

Improving Pupils' Academic Achievement in Mathematics: Peer Tutoring Instructional Strategy as a Panacea

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Abstract: *This research endeavoured to investigate the impact of a peer tutoring strategy on pupils' mathematical performance in the classroom. A quasi-experimental approach was taken for this research. Pupils in primary 5 from two different public primary schools were chosen at random. In this study, Mathematics Achievement Test (MAT), a single research instrument with a long history of validity and reliability testing was used. The test-retest method revealed that MAT had a reliability index of 0.78. An Analysis of Covariance (ANCOVA) was used to test for the three hypotheses. The results showed that the treatment significantly affected the pupils' math performance ($F(1; 82) = 310.474, P < 0.05$). However, there was no statistically significant difference between the genders in terms of pupils' performance in Math ($F(1; 82) = .354; P > 0.05$). Finally, there was no a statistically significant difference in math performance between the sexes ($F(1; 82) = .003; P > 0.05$) when treatment and gender were taken into account. The results indicated that pupils of both sexes benefited from the peer tutoring instructional strategy, suggesting its potential utility in promoting higher math achievement in the classroom. Instructional strategies such as peer tutoring have been proposed for use in the classroom when instructing subjects like mathematics.*

Keywords: Peer tutoring, Instructional strategy, Academic achievement, Mathematics.

Introduction

Mathematics, which is one of the oldest fields of study in the history of mankind, has long been one of the most central components of human thought. It has been believed for centuries that mathematics sharpens the human mind, develops their logical thinking; enhances their reasoning ability and spatial power. It influences an individual's personal development and contributes to the wealth of the country. This is mainly because it is at the heart of many successful careers and successful lives. Mathematical skills for daily life are developed in school mathematics curriculum (Adamu, 2020). (Adamu, 2020). Mathematics is the science of reasoning and computations. It is the science or study of numbers, quantities or shapes (Isack, 2015).

Making mathematics a required subject in Nigeria's elementary and secondary schools is one way the country is working to improve the quality of its math education (Miheso, 2012). The number of mathematics lessons taught in schools is greater than the number of science lessons taught, and this gives mathematics a privileged place in the curriculum. Also, mathematics was and is a required subject for students in both elementary and secondary education levels in Nigeria. Nosa and Ohenhen (2018) claimed that there is a mountain of evidence demonstrating that countries with a high level of interest in mathematics, science, and technology have a lower poverty rate and greater independence from other countries. As the world continues to shrink into a global village, it is more important than ever that people have a solid grounding in the concepts and methods of mathematics. According to Adedayo (2017), math education fosters in students a preference for precision, logic, systematisation, and the systematic organisation of knowledge. It helps students think critically and find their own solutions to problems, while simultaneously fostering a habit of independence.

As students move through school and into adulthood in the home and the workplace, the mathematical demands placed on them only grow. Students need a solid grounding in mathematics to be able to function in a mathematically literate manner in the future. It takes more than just knowing how to do things by heart to build a solid basis (Adamu, 2020). Students' dismal math scores belie the subject's centrality to everyday life and the importance of mathematics education in the classroom. Students in Kwara state did not fare well academically in the external examinations of the West African Examinations Council (WAEC) in 2017 and 2018; only about half of the students who took the exams received a passing grade in Mathematics (National Bureau of Statistics, 2019). In 2017, 49% of students were awarded passing grades in mathematics; in 2018, that number dropped to 46%.

Given mathematics' prominence and relevance across many sectors of American society, the current state of mathematics education cannot be allowed to persist. This is cause for grave concern because if this pattern continues, it will stymie efforts to improve the country as a whole. Therefore, all hands must be on deck to boost students' math scores in elementary school, where a firm groundwork for subsequent learning can be established. Adamu (2020) claimed that ineffective classroom strategies were to blame for students' low math scores. Methods that encourage student participation in the classroom have been advocated by

researchers and academics (Molla & Muche, 2018; Kingdom-Aaron, Etokeren & Okwelle, 2019). In this analysis, the instructional strategy of using students as tutors for one another is one of several variables of interest.

