

COOPERATIVE TEACHING STRATEGY AND ACADEMIC PERFORMANCE OF PUPILS IN MATHEMATICS IN PUBLIC PRIMARY SCHOOLS IN RIVERS EAST SENATORIAL DISTRICT OF RIVERS STATE

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Abstract: This paper examined the relationship between cooperative teaching strategy and the academic performance of public primary school pupils in Mathematics in Rivers East Senatorial District of Rivers State. Three research questions and three null hypotheses guided the study. The study adopted a quasi-experimental research design. 3,284 primary three pupils found in 245 public primary schools constituted the population of the study. A sample of 164 respondents representing was drawn for the study. Two research questions and hypothesis guided the study. The instrument for data collection was a researcher-designed "Test of Pupils Performance in Fraction (TPPF)". The instrument was validated by two lecturers in the Department of Early Childhood/Primary Education in Faculty of Education in Ignatius Ajuru University of Education. A total of 164 instruments were retrieved from the respondents as no loss was recorded. The Mean and Standard Deviation was used to analyze the research questions, while the Analysis of Co-variance (ANCOVA) was used in analyzing the hypotheses at a significant level of 0.05. It was concluded that cooperative teaching strategies such as Think-pair-share strategy, Jigsaw and Group investigation has more positive impact on academic performance of pupils in Mathematics compared to the traditional teaching method. Based on the findings and conclusion in the study, it was recommended among several others that teachers should integrate the Think-Pair-Share strategy into Mathematics instruction, as it has been shown to significantly improve pupils' academic performance compared to traditional teaching methods.

Keyword: Think-Pair-Share, Jigsaw, Group Investigation.

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INTRODUCTION

The philosophy of Nigeria education is based on the development of pupils into sound and effective citizen. Thus, the academic performance of pupils is undoubtedly a variable after the heart of many educationists. Academic performance can be conceived as the degree or level of success attained in a subject after a test or examination. The academic performance of pupils is commonly measured by examinations and continuous assessments. Hence, the desire for appropriate and dependable means of measuring performance is a concern to all experts in the field of education; who are concerned with the evaluation of learning outcomes. In the school system, the relevance of evaluation cannot be over-emphasized.

Mathematics as an aspect of science that deals with the logic of shape, quantity and arrangement can be seen all around us. It is the building block for everything in our daily lives,

including mobile devices, architecture, art, money, engineering and even sport (Oxford languages, 2019). Mathematics is also seen as a subject that helps in developing variety of skills that support mental growth in pupils. This is because, mathematics encompasses a wide range of skills that covers logical and problem-solving skills. Some primary school pupils are inattentive in mathematics class, this could be as a result of not being able to recall mathematical concept taught with ease. Hence performing mathematical task becomes difficult. Furthermore, reasons for this difficulty may vary but this could sometimes be related to the teaching method being used to explain such topics. Little wonder why Okabiah (2018) blamed poor performance of learners in mathematics on poor methods and approaches to teaching which has reduced the level of motivation. Similarly, Harbor (2020) added that the issue of poor performance in mathematics examinations was due to problem of teaching methods.

Mathematics helps in developing the child's critical, analytical and quantitative thinking. Its relevance is crucial to pupils, in order that they may develop the ability to tackle and solve numerical problems. In regards to the significance of mathematics in day-to-day life, it is very important in order to improve pupils' performance in this subject which Fraction happens to be one of its major components. As an operational aspect of mathematics, Fraction helps pupils to confidently and effectively meet with every day demand of transactional problem. In a quest to tackle the persistent situation of pupils' poor performance in mathematical concepts, such as; Fraction, learners have been exposed to various techniques of teaching. In addition, teachers have been exposed to various programmes that can help them in delivery of mathematical instruction. In spite the various traditional teaching approaches to solving high failure in mathematics, not much improvement has been noticed.

For effective teaching to take place, it is believed that skillful and innovative approach towards teaching mathematics needs to be appropriately utilized. Thus, the teacher is encouraged to vary his teaching approach and technique and to explore as many techniques at his disposal. A carefully designed teaching method can make teaching and learning effective. Therefore, the persistent failure is blamed on constant usage of traditional method of mathematics educators.

