

Effect of Jigsaw IV Instructional Strategy on Pupils' Academic Achievement in Mathematics in Kwara State, Nigeria

Kayode Ezecheal OBAFEMI; Ayodele Anthony FAJONYOMI & Eniola Keji OLA-ALANI

Department of Adult and Primary Education, University of Ilorin, Ilorin, Nigeria

Correspondence: ourchildrenyourchildren@gmail.com

Abstract: *This study investigated the effect of Jigsaw IV instructional strategy on pupils' academic achievement in mathematics. Quasi-experimental research design was adopted. A total of 113 pupils from two public primary schools were involved in the study. The two schools were selected using simple random sampling technique. Mathematics Achievement Test (MAT), Jigsaw IV Instructional Guide (JIG), and Conventional Instructional Guide (CIG) were used for data gathering. They were all validated. MAT was tested for reliability ($r = 0.78$) using test retest method. Two hypotheses were formulated and tested with Analysis of Covariance (ANCOVA) at 0.05 level of significance. The findings of the study revealed that treatment had significant effect on pupils' academic achievement in mathematics ($F_{(1, 108)} = 270.332$; $p < 0.05$). Furthermore, it was revealed that there was no significant interaction effect of treatment and gender on pupils' academic achievement in mathematics ($F_{(1, 108)} = .793$; $p < 0.05$). Based on the findings, it was concluded that Jigsaw IV instructional strategy can improve academic achievement of pupils in mathematics. Based on the conclusion, it was recommended that teachers should be trained on Jigsaw IV instructional strategy.*

Keywords: Jigsaw IV, Instructional strategy, Achievement, Mathematics

Introduction

Mathematics education is essential to the development of a nation, much like protein is to a growing organism. It is viewed by society as a key contributor to scientific and technological understanding and is a pivotal factor in a nation's socioeconomic growth. Mathematics is an essential component of many areas of life, permeating through all aspects of human activity (Abubakar & Eze, 2010). Nigeria requires mathematics for primary and secondary school curriculums, as well as for various degree programmes such as education, medicine, architecture and engineering.

Mathematics is an essential component of human thinking and is integral to the way in which we comprehend our surroundings and ourselves (Jameel & Ali 2016). It is also a major component of numerous science disciplines and is used as a tool to understand many other subjects and languages. Unfortunately, students' results in the subject during national examinations have been uninspiring (Abubakar & Uboh, 2010, Makondo & Makondo, 2020). In recent years, there has been a heightened focus on the teaching of Mathematics at primary school level, with educators and academics showing increasing concern over the subject's status as the most detested course in school, with students' grades decreasing over time (Gafoor & Kurukkan, 2016).

Moreover, despite the importance of Mathematics, it has been recognized with dissatisfaction that pupils' academic progress in Mathematics has been lacking. Learners' academic outcomes in external examinations were not encouraging. In the year 2019, the academic performance of pupils, in Ilorin West Local Government Area of Kwara State, who sat for the Kwara State Common entrance examination, was not encouraging. Out of the 13,062 pupils who registered for the Common entrance examination in the local government area, only 4,781 (36.6%) pupils had 50 marks and above in Mathematics. 8,281 (63.4%) pupils had less than 50 marks in mathematics (Kwara State Universal Basic Education Board, 2019). According to the former Registrar and Chief Executive of National Examinations Council (NECO) Godswill Obioma, while presenting the results to the Minister of Education, Mallam Adamu Adamu, he noted that a number of 70,580 candidates sat for the examination nationwide, out of which only 34.6 percent (24,416) of the candidates had pass mark in all the examinable subjects including mathematics (Erunke, 2020).

Previous studies (Atandi, Gisore, & Ntabo, 2019; Isa, Mammam, Badar & Bala, 2020) have found that improvement in the academic performance of pupils is dependent on method of teaching. That is why the poor academic performance of pupils in mathematics has partly attributed to lecture method of teaching often used by some teachers. Some researchers and scholars (Kingdom-Aaron, Etokeren & Okwelle, 2019; Molla, & Muche, 2018; Yaduvanshi, & Singh, 2018) have recommended the use of teaching strategies that tolerate pupils' participation in teaching-learning situation. Parts of such teaching strategies are think-pair-share and jigsaw teaching strategies which are variables of interest in this study.