According to Ehirheme and Eze (2021), the peer-tutoring approach is a student-centered strategy for teaching that originates from social constructivist theories. Collaboration in the classroom occurs when two students assist one another with their studies. Students of varying academic abilities can learn the most from this method when they work in groups (Kunsch, Jitendra, & Sood, 2007). According to Saga (2013), this method of education has students teach each other about topics in which one student is more knowledgeable than the other. Vygotsky advocated for peer instruction more than anyone else. According to Vygotsky, students who are working together or being tutored by their peers have a better chance of improving their academic performance (Ullah, Tabassum & Kaleem, 2018).

According to Moreneo and Duran (2002), peer tutoring is a form of cooperative learning in which students with different levels of academic ability work together toward a common goal. This objective can only be attained through a carefully orchestrated system of teacher-student relationships. There is a growing consensus that mentoring from one's peers is a great way to learn and practise social skills. According to Yusuf, Yusuf, and Odutayo (2017), the social and educational benefits of peer tutoring are mutual.

A number of studies have been conducted on peer tutoring (Yusuf, Yusuf, & Odutayo, 2017; Ullah, Tabassum, & Kaleem, 2018; Olulowo, Ige, & Ugwoke, 2020; Ehirheme, & Eze, 2021; Kim, Jillapali, & Boyd, 2021). However, none of the aforementioned studies investigated the impact of peer tutoring on the academic performance of primary school pupils in Mathematics especially where this study was carried out

The gender of the participants is another important factor. Gender is the characteristics that identify women as female and men as male. Biological sex is one example of such a characteristic (Kevin, 2017). A number of studies have been conducted on the effect of gender on the academic achievement of students in various subject areas, but the studies have reported conflicting findings (Nnamani & Oyibe, 2016; Pirmohamed, Debowska & Boduszek, 2017; Lori, Michelle, Glenda & Brian, 2019). In light of this, it was necessary to include the gender in the study

Statement of the Problem

Some researchers believe that a teacher-centered approach may be to blame for students' persistently low math scores. A number of academics and researchers have advocated for the adoption of strategies that encourage student participation in the classroom. There have been many suggestions for how to improve students' performance in mathematics, and many studies have been done on the topic. However, no such suggestions or studies have led to significant changes in student achievement, especially at the elementary school level. As such, this study sought to ascertain whether or not the use of peer tutors improved students' proficiency in Mathematics in the Ilorin East LGA of Kwara State..

Research Hypotheses

- Ho1: There is no significant effect of treatment on the academic achievement of pupils in Mathematics.
Ho2: There is no significant effect of gender on the academic achievement of pupils in Mathematics.
Ho3: There is no significant interaction effect of treatment and gender on the academic achievement of pupils in Mathematics.

Methodology

The study used a 2X2 factorial design, which is a quasi-experimental research approach that involves a control group taking part in both pre- and post-testing. All students in grades five and up in the Ilorin East LGA of Kwara State were the intended audience. The two (2) public elementary schools were chosen using a simple random sampling technique. The first school served as a control group, while the second served as the experimental group (38 students) (49 pupils). Children in Grade 5 at each of the participating elementary schools took part in the research. Study participants were given an achievement test in mathematics that the study's authors had developed; it was called the Mathematics Achievement Test (MAT). The MAT consisted of twenty-five (25) multiple-choice questions taken from the primary five mathematics scheme of work. Lecturers from Early Childhood and Primary Education at Kwara State University reviewed the questions that would eventually become part of the MAT, the Peer Tutoring Instructional Guide (PTIG), and the Conventional Instructional Guide (CIG), and provided feedback that helped improve the instrument. The test-retest technique was used to determine the MAT's consistency. Twenty-eight primary five pupils who were not part of the study were given the test twice, with a two-week gap in between. The reliability coefficient was calculated to be 0.79 after Pearson Product Moment Correlation (PPMC) analysis was performed on the data from the two surveys. Analysis of Covariance was used to analyse the data gathered over the course of the 6-week study (ANCOVA).