Fostering collaboration among pupils is paramount for creating a dynamic learning environment which promotes active participation in mathematical tasks. Cooperative teaching strategies offer an effective approach to achieve this goal, encouraging active engagement, critical thinking, and peer-to-peer support. Thus, cooperative teaching strategy revolves around pupils working together in small groups to achieve common learning goals (Sharan, 2019). Unlike the traditional methods where learning is primarily instructor-driven, cooperative teaching emphasizes peer interaction and shared responsibility for learning outcomes (Vermette, 2018). This instructional approach includes series of strategies such as: Think-pair-share strategy, Jigsaw and Group investigation. The foundational base of cooperative teaching strategy encompasses the learners' acquisition of problem-solving approach, critical thinking and analytical thinking as they work towards achieving a given task, and also promoting inclusive, and hands-on activities.

In the opinion of Rodger (2019), cooperative teaching strategy is the instructional use of small groups so that pupils work together to maximize their own and each other's learning. This, involves the use of small groups of pupils working together to increase their personal learning and that of their group members. Usually, the pupils are placed into small groups, while the teacher gives direction on what to do. Similarly, Salvin (2015) defined cooperative teaching strategy as a variety of teaching methods in which pupils work in small groups to help one another learn academic content. Furthermore, Kagan (2014) in his study asserted that,

cooperative teaching strategy is a teaching arrangement that refers to small, heterogeneous groups of pupils working together to achieve a common goal.

Think-pair-share as a cooperative strategy of teaching involves an approach where pupils are first allowed to reflect independently on a question (think), then discuss their thoughts with a partner (pair), and finally share their ideas with the larger group (share). In teaching mathematics in primary school, think-pair-share approach encourages pupils to actively engage with mathematical concepts rather than passively receiving information. This active engagement helps deepen their understanding and retention of the mathematical concept, and the manipulation of arithmetic operation. Also, the "think" phase allows pupils to independently ponder a mathematical problem, promoting critical thinking and problem-solving skills. This allows them to formulate their own understanding and before discussing it with a peer. During the pair phase, pupils are allowed to discuss their thoughts with a partner. This practice develops their ability to articulate mathematical reasoning and listen to alternative perspectives, which are crucial skills in mathematics. This peer interaction can clarify misconceptions and reinforce internalization of mathematical concept.

The Jigsaw is another substantial cooperative approach to teaching. This approach involves the division of pupils into small groups to master different segments of a lesson or topic (Nurbianta, 2018). The approach promotes pupils' collaboration, enhance understanding, and improve social skills. Practically, this approach can be utilized in teaching mathematics through the following steps; firstly, the class is divided into diverse small groups, each containing 4-6 pupils. Thereafter, each group member is assigned a different mathematical concept to learn and become an expert in. Then, pupils from different groups who are assigned the same concept meet in expert groups to discuss and understand their concept thoroughly. After mastering their concepts, pupils return to their groups to teach the other group members. Finally, the entire class then discusses the complete topic, with all group members contributing their knowledge to synthesize a comprehensive understanding (Unal, 2017). As pupils undergo this process, they develop spirit of teamwork and communication skills. Jigsaw involves working on a part of a whole task and thereafter coming together to reinforce pupils' understanding which allows for clarification of any misconceptions, promoting a robust comprehension of fractions (Jainal & Shahrill, 2021). Therefore, each learner delves deeply into their fraction topic, becoming an expert. To Lamon (2015), this deep learning helps learners develop a thorough understanding of their part, which they then convey to their peers. Also, in solving problem, learners work together to solve fraction problems, combining their expertise to tackle complex questions. Learners must analyze and synthesize information to convey it effectively, which sharpens their cognitive abilities (Levi, 2013, Lamon, 2022).

In utilizing the cooperative teaching strategy in teaching mathematics, all learners in the classroom are expected to work together in small group to complete a given mathematical task (Robert, 2018). It is prevalent knowledge that mathematics involve problem solving activities; by promoting working together in class, the cooperative strategy may help learners to improve their performance in mathematics (Gallies, 2016). In a quest to facilitate pupils' improved performance in mathematics, teachers have tried to adapt various traditional methods of teaching to suit the teaching of mathematical concepts. In spite of this, no major improvement has been noticed in the performance of primary school pupils in mathematics. It is in light of this that this study seeks to investigate how cooperative teaching strategy relates to the academic performance of public primary school pupils in Mathematics in Rivers East Senatorial District of Rivers State.

Research Questions

The following research questions guided the study:

- What is the mean difference in academic performance in Mathematics between pupils taught using Think-pair-share strategy and those taught using the traditional method of teaching in public primary schools in Rivers East Senatorial District of Rivers State?
- What is the mean difference in academic performance in Mathematics between pupils taught using Jigsaw strategy and those taught using the traditional method of teaching in public primary schools in Rivers East Senatorial District of Rivers State?

