it can have long-lasting effects on a child's development and well-being. Neglected children may face various challenges in their academic development, including lower academic achievement, poorer school attendance, and limited access to resources and support for their education. It is important to investigate a different instructional method that address the needs of neglected children and provide them with the support they need to succeed in developing understanding ability in all subjects specially mathematics.

Collaborative learning has been shown to be effective in improving students' conceptual understanding and academic performance in various subjects, including mathematics. However, there is limited research on the impact of collaborative learning on neglected children, who may lack access to resources and support for their education.

To address this gap in research, this study aims to investigate the effect of collaborative learning on the conceptual understanding ability in mathematics among neglected 5th-grade children.

Literature Review

Humans are social and have a natural inclination to learn in social environments. This is because social interactions and connections play a crucial role in our development and overall well-being. From an evolutionary perspective, humans have always relied on social connections to survive and thrive.

Learning in a social setting refers to the process of acquiring knowledge and skills in a group or community environment. According to Lee and Bonk, (2014), Collaborative learning is an instructional technique that encourage learners to work in groups for completion of academic tasks. This type of learning encourages collaboration, communication, and interaction among individuals, leading to enhanced learning outcomes. Learning in a social setting can provide a sense of community and belonging, which can increase motivation and engagement. Moreover, group settings can serve as a platform for exchanging ideas and asking questions, which can help to clarify and solidify understanding. Additionally, learning with others can provide opportunities for peer-to-peer teaching and learning, which can also be beneficial. Cohen et al (2014), argued that John Dewey believed that students should not only learn from teachers, but also from their peers. This idea is supported by the concept of peer learning, which can be achieved through group work. When students work in groups, they not only learn from each other, but also develop new skills and improve their learning abilities.

In Pakistan, the educational system has a low standard. The teaching and learning process is restricted to just achieving good exam results. Teachers who just finish their lessons on time and don't care about their students' understanding are considered good. The emphasis of this system is on teacher performance rather than student learning outcomes (Akber, 2020, p. 10).

Neglected children are those who do not receive the required care, attention, and support from their caregivers or parents. Neglect can take many forms, including physical, emotional, and educational neglect. Children who are neglected may experience a range of problems, including poor academic performance, low self-esteem, depression, anxiety, social withdrawal, and physical health problems. Financial struggles and the need to

support their families through labor-intensive jobs often prevent these children from receiving an education.

The responsibility for education in Pakistan lies with the provinces, following the 18th amendment to the country's constitution. Various programs have been implemented by the provinces to support neglected children, such as the Universal Primary Education, Universal Secondary Education and the establishment of Child Protection Departments. However, many children still drop out of school because of the hard education system. It is important to look at new ways of teaching, like collaborative learning, which would be more helpful for these children as they are more used to working in groups in their daily lives. By studying the effects of collaborative learning on neglected children's education, we can help to improve the education system in Pakistan.

Collaborative learning is a method of teaching and learning in which students work together in small groups to achieve a common goal. According to Christyanti and Nuraeni (2020), Collaborative learning is a method of working together in pairs or small groups to accomplish educational objectives. According to Gaudet et al. (2010), Collaborative learning is a teaching approach that emphasizes peer interactions among individual learners who contribute to a group's emerging knowledge pool. This approach takes place in a learning atmosphere where mutual support is encouraged and learners work together to build learning groups. Collaborative learning is based on the theory of the proximal growth zone (ZPD), which allows for the establishment of mutual understanding during the learning phase. This teaching method has been widely accepted and proven effective in achieving intended learning outcomes.

Collaborative learning is known to boost critical thinking and problem-solving abilities. Neglected children may have limited exposure to these skills, which are essential for academic success. Collaborative learning provides an opportunity for children to develop these skills through working with their peers. This can help them to become more independent learners and to think more critically about the information they are presented with.

