



Effect of Heuristic Teaching Approach on Secondary School Students' Achievement in Algebra in Jalingo Education Zone, Taraba State

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Abstract

This study investigated the effect of heuristic teaching approach on secondary school students' achievement in algebra in jalingo education zone, taraba state. The study was led by two research questions and two null hypotheses examined at a significance level of 0.05. A quasi-experimental design was employed. A sample of 194 was extracted from a population of 5,469 SS II pupils. The instrument utilized for data collection was the AAT. A reliability estimate of 0.77 was obtained using the KR-20 formula. The acquired data was analysed utilizing mean scores, standard deviation, and ANCOVA. Research indicates that the heuristic approach significantly influences students' progress in Algebra more than the lecture method. The research advised that the government should motivate textbook writers to revise their works according to the Heuristic Teaching Approach, and that Mathematics instructors ought to undergo refresher courses conducted by professionals from the University Faculty of Education on the use of the Heuristic teaching method.

Keywords: achievement, algebra, gender, heuristic, mathematics

Introduction

Mathematics is a crucial discipline that facilitates the scientific and technical advancement of a nation. Mathematics is a crucial and compulsory subject for pupils in Basic Education and secondary school (FRN, 2017). Alechenu (2012) characterized Mathematics as the "queen" of the sciences, asserting that its absence would hinder the study of other disciplines such as Physics, Chemistry, Biology, and Computer Science/Information Technology. Abari (2021) asserts that Mathematics encompasses the examination of forms, dimensions, and spatial properties. It pertains to logical reasoning and quantitative analysis, with its evolution reflecting a growing level of idealization and abstraction of its subject matter. Neglecting Mathematics detrimentally affects all knowledge (Roohi, 2015), since one who is uninformed in this discipline cannot comprehend other sciences or worldly matters. The advancement of both national and human development is predominantly reliant on the progress of science and technology, with Mathematics serving as the foundation (Haruna, 2014). No nation can advance scientifically and technologically without a solid foundation in school Mathematics (Okafor, 2015).

Research in mathematics education indicates that instructional methods, particularly at the

secondary school level, are predominantly teacher-centred. There is a heightened focus on the expository technique and the utilization of textbooks, rather than fostering critical thinking among students across many subjects and applying gained information to real-world scenarios (Butty in Iyoke, 2015). Regardless of the quality and appeal of a teaching and learning methodology, its relevance is enhanced only when practical activities are integrated into the everyday educational experience of students. The role of Mathematics in the secondary school curriculum in Nigeria is crucial for scientific advancement. To underscore the significance of this subject, it must be presented to students at all educational levels. This aims to cultivate versatility, resourcefulness, and a solid foundation in pupils for their future endeavours.

The academic achievement of students in the topic has been a significant worry for society. In this sense, achievement refers to the level of success a student attains in any assessment or examination following a teaching method or program. Adetunji (2022) asserted that there is an agreement on the inadequate performance of pupils in Mathematics in Nigeria. Also, teachers are expressing concerns over the low performance in both internal and external assessments. The National Curriculum for secondary

schools categorizes Mathematics into five sections: number and numeration, algebraic processes, geometry, statistics, and probability. Students have demonstrated inadequate performance in all four areas. Narad and Abdullah (2016) defined academic performance as the result of the teaching and learning process. The degree to which a student, educator, or institution has fulfilled their educational objectives. Research by Nwafor, Okpala, and Okoi (2019) demonstrated that the heuristic technique enhances students' academic performance compared to conventional teaching methods. However, this prior research did not ascertain the impact of various heuristic types on students' success and interest. The constraints of prior studies necessitate the current research, which aims to assess the impact of a heuristic approach on students' academic performance. Another significant aspect in this study is the gender of Mathematics students.