Hypotheses

The following hypotheses were tested in the study at 0.05 level of significance:

- **H₀₁:** There is no significant mean difference in the academic performance of pupils in Mathematics taught using the Think-pair-share strategy and those taught using the traditional method of teaching in public primary schools in Rivers East Senatorial District of Rivers State.
- **H₀₂:** There is no significant mean difference in the academic performance of pupils in Mathematics taught using the Jigsaw strategy and those taught using the traditional method of teaching in public primary schools in Rivers East Senatorial District of Rivers State.

METHODOLOGY

The study adopted a quasi-experimental research design. 3,284 primary three pupils found in 245 public primary schools in the 8 Local Government Areas that make up Rivers East Senatorial District constituted the target population of the study. 164 primary three pupils selected from three (3) intact classes constituted the sample of the study. The sample size for the study was drawn using a purposive sampling technique. Two intact classes were used for the experimental group, while one intact class was used for the control group. The instrument for data collection was “Test of Pupils Performance in Fraction (TPPF)” designed by the researcher. A reliability coefficient of 0.82 was obtained to ensure the reliability of the instrument. The instrument was administered with the help of three research assistants. The Mean and Standard Deviation was used in answering the research questions, while the Analysis of Co-variance (ANCOVA) was used in testing the null hypotheses at a significant level of 0.05.

PRESENTATION OF RESULTS

Research Question One: What is the mean difference in academic performance in Mathematics between pupils taught using Think-pair-share strategy and those taught using the traditional method of teaching in public primary schools in Rivers East Senatorial District of Rivers State?

Table 1: Pretest and posttest mean score on Think-pair-share strategy (TPSS) and traditional method (TM)

Group	N	Pretest		N	Posttest		Mean Difference
		\bar{x}	SD		\bar{x}	SD	
TPSS	41	62.04	13.11	37	76.21	15.53	14.17
TM	43	56.31	10.04	43	43.12	9.21	-13.19

Table 1 shows the pretest and posttest mean scores of pupils taught fraction using the Think-pair-share strategy (TPSS) and traditional method (TM). The table shows that for pupils taught using Think-pair-share strategy the pretest mean is 62.04 with a standard deviation is 13.11, while the posttest mean is 76.21 with a standard deviation of 15.53, and a mean difference of 14.17, while pupils taught using traditional method the pretest mean is 56.31 with a standard deviation of 10.04 while the posttest mean is 43.12 with a standard deviation of 9.21 and a mean difference of -13.19. The result shows that Think-pair-share is an effective and better strategy of teaching Fraction when compared to the traditional method.

Research Question Two: What is the mean difference in academic performance in Mathematics between pupils taught using Jigsaw strategy and those taught using the traditional method of teaching in public primary schools in Rivers East Senatorial District of Rivers State?

Table 2: Pretest and posttest mean score on Jigsaw strategy (JS) and traditional method (TM)

Group	N	Pretest		N	Posttest		Mean Difference
		\bar{x}	SD		\bar{x}	SD	
JS	45	65.43	11.52	35	81.04	18.09	15.61
TM	43	59.22	10.12	43	47.31	8.02	-11.19

Table 2 shows the pretest and posttest mean scores of pupils taught fraction using the Jigsaw strategy (JS) and traditional method (TM). The table shows that for pupils taught using Jigsaw strategy the pretest mean is 65.43 with a standard deviation is 11.52, while the posttest mean is 81.04 with a standard deviation 18.09, and a mean difference of 15.61, while pupils taught using traditional method the pretest mean is 59.22 with a standard deviation of 10.12 while the posttest mean is 47.31 with a standard deviation of 8.02 and a mean difference of -11.91. The result shows that Jigsaw is an effective and better strategy of teaching Fraction when compared to the traditional method.

Testing of Hypotheses

H₀₁: There is no significant mean difference in the academic performance of pupils in Mathematics taught using the Think-pair-share strategy and those taught using the traditional method of teaching in public primary schools in Rivers East Senatorial District of Rivers State.

Table 3: Analysis of Co-variance on Think-pair-share teaching strategy and traditional method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.441 ^a	2	.221	.948	.392
Intercept	21.889	1	21.889	94.085	.000
Main Effect	.441	2	.221	.948	.392
Error	18.845	81	.233	-	-
Total	606.000	84	-	-	-
Corrected Total	19.286	83	-	-	-

a. R Squared = .023 (Adjusted R Squared = -.001)

Table 3 shows the Analysis of co-variance on the significant mean difference between the academic performance of pupils in Mathematics taught using Think-pair-share strategy and those taught using the traditional method in public primary schools in Rivers East Senatorial District. The result shows that $f=94.085$, $p=.000 < 0.05$ with a Df; 2 and 81, the result is significant as the p-value .000 is less than 0.05, hence the hypotheses is rejected. This means that there is a significant mean difference in the academic performance of pupils in Mathematics taught using the Think-pair-share strategy and those taught using the traditional method of teaching in public primary schools in Rivers East.