Collaborative learning also allows for differentiated instruction. Children from neglected backgrounds may have diverse learning needs that traditional instruction methods are not equipped to address. Collaborative learning allows for children to learn at their own pace and to receive individualized instruction from their peers. This can help to ensure that all children are able to learn and succeed, regardless of their background.

According to Norman (2014), students have difficulties in learning mathematics, such as interpreting mathematical signs, linkages between abstract ideas and real-life situations, recalling formulae, and procedural knowledge for problem-solving. According to Chebet (2016), one can develop important skills such as logical reasoning, creative thinking, abstract and spatial awareness, critical thinking, problem-solving ability, and effective communication skills through the study of mathematics.

Conceptual understanding refers to the ability to grasp the underlying principles and relationships that govern a particular topic or subject. It goes beyond the ability to simply memorize facts or procedures and involves a deeper comprehension of the concepts and their interrelationships. Conceptual understanding is particularly important in subjects such as mathematics, where it is necessary to understand the fundamental principles and logic behind formulas and equations.

Mathematics is a subject that often requires a deep level of conceptual understanding. Unlike rote memorization of facts or formulas, conceptual understanding involves grasping the underlying principles and relationships between mathematical concepts. This type of understanding enables students to apply mathematical concepts to

new problems and situations and to explain their reasoning. It also allows them to see the connections between different mathematical topics, making it easier to integrate and synthesize their knowledge. Achieving conceptual understanding in mathematics requires more than just memorization and practice; it involves active engagement, critical thinking, and problem-solving. Collaborative learning can promote conceptual understanding by emphasizing the relationships between mathematical concepts, encouraging students to explain their reasoning, and providing opportunities for exploration and discovery. According to Zakaria et al. (2010), collaborative learning leads to enhanced academic performance in mathematics among students.

This approach has been shown to be effective in improving educational outcomes for students. The research conducted by Melihan and Sirri (2011) revealed that collaborative learning approach is more effective than traditional teaching method in promoting academic achievement among students.. In this paper, we will explore the ways in which collaborative learning can positively impact on the academic achievement of neglected children.

Hypotheses

1. There is no significant difference between the control and experimental groups on the basis of conceptual understanding ability of neglected children in pretest.
2. There is no significant difference between of conceptual understanding ability of neglected children of control and experimental groups on the basis of posttest.

Material and Methods

The population of the study was comprised 1000 neglected children that enrolled in Child Protection Schools and residing in Child Protection & Welfare Bureau, Punjab. The sample of the study as sixty neglected children of 5th class of Child Protection School, Lahore. These children were further divided into control and experimental groups by using simple random sampling technique. Traditional learning method was used as instructional method for students in the control group while students in the experimental group was received collaborative learning treatment. Experimental group was further divided into small groups in class room by using Student Team Achievement Division (STAD) model. This study utilized a teacher made test to examine the academic achievements of the sample students. Sixty students were given forty multiple choice questions (MCQs) from the first three chapters of 5th grade Mathematics. The pre-test was administered before the treatment was started and the post-test was administered after the treatment. A retention test was administered to both the groups as well two weeks. . The numerical data collected through the pre-test, post-test, were analyzed by applying t-test at 0.05 level. Qualitative data was gathered from students through the use of structured interviews.

It is important to note that the study focused on neglected children in Child Protection Schools and aimed to determine the effectiveness of collaborative learning methods in comparison to traditional learning methods. The results of the study can provide valuable insights into effective teaching methods for neglected children and aid in the development of educational programs that cater to their unique needs.