Gender is a socio-cultural construct that attributes certain qualities and functions to the sexes, namely male and female, within society. The notion of gender parallels class and race, encompassing several social categories similar to those of class and race (Robert, 2016). Mathematics and science are frequently perceived as fields where guys excel more significantly, regarding both attitudes and self-perception. Despite the ambiguous findings about gender disparity in science, technology, and mathematics education (STME), it is posited that closing the gender gap is a significant means of attaining egalitarianism and promoting human growth. In the domains of Mathematics and Science (Physics), it is believed that guys outperform girls. It was asserted that guys outperform girls in academic success (Lavy & Sand, 2015). Eccles and Wang (2015) highlighted that females exhibit less interest in Mathematics compared to their male counterparts. Abdo-Raheem (2012) examined the impact of gender on the academic achievement of secondary school students in South-West Nigeria, concluding that male students outperformed female students in Mathematics and Science disciplines. The meta-analysis by Lindberg (2013), encompassing data from 242 research and 1,286,350 individuals, demonstrates a striking comparability in achievement between males and girls, demonstrating no gender differences and virtually identical variances for both sexes.

Certain researchers, including Ibe (2014), Iweka (2016), Okoro (2011), Kolawole (2017), and Obiekwe (2018), assert that males outperform females in scientific disciplines. Conversely, other educators such as Okeke (2017), Nzewi (2010), and Oludipe (2017) contend that both genders achieve comparably in science when provided with equal

opportunities and resources. A multitude of elements may contribute to the gender gap, which have significance for the instructional techniques necessary to establish an acceptable teaching and learning environment for Mathematics education that accommodates both genders. The selection of gender as a variable for this study is based on contemporary global trends and research focus on gender issues. Furthermore, performance in other branches of Mathematics, including algebra, has been seen to differ by gender in certain instances.

Algebra is a discipline of Mathematics where symbols, typically letters, denote unknown quantities in Mathematical equations. Algebraic topics are taught for several reasons, including their effectiveness in explaining complex relationships and serving as a valuable tool for cognitive development. Algebra facilitates the execution of fundamental arithmetic operations, including addition, subtraction, and multiplication, without the necessity of precise numerical values (Microsoft Encarta, 2019). The term "Algebra" originates from Arabic, derived from a text authored about A.D. 825 by an Arab called Al-Khwarizmi. The title was "Hisab al-jabr w'al-muqabala," translating to "the science of equations"; where 'al' denotes 'the,' 'jabr' signifies the operation of transferring a quantity from one side of an equation to another (after altering its sign), and 'muqabalah' refers to the process of subtracting equivalent quantities from both sides of an equation. "Al-jabr" or "Algebra" refers to the entirety of subjects encompassed under the field of Algebra (Okechukwu & Umehi, 2014). A robust teaching and learning method such as the heuristic approach may be seen as essential to improve learners' performance in this area of Mathematics. This is crucial as it serves as a gatekeeper for subsequent Mathematics courses (Ferrini-Mundy, Floden, McGrory, Burrill & Sandon, 2016).

Algebra is largely instructed for the development of manipulative skills, problem-solving through equations, generalization capabilities, and the application of formulas and functional concepts (Fasasi, 2015). Ajai (2012:52) identified the significance of teaching Algebra due to its applicability in several fields of Mathematics, the provision of concise formulas or generalizations, its practical utility across numerous crafts and industries, and its promotion of analytical skills, among other reasons. Algebraic subjects covered at the secondary school level include factorization of algebraic expressions, manipulation of formulas, linear inequalities, algebraic expressions, basic linear equations, graphing, simultaneous linear equations, and set logic. In arithmetic, multiplication serves as a

concise method for summing equal groups. For instance, 2×7 represents $2 + 2 + 2 + 2 + 2 + 2 + 2$ in Algebra; a comparable method applies when all multiplicands are identical, such as $7(2)$. According to Palin and Lassa, in Ajai (2015), the instruction of Mathematics (Algebra) should encompass activities that encourage students to contemplate and reason about their actions to identify relationships, so expanding and enhancing their repertoire of Mathematical approaches. This may enhance pupils' performance metrics in the subject area. Dave, Robledo, Motin, Eliseo, and Erma (2014) reported that the National Achievement Test results from 2012 to 2014, quantified by the "mean percentage score," indicated that Grade 8 pupils from CALABARZONE remained below the Department of Education's objective of 75 percent. The Philippines rated 69th in educational systems, 112th in science and mathematics, and 76th in internet connectivity among 125 nations, trailing behind Singapore, Brunei, Malaysia, Indonesia, Thailand, and Vietnam (Umil, 2014).