H₀₂: There is no significant mean difference in the academic performance of pupils in Mathematics taught using the Jigsaw strategy and those taught using the traditional method of teaching in public primary schools in Rivers East Senatorial District of Rivers State.

Table 4: Analysis of Co-variance on Jigsaw teaching strategy and traditional method

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4.853 ^a	2	2.427	4.375	.016
Intercept	19.630	1	19.630	35.390	.000
Main Effect	4.853	2	2.427	4.375	.016
Error	47.147	85	.555	-	-
Total	1130.000	88	-	-	-
Corrected Total	52.000	87	-	-	-

a. R Squared = .093 (Adjusted R Squared = .072)

Table 4 shows the Analysis of co-variance on the significant mean difference between the academic performance of pupils in Mathematics taught using Jigsaw strategy and those taught using the traditional method in public primary schools in Rivers East Senatorial District. The result shows that $f=4.375$, $p=.016 < 0.05$ with a Df; 2 and 85, the result is significant as the p-value .016 is less than 0.05, hence the hypotheses is rejected. This means that there is a significant mean difference in the academic performance of pupils in Mathematics taught using the Jigsaw strategy and those taught using the traditional method of teaching in public primary schools in Rivers East Senatorial District of Rivers State.

DISCUSSION OF FINDINGS

The findings in hypothesis one as presented in table 3 shows that $f=94.085$, $p=.000 < 0.05$ with a Df; 2 and 81, the result is significant as the p-value .000 is less than 0.05, hence the hypotheses

is rejected. This means that there is a significant mean difference in the academic performance of pupils in Mathematics taught using the Think-pair-share strategy and those taught using the traditional method of teaching in public primary schools in Rivers East. The finding of study agrees with the view of Michael (2021) who stated that Think-Pair-Share is a cooperative strategy designed to promote pupils' engagement and facilitate deeper understanding of content. The process involves three stages, namely: think, which is a stage where pupils individually consider a question or problem, pair, this is a stage where pupils pair up to discuss their thoughts and solutions and share, which is the stage where pupils share their conclusions with the larger group or class.

The findings in hypothesis two as indicated in table 4 shows that $f = 4.375$, $p = .016 < 0.05$ with a Df; 2 and 85, the result is significant as the p-value .016 is less than 0.05, hence the hypotheses is rejected. This means that there is a significant mean difference in the academic performance of pupils in Mathematics taught using the Jigsaw strategy and those taught using the traditional method of teaching in public primary schools in Rivers East Senatorial District of Rivers State. The finding corroborates the view of Lamon (2015), who expressed that Jigsaw involves working on a part of a whole task and thereafter coming together to reinforce pupils' understanding which allows for clarification of any misconceptions, promoting a robust comprehension of fractions. Furthermore and in line with the findings of this study, Levi (2013) and Lamon (2022) noted respectively that each learner delves deeply into their fraction topic, becoming an expert. This deep learning helps learners develop a thorough understanding of their part, which they then convey to their peers. Also, in solving problem, learners work together to solve fraction problems, combining their expertise to tackle complex questions.

CONCLUSION

Cooperative teaching strategies which are think-pair-share, jigsaw and group investigation has more positive impact on academic performance of pupils in Mathematics compared to the traditional teaching method in public primary schools in Rivers East Senatorial District of Rivers State. The findings revealed that pupils taught using these cooperative strategies performed significantly better than those taught through conventional methods, demonstrating the positive impact of interactive and pupil-centered learning approaches in Mathematics achievement. The study underscores the importance of integrating cooperative learning techniques into Mathematics instruction to create a more engaging and effective learning environment. These strategies encourage collaboration, critical thinking, and active participation, which are essential for improving learning outcomes.

Recommendations

Based on the findings made in the study, the following recommendations were made:

- Think-Pair-Share strategy should be integrated into Mathematics instruction, as it has been shown to significantly improve pupils' academic performance compared to traditional teaching methods.
- The Jigsaw cooperative learning strategy should be widely implemented in primary school Mathematics classrooms, as it enhances academic performance more effectively than traditional teaching methods.

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