Results

Research Hypothesis One: There is no significant main effect of treatment on the academic achievement of pupils in mathematics

Table 1: Summary of Analysis of Covariance (ANCOVA) showing the effect of treatment in pupils' academic achievement in mathematics

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1270.318 ^a	4	317.579	79.050	.000
Intercept	18.305	1	18.305	4.556	.036
Pretest	.237	1	.237	.059	.809
Treatment	1247.310	1	1247.310	310.474	.000
Gender	1.424	1	1.424	.354	.553
Treatment * Gender	.012	1	.012	.003	.957
Error	329.429	82	4.017		
Total	25302.000	87			
Corrected Total	1599.747	86			

Treatment's impact on Pupils' math grades is presented in Table 1. Treatment had a statistically significant impact on Pupils' mathematics performance ($F(1; 82) = 310.474, P < 0.05$). Since the significant value (.000) is smaller than 0.05, the result indicated that the null hypothesis should be disregarded. This suggested that there was a substantial effect of treatment on Pupils' mathematical performance in school. Table 2 provides an explanation for the discrepancy.

Table 2: Summary of Bonferroni's Poc Hoc Pairwise Comparison of the scores between the two groups

Treatment	Mean Difference	Experimental	Control Group
Peer tutoring	20.83	*	
Conventional Method	13.13		*

Using Table 2, we can deduce that the notable effect seen in Table 1 is due to the notable distinction between the peer tutoring instructional strategy and the traditional method. The term experimental group is used to describe those who participate in the peer tutoring instructional strategy, while control group describes those who use the more traditional control method. In other words, the results show that pupils whose teachers used a peer-tutoring strategy had significantly higher test scores than those whose teachers used a more traditional approach (20.83 (13.12)).

Research Hypothesis Two: There is no significant effect of gender on pupils' academic achievement in mathematics

Table 1 also showed that there was a gender difference in students' performance in math. Gender did not play a role in pupils' performance in mathematics ($F(1; 82) = .354; P > .05$). Since the significant value (.553) is greater than 0.05, the hypothesis is not rejected in light of the result. Therefore, this suggests that there was no discernible difference in students' mathematical performance based on their gender.

Research Hypothesis Three: There is no significant interaction effect of treatment and gender on pupils' academic achievement in mathematics

Pupils' mathematical performance varied by both treatment and gender, as shown in Table 2. Pupils' mathematical performance did not differ significantly by gender or treatment ($F(1; 82) = .003; P > 0.05$). In light of the data, the hypothesis is not rejected because

the significant value (.957) is greater than 0.05. This means that there was no discernible effect of treatment by gender on students' math performance.

Discussion of Findings

The study's results showed that in the Ilorin South LGA of Kwara State, students who received the intervention had a statistically significant increase in their mathematics grades. This indicates that students' mathematical achievement improved significantly when they were taught using a peer tutoring instructional strategy as opposed to the more traditional methods. It's possible that the students' success can be explained by the fact that they took an active role in learning thanks to the many chances they were given to learn from and teach their more seasoned classmates. This result corroborated the findings of Ullah, Tabassum, and Kaleem (2018), who found that students' performance in biology improved significantly after receiving peer tutoring. This result was consistent with the findings of Kim, Jillapali, and Boyd (2021), who found that peer tutoring significantly influenced the academic performance of first-year baccalaureate nursing students.

A second finding was that there was no correlation between students' gender and their performance in mathematics. This suggests that gender played no role in explaining variations in students' performance in mathematics. Ahmed (2017) also found no significant main effect of gender on student performance in Mathematics in the Moro Local Government Area of Kwara State, which these results corroborated. This finding was consistent with another study conducted in Ilorin West LGA of Kwara State by Rafiu (2018), which found that there was no significant difference in students' numeracy scores based on gender.

Results also showed that in the Ilorin East LGA of Kwara State, there was no observable difference in mathematical performance between the sexes regardless of treatment. This indicates that there was no discrimination based on gender in the provision of care. This discovery was made possible because all students had access to mentors and role models. These results corroborated those of Oyinlola (2022), who found that there was no significant effect of treatment and gender on English language proficiency. Similarly, Yusuf (2019) found no statistically significant gender interaction effect on students' academic performance across all treatments.

Conclusion

The results of the study suggested that pupils can benefit from using peer tutoring as an instructional strategy to boost their mathematical skills regardless of gender

Recommendations

The following suggestions were made based on the above findings.:

1. Math educators should adopt the practise of using peer tutoring as a method of instruction.
2. Teachers should be given opportunities to learn about the peer tutoring instructional strategy through seminars, workshops, and conferences.
3. There are needs to be more emphasis on the use of peer tutoring as a teaching strategy in teacher preparation programmes.
4. Peer tutoring instructional strategy should be included in mathematics curriculum.

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