The inadequate performance of pupils in Algebra has been attributed to the teaching methodology. Educational materials enhance and maximize the achievement of defined educational objectives. To achieve optimal educational programs, suitable instructional materials must be accessible. Failing in Algebra is inconceivable, yet attributable to external forces. Okoli (2019) categorized these variables as insufficient competence, teachers' experience, teachers' qualifications, students' attitudes towards Mathematics, students' backgrounds, class size, and inadequate use of instructional tools to enhance the teaching and learning of Mathematics, among other considerations.

Consequently, there is a necessity to explore more suitable methodologies for the instruction and comprehension of Algebra. Eranikhueman (2003) in Iyoke (2015) asserts that students exhibit aversion to specific topics due to their perception of difficulty and challenges in retention. It has been shown that some educators lack the necessary strategies and tools to teach specific subjects, to the degree that they would opt not to teach those topics if given an option. One area where instructors and students have difficulties, due to a deficiency of methodologies and resources, is Algebra. The WAEC Chief Examiners' Reports (2018) indicated that several applicants lost complete points due to arithmetic mistakes in factorization and the resolution of quadratic functions. Osuafor and Orji (2017) asserted that several pupils comprehend Algebraic ideas more readily with the tangible depiction provided by the tiles. Games can serve to introduce concepts prior to formal instruction,

facilitate skill practice, or reinforce a concept following explicit teaching. Significant learning transpires when pupils actively develop their own comprehension of Algebra, sometimes achieved through the utilization of games. To acquire possibilities for learning Algebra, kids require direct experiences pertinent to Algebra, engagement with peers and adults over these experiences, and time for reflection on them.

Inadequate accomplishment results from instructors' failure to employ suitable instructional strategies (Fasasi, 2015). The author further stated that pupils are not completely engaged in the teaching-learning process. The inclusion of the heuristic teaching technique is essential in the pursuit of enhancing student participation in the teaching and learning process, as emphasized by prior scholars. The term heuristic originates from a Greek phrase meaning 'I find.' The student assumes the role of a discoverer. The technique entails the pupil discovering information independently rather than the teacher providing exhaustive explanations. The heuristic teaching technique seeks to eliminate the deficiencies associated with the lecture method and other traditional instructional approaches employed by educators. The guided heuristic teaching technique is characterized by problem-solving, critical thinking, reflective heuristics, and deductive reasoning, rather than just personal assumptions. It is a pedagogical approach that encompasses probing, inquiry, investigation, analysis, synthesis, discovery, evaluation, questioning, and critical thinking (Adejo 2015). German (2019) argued that while the approach can provide significant benefits when employed by a proficient educator, its inept application as a trend may be more detrimental to learning than an exclusive dependence on traditional ways.

For a practical illustration of the heuristic technique, consider the issue of pupils identifying the properties of a parallelogram. The Mathematics instructor provides pupils with several pre-drawn parallelograms on sheets of paper and requests them to identify the characteristics of the various aspects of a parallelogram. The pupils will inevitably begin to assess and evaluate the characteristics of various parallelograms, and their conclusions on the equality of opposing sides and the sum of neighbouring angles will be entirely consistent. Consequently, their observations will allow them to generalize some aspects of a parallelogram. Additionally, students might be prompted to construct the diagonals of the parallelograms and, by empirical measurements, ascertain that the diagonals bisect one another in all parallelograms. Therefore, pupils may effectively

enumerate all the features of a parallelogram without rote memorization.