Gender is a term used to describe the characteristics of both males and females. It is also defined as the set of qualities that differentiate femininity and masculinity. These features may include biological sex, social systems based on sex, and so on, which may vary depending on the environment (Kevin, 2017). Gender can also refer to the economic, social, political, and cultural attributes and chances related to being a man or a woman, which may vary across cultures and change over time (Ghosh, 2020). There is an

apparent link between the biological distinctions and social attitude when it comes to performance. For decades, there have been ongoing debates about the disparities in capabilities between men and women. The masculine sex is often said to have a superiority complex over the feminine sex (Nnamani & Oyibe, 2016). Academic achievement is another area where this superiority is disputed. To this end, a number of studies (Ajaja & Mezieobi, 2018; Albalawi 2019; Awodun & Oyeniya, 2018; Lori, Michelle, Glenda & Brian, 2019; Nnamani & Oyibe; 2016; Pirmohamed, Debowska & Boduszek, 2017; Renato, 2016; Saida & Mustapha, 2018; Salman, 2020) have been conducted on the effect of gender on the academic performance of learners in various school subjects but the findings of these studies have not been consistent. Therefore, gender was included in this study as a moderator variable to mitigate any unintended effects it could have on students' academic ability in mathematics.

Statement of the problem

It has been argued that the teacher-centered teaching approach, which is frequently used by some educators, has been a contributing factor to the continued underperformance of learners in primary school mathematics examinations, both internal and external. Researchers have stressed the importance of implementing teaching strategies that promote active engagement from learners during learning activities. Numerous teaching strategies have been proposed to raise mathematics performance, and a number of studies have been conducted; however, none of the teaching strategies has been found to be effective in improving the performance. With this in mind, the present study aimed to explore the effect of the Jigsaw IV teaching technique on pupils' academic achievement in mathematics.

Hypotheses

H₀₁: There is no significant effect of treatment on pupils' academic achievement in Mathematics in Ilorin, Kwara State.

H₀₂: There is no significant interaction effect of treatment and gender on pupils' academic achievement in Mathematics in Ilorin, Kwara State.

Methodology

The study adopted a quasi-experimental research design with a factorial design of 2X2. The target population was all primary six (6) pupils in Ilorin West Local Government Area of Kwara State, Nigeria. Simple random sampling technique was used to select two (2) public primary schools. One of the two schools was experimental group while the other was the control group. Primary six pupils in each of the selected schools were involved in the study. The research instrument used in the study was researchers' designed achievement test titled 'Mathematics Achievement Test (MAT)'. The MAT consisted of 40 multiple choice questions. The MAT, Jigsaw IV Instructional Guide (JIG), and Conventional Instructional Guide (CIG) were given to lecturers in the Department of Adult and Primary Education, University of Ilorin, who validated the instrument. To establish the reliability of the MAT, test retest method was used. The test was administered twice, with an interval of two weeks, to 25 pupils in primary six who were not part of the study. Data from the two administrations were correlated using Pearson Product Moment Correlation (PPMC) and the reliability coefficient was established at 0.78. Data collected were analyzed using Analysis of Covariance (ANCOVA).

Results

Hypothesis One: There is no significant effect of treatment on pupils' academic achievement in Mathematics in Ilorin, Kwara State

Table 1: Effect of Treatment on Pupils' Academic Achievement in Mathematics

| Source | Type III Sum of Squares | df | Mean Square | F | Sig. |
|--------------------|-------------------------|-----|-------------|---------|------|
| Corrected Model | 20585.899 ^a | 4 | 5146.475 | 78.993 | .000 |
| Intercept | 420.118 | 1 | 420.118 | 6.448 | .013 |
| Pretest | 60.510 | 1 | 60.510 | .929 | .337 |
| Treatment | 17612.481 | 1 | 17612.481 | 270.332 | .000 |
| Treatment * Gender | 51.649 | 1 | 51.649 | .793 | .375 |
| Error | 7036.349 | 108 | 65.151 | | |
| Total | 468966.000 | 113 | | | |

| | | |
|-----------------|-----------|-----|
| Corrected Total | 27622.248 | 112 |
|-----------------|-----------|-----|