Steps of Treatment

Student Team Achievement Division (STAD) was used for the collaborative learning treatment in experimental group. This teaching method emphasized on the importance of teamwork and collaboration in the learning process. It is designed to provide students with the opportunity to work together and apply their knowledge in a real-world context. The

following are the steps and process of implementing STAD in a experimental classroom setting:

1. **Team formation:** The first step in implementing STAD model was to divide students into teams. This was done based on student abilities or interests. It is essential to ensure that teams are diverse and have a balance of skills and strengths.
2. **Task assignment:** After the formation of teams/groups, the tasks were given to them. The members of each group help each other in completion of the tasks..
3. **Resource provision and guidelines:** To ensure that teams are able to complete their task successfully, teachers provided them with the necessary resources and guidelines. These might include materials, equipment, and a clear set of instructions.
4. **Monitoring and feedback:** Teachers regularly monitored the progress of each team and provide feedback and guidance as needed. This was helpful to ensure that teams stay on track and were able to complete their task on time.
5. **Evaluation:** At the end of the treatment, teams work was evaluated and graded based on specific criteria.

After completion the three chapter of mathematics of grade 5th a post test was administrated to evaluate the performance of both control and experimental groups. Furthermore a retention test was also administrated after the one month of posttest.

Results and Discussion

Table 1
Significance of difference between mean achievement scores of control and experimental groups on pre-test

Group	N	x	SD	T	Sig-level	p-value
Control	30	12.6667	2.32428			
Experimental	30	13.0000	2.27429	-0.561	0.05	.577

Table 1 showed that there was no noticeable distinction between the mean achievement scores of the control (12.6667) and experimental (13.0000) groups of neglected children on the math achievement test's conceptual understanding ability items. The null hypothesis, which stated that there was no significant difference between the two groups, was accepted due to the calculated t value being greater than 0.05. As a result, it can be inferred that both groups had equal student distributions in terms of their learning abilities and capacities.

Table 2
Significance of difference between mean achievement scores of control and experimental groups on posttest

Group	N	x	SD	T	Sig-level	p-value
Control	30	7.4333	1.07265			
Experimental	30	10.4333	.85836	-11.961	0.05	0.001

Table 2 showed that the mean achievement score of control (7.4333) and experimental (10.4333) groups has a mark able difference and value of $p=0.01$ was less than the critical value of 0.05. As a result, the null hypothesis (H_0) stating that there is no

significant difference between of conceptual understanding ability of neglected children of control and experimental groups on the basis of posttest, was rejected.

To explore the beliefs of learners' interviews were conducted at three different times: prior to, during, and after the intervention. The interview protocol encompassed a wide range of themes that delved into individuals' beliefs and perceptions surrounding mathematics. These themes included an exploration of the perceived difficulty level of understanding mathematical concepts, the level of interest in mathematical concepts, the practical applications of mathematics in everyday life, the effectiveness of co-learning approaches in mathematics classrooms, the interconnectivity between various mathematical concepts, the potential benefits of incorporating interactive activities into mathematics learning, the value of memorizing mathematical formulas prior to problem-solving, and the extent to which the sole purpose of studying mathematics should be to find solutions to mathematical problems. These interviews were designed to provide a more in-depth understanding of how participants' attitudes and perceptions towards mathematics evolved throughout the intervention, and to identify key areas of focus for future interventions and learning strategies.

Table 3
Change in Beliefs of Students about Mathematics and Mathematics Teaching

Beliefs of Students	Beliefs before	Beliefs during	Beliefs after
	Experiment	experiment	experiment
	Yes	Yes	Yes
In percentage			
1 Math is easy to understand	39	60	79
2 Math's concepts are interesting	44	59	86
3 It is useful in everyday life	48	88	96
4 Its concepts are interconnected with each other	10	35	70
5 One must to memorize the formulae first to understand and solve math problems	83	55	25
6 Math is used to find the solutions of mathematical problems only	90	59	30
7 CL in the Math class produces better conceptual understanding skill	10	54	97
8 Math concepts can be learnt through activities	13	75	92