The heuristic technique has several advantages; for example, students become active participants in the teaching and learning process, cultivate more interest in their education, and take pleasure in their accomplishments after independently uncovering fundamental concepts in Algebra. It also provides individuals with delight and mental fulfilment, therefore fostering a positive interest in the topic, which results in improved accomplishment in Algebra. This researcher may be a pointer that the Heuristic Teaching Approach could be an effective method for enhancing student success. Against this backdrop, the researcher examines the effect of the Heuristic Approach on secondary school students' success in Algebra within the Jalingo Education Zone, Taraba State.

The Nigerian National Policy on Education (FRN, 2013) designates Mathematics (Algebra) as a fundamental and mandatory subject within the secondary school curriculum, underscoring its essential role in modern society. The juxtaposition between Mathematics' significance to nation-building with the SSCE scores of school students in Taraba State over the years indicates a dismal level of success (Hanawa, 2022). Over the previous decade, the percentage of passes at the credit level has not surpassed 30% (Hanawa, 2022). Furthermore, comments from WAEC chief examiners over the previous six years indicate that students have difficulties in Mathematics, particularly with their perceived knowledge, a situation attributable to inadequate comprehension of the topic. One so contemplates if the heuristic teaching technique may influence accomplishment in Algebra, despite stakeholders' neglect in addressing issues pertaining to the heuristic teaching approach's impact on students' performance in Mathematics (Algebra).

There is minimal or no research undertaken in Taraba State regarding the impact of the heuristic teaching technique on secondary school students' success in Algebra. This issue may hinder the advancement of Science and Technology in Taraba State, which aspires to be recognized as a developing state. The ongoing inadequate performance of students in Mathematics (Algebra) at the secondary school level in Taraba State and Nigeria, if not promptly remedied, could jeopardize the advancement of scientific and technological development. This study examined the impact of the heuristic teaching technique on secondary school students' success in Algebra within the Jalingo Education Zone of Taraba State. This research is based on the operant conditioning models and

stimulus-response (SR) association theory by B.F. Skinner (1958); and Jerome Bruner's (1968) cognitive learning theory

Fasasi (2015) performed a research to examine the impact of the Heuristic Teaching Approach on the academic performance of Senior Secondary School students in Adamawa State, Nigeria. A total of 100 SSII students were selected from five senior secondary schools via a stratified random sample method, including 50 men and 50 females. The study's findings indicated that pupils subjected to the Heuristic Teaching Approach outperformed those instructed using the Conventional Approach. Yusuf, Bako, Guga, and Yakub (2020) conducted a study on the impact of the heuristic teaching approach on student performance in economics in senior secondary schools in Kano State, Nigeria. Two null hypotheses were established in accordance with the aims. The findings indicated that the heuristic method is successful for teaching Economics in senior secondary schools in Kano State. Furthermore, pupils instructed in Economics by a heuristic approach remembered knowledge more effectively than those taught via the lecture technique.

Okechukwu and Umeh (2014) examined the impact of the heuristic teaching style on students' performance in Algebra in Anambra State, Nigeria. The research utilized a quasi-experimental design with a non-equivalent control group. The study was led by three research questions and three null hypotheses. The study's results indicate that the heuristic approach outperforms the lecture method in enhancing students' success in linear algebra. Research undertaken by Ajai, Iyekekpolor, and Hanawa (2022) examined the impact of the Eng-Hau medium of instruction on the algebraic accomplishment of Upper-Basic students in the Jalingo Local Government Area of Taraba State. The study was directed by three research topics and corresponding hypotheses. One finding reached was that pupils instructed in Eng-Hau outperformed those taught alone in English. Several studies have examined potential disparities in accomplishment scores between male and female students instructed by Heuristic methods. Ajai (2015) investigated the impact of problem-based learning (PBL) and the interaction of gender on students' achievement and retention in Algebra within Education Zone B of Benue State, revealing no significant difference in the mean achievement scores of male and female students instructed in algebra through PBL. The study also found no significant interaction impact between technique and gender on students' success. Similarly, Elaigwu, Agbo-Egwu, and Abari (2023) discovered that the disparities in achievement and retention

scores between male and female students were not statistically significant. In contrast, Egbodo (2026) examined the impact of computer-aided instruction (CAI) on junior secondary school students' achievement in basic science and found no significant difference in the achievement scores of male and female students subjected to CAI.