Table 1 shows that there was significant effect of treatment on pupils' academic achievement in Mathematics in Ilorin, Kwara State ($F_{(1; 108)} = 270.332$; $p < 0.05$). The null hypothesis is therefore rejected in the light of the result since the significant value (.000) is less than 0.05. This implies that the treatment had significant effect on pupils' academic achievement in Mathematics in Ilorin, Kwara State. Table 2 revealed the source of the difference in pupils' academic achievement in Mathematics in Ilorin, Kwara State.

Table 2: Summary of Bonferroni's Post Hoc Pairwise Comparison of the Scores within the Two Groups

| Groups | Mean Scores |
|----------------------------------|-------------|
| Jigsaw IV instructional Strategy | 75.79 |
| Conventional method | 49.33 |

Table 2 shows that the significant effect shown in table 1 was as a result of the significant difference between:

- i. Jigsaw IV instructional Strategy and
- ii. Conventional method

This implies that those exposed to Jigsaw IV instructional Strategy (Mean = 75.79) performed significantly better in mathematics than those exposed to conventional method (Mean = 49.33). This implies that Jigsaw IV instructional Strategy was effective in bring about improvement in pupils' academic achievement in Mathematics.

Hypothesis Two: There is no significant interaction effect of treatment and gender on pupils' academic achievement in Mathematics in Ilorin, Kwara State.

Table 1 further showed that there was no significant interaction effect of treatment and gender on pupils' academic achievement in Mathematics in Ilorin, Kwara State ($F_{(1; 108)} = .793$; $p < 0.05$). The null hypothesis is therefore not rejected in the light of the result since the significant value (.375) is greater than 0.05.

Discussion of Findings

The study investigated the effect of Jigsaw instructional strategy on pupils' academic achievement in Mathematics in Ilorin, Kwara State. The findings of the study reported that there was significant effect of jigsaw IV on the pupils' academic achievement in Mathematics. The significant effect of the treatment on pupils' academic achievement in Mathematics may be traceable to the uniqueness of the instructional strategy. The instructional strategy allows for interaction among the pupils. This finding of the study supported the findings of Alfares (2020) who reported a statistically significant difference in performance between pupils taught using self-regulated jigsaw activities and those taught using traditional tasks. The finding was also in tandem with the finding of Samuel and Sambo (2019) who reported a substantial difference in achievement between university science students exposed to Individualized Jigsaw, Jigsaw II, and Jigsaw IV Learning Strategies, with Jigsaw II coming out on top. On the contrary, this finding negated the finding of Yatimah, Solihin, Adman, and Syah (2019) who reported that jigsaw instructional technique did not significantly boost adult students' learning outcome.

Another finding of the study showed that there was no significant interaction effect of effect of treatment and gender on the pupils' academic achievement in Mathematics. This finding corroborated the finding of Obafemi, Ola-Alani and Fajonyomi (2022) which reported that there was no significant interaction effect of treatment and gender on the academic achievement of pupils' in mathematics. Similarly, Abdulquadri (2022) revealed that there was no significant interaction effect of treatment and gender on pupils' learning outcome. Also, the finding was in tandem with the finding of Adeboye (2022) which revealed that there was no significant interaction effect of treatment and gender on the academic performance of pupils in basic science.

Conclusion

Based on the findings of the study, it can be concluded that Jigsaw IV instructional strategy can bring about improvement in pupils' academic achievement in mathematics regardless of gender.

Recommendations

Based on the above conclusion, the following recommendations were made:

- Teachers should adopt the use of Jigsaw IV instructional strategy in teaching mathematics.
- Seminars, workshops and conferences should be organized for teachers on how to use Jigsaw IV instructional strategy.
- Jigsaw IV instructional strategy should be incorporated in teacher training programme courses

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