Table 3 presents several noteworthy findings. Firstly, prior to the intervention, only 39% of learners held the belief that mathematics was easy to understand. However, this percentage increased to 60% during the middle of the intervention, and further increased to 79% at the end of the intervention. Secondly, math's concepts are interesting, 44% held this belief before the intervention, which increased to 59% during the middle of the intervention, and to 86% at the end of the intervention. Thirdly, regarding the usefulness of mathematics in everyday life, 48% of learners believed this prior to the intervention, while this percentage increased to 88% during the middle of the intervention, and further increased to 96% at the end of the intervention. Moreover, Its concepts are interconnected with each other, Prior to the intervention, only 10% believed in this concept, which increased to 35% during the middle of the intervention and to 70% after the intervention. Furthermore, with respect to the belief that memorizing mathematical formulas was necessary to understand and solve mathematical problems, this percentage decreased gradually from 83% prior to the intervention to 55% during the middle of the intervention,

and further decreased to 25% after the intervention. In terms of the belief that the sole purpose of mathematics was to find solutions to mathematical problems, this percentage also decreased gradually from 90% prior to the intervention to 59% during the middle of the intervention, and further decreased to 30% after the intervention. Regarding the effectiveness of collaborative learning approaches in mathematics classrooms, learners' beliefs showed an increasing trend. Prior to the intervention, only 10% believed that co-learning produced better conceptual understanding skills, which increased to 54% during the middle of the intervention, and to 97% at the end of the intervention. Lastly, the belief that mathematical concepts can be learned through activities was held by only 13% of learners before the intervention, but this number increased to 75% during the middle of the intervention and further increased to 92%.

Discussion

The findings of the study suggest that the collaborative learning intervention had a positive impact on the neglected children's conceptual understanding ability in math. The pretest mean score analysis revealed no significant difference between the control and experimental groups. This showed that both groups (control & experimental) have equal capabilities. The posttest mean scores showed a marked improvement in the experimental group. Therefore, the null hypothesis of no significant difference between the two groups was rejected.

Additionally, the study highlights the importance of learners' beliefs and attitudes towards math in their learning and performance. The collaborative learning intervention had a positive impact on learners' beliefs about conceptual understanding in math, including an increase in the percentage of learners who found math easy to understand, interesting, and useful in everyday life. This suggests that learners who hold positive beliefs about math are more likely to be motivated and engaged in learning the subject, resulting in better performance.

Furthermore, the increasing trend in learners' beliefs about collaborative learning and learning through activities suggests that these approaches can be effective in improving conceptual understanding ability and increasing engagement in the subject.

In conclusion, the findings of this study have important implications for teachers and policymakers involved in designing and implementing interventions to improve math education for neglected children.

These findings are consistent with those of other studies by Zakaria et al. (2010) and Melihan and Sirri (2011), and support the importance of student interaction as proposed by Vygotsky and Piaget.

Conclusion

In conclusion, the study found that there was no significant difference in the mean achievement scores in pretest between the control and experimental groups in terms of conceptual understanding ability in math. However, there was a significant difference between the two groups in terms of posttest scores. The intervention had a positive impact on learners' beliefs about math, including an increase in the percentage of learners who believed that math was easy to understand, interesting, and useful in everyday life. Additionally, learners' beliefs about collaborative learning and learning through activities also showed an increasing trend. These findings suggest that collaborative learning interventions that focus on changing learners' beliefs and attitudes towards math can have a positive impact on their performance and understanding of the subject.

Recommendations

1. It is recommended that implement collaborative learning as an instructional approach for neglected children in Punjab in order to improve their conceptual understanding ability in mathematics and other subjects.
2. More research should be conducted on the effectiveness of collaborative learning aimed at improving learners' conceptual understanding ability in math. This will help to identify best practices and ensure that resources are being used effectively.
3. Policy-makers should consider incorporating strategies to improve learners' conceptual understanding ability towards math into broader education policies. This could involve initiatives to promote collaborative learning and learning through activities, as well as efforts to highlight the relevance of math to learners' daily lives.
4. Educators should be trained to create positive and engaging learning environments that facilitate improved learning outcomes. This could involve professional development programs that focus on strategies for improving learners' beliefs and attitudes towards math, as well as approaches to collaborative learning and learning through activities.

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