Research Questions

The following research questions were formulated to guide the study

1. What is the difference between the mean achievement scores of students taught Algebra using heuristic approach and those taught using the lecture method in Jalingo Education Zone?
2. What is the difference between the mean achievement scores of male and female students taught Algebra using the Heuristic approach in Jalingo Education Zone?

Hypotheses

The following null hypotheses were formulated to guide this study and were tested at 0.05 level of significance.

H₀₁: There is no significant difference between the mean achievement scores of students taught Algebra using heuristic teaching approach and those taught using lecture method.

H₀₂: There is no significant difference between the mean achievement scores of male and female student taught algebra using heuristic teaching approach in Jalingo Education Zone.

Materials and Methods

The study employed a quasi-experimental design with a non-randomized pre-test and post-test control group. Intact classrooms were randomly allocated to experimental and control groups, without interfering with school activities. The pre-test attempted to establish the homogeneity of performance between the experimental and control groups and functioned as the covariate. The research population consisted of 5,469 SS II students from 51 public senior secondary schools in the Jalingo Education Zone (DPRS Taraba State Post Primary Schools Management Board, Jalingo). The pupils'

ages varied from 16 to 18 years. The study's sample size is 194, obtained by a multistage sampling method. Initially, purposive sampling was employed to pick 10 schools with graduate instructors in Mathematics or similar disciplines, with teaching qualifications and a minimum of 2 years of experience within each Local Government Area of the research. Of the 10 schools, 7 were located in Jalingo, 5 in Ardo-Kola, and 3 in Lau. In the second stage, basic random sampling was employed to choose two co-educational schools. All school names were inscribed on little pieces of paper, folded, and deposited into cups. A single piece of paper was selected at random, followed by the reshuffling of the cup, and subsequently, another piece of paper was chosen, resulting in the selection of two pieces in total. The third stage of sampling is employing basic random sampling via a hat draw to allocate one school to the experimental group and another to the control group. All streams of the SS II were employed to mitigate the Hawthorne effect in the study. Two intact classes were randomly chosen and allocated to either the experimental or control groups.

The instrument utilized in this study is the Algebra Achievement Test (AAT), including forty (40) multiple-choice items created by the researcher and employed as the assessment tool. Additionally, lesson plans were prepared and implemented during the teaching session. The instrument's validity was confirmed by three experts: two from Science Education and one from Measurement and Evaluation within Educational Foundations, all affiliated with the Faculty of Education. Reliability was determined through a pilot test and the Kuder-Richardson (KR-20) formula, resulting in a reliability coefficient of 0.77. The acquired data was analyzed utilizing mean, standard deviation, and Analysis of Covariance (ANCOVA) statistics. The decision criterion said that mean scores and mean gains between the two groups would be compared to determine superior performance, while hypotheses would be discarded if the p-value exceeded 0.05; otherwise, they would be preserved. The P-value was utilized in conjunction with the F-statistics for decision-making purposes. All hypotheses were evaluated at a significance level of $p=0.05$.

Results

Table 1

Mean achievement scores of students in experimental and control group

Group	N	Pretest mean	Std. dev	Posttest mean	Std. dev	Mean gain
Exp Grp	100	22.84	9.2	60.67	12.09	37.83
Control Grp	94	24.28	10.37	40.97	9.39	16.69
Mean difference		1.44		19.7		18.26

Exp Grp = Heuristic Approach

Control Grp = Lecture Method

Source: (researchers' analysis; SPSS, 2023)

Table 1 shows that the posttest mean score for students instructed using the heuristic technique is 60.67, whereas their peers taught through the lecture method had a mean score of 40.97. The disparity in the post-test mean scores of the two student groups is 19.70, favoring the group instructed by a heuristic technique. The average gain, defined as the difference

between pretest and posttest scores, for students instructed using the heuristic technique is 37.83, but for those taught through the lecture method, it is 16.69. The average gain indicates that the heuristic group surpassed the control group by 18.26 units. Consequently, it can be deduced that the heuristic method improved students' performance in Algebra.

Table 2

One-way ANCOVA of the method of teaching Students' Achievement in Algebra

Sources of Variation	Sum of Squares	df	Mean Square	F	Sig	Partial Eta squared
Corrected Model	18587.63 ^a	2	9293.81	78.4	0	0.45
Intercept	75503.5	1	75503.5	636.96	0	0.77
Pre-test	26.99	1	26.99	0.23	0.63	0
Group	18356.6	1	18356.6	157.86	0	0.45
Error	22640.8	191	118.54			
Total	546945	194				
Corrected Total	41228.4	193				

a. R Squared = .451 (Adjusted R Squared = .445)

Source: (researchers' analysis; SPSS, 2023)

Table 2 presents solid data concerning the impact of the heuristic method on students' progress in Algebra. Initially, after controlling for pre-test scores, a substantial difference is seen between the two groups regarding students' post-test results, as demonstrated by the F-statistic of 157.86 and a p-value of 0.00, signifying statistical significance. Furthermore, the significant impact size, shown by a partial eta-squared value of 0.45, implies that a sizeable proportion (45%) of the variance in accomplishment scores is attributable to the utilized heuristic strategy. Furthermore, it was found that

there is no statistically significant change between pretest and post-test scores, since the correlation between these scores is rather weak, evidenced by a partial eta-squared value of 0.00. In light of these data, the hypothesis positing that there is no significant difference between the mean achievement scores of students taught Algebra using heuristic teaching approach and those taught using lecture method is rejected. The results demonstrate a substantial favourable effect of the heuristic approach on students' performance in Algebra.

Table 3: Mean achievement scores of male and female students in experimental group

Group	N	Pretest mean	Std. dev	Posttest mean	Std. dev	Mean gain
Female	55	24.8	10.37	60.44	13.38	35.64
Male	45	20.44	6.91	60.67	10.44	40.03
Mean difference		4.36		0.03		4.33

Source: (researchers' analysis; SPSS, 2023)

The data in Table 3 indicate that female students achieved a pretest mean score of 24.80 with a standard deviation of 10.37, whereas male students attained a pretest mean score of 20.44 with a standard deviation of 6.91. The disparity in pretest achievement scores between the experimental group and the control group is 4.36. The adjusted mean score of female students is 60.44, whereas that of male students is 60.67. The disparity between the

posttest mean scores of male and female students is 0.03, favouring male students. The achievement score of male pupils (40.03) surpasses that of female students (35.64). Consequently, the male students achieved scores that were 4.33 points higher than those of their female counterparts. This indicates that male students outperformed female pupils in algebra when instructed using a heuristic method.

Table 4

Tests of Between-Subjects Effect of Gender on Students' achievement in Algebra

Sources of Variation	Sum of Squares	Df	Mean Square	F	Sig	Partial Eta squared
Corrected Model	274.93 ^a	2	137.46	0.93	0.4	0.02
Intercept	55722.1	1	55722.1	378.53	0	0.8
Post-AAT	274.83	1	274.83	1.87	0.18	0.02
Gender	12.59	1	274.83	0.07	0.77	0
Error	14131.7	96	122.93			
Total	376348	99				
Corrected Total	14406.6	98				

a R Squared = .019 (Adjusted R Squared = -.001)

Source: (researchers' analysis; SPSS, 2023)

Table 4 shows a one-way between-groups analysis of covariance to compare the mean achievement scores of male and female students taught algebra using heuristic approach. After accounting for post-test scores, there is no significant difference in achievement scores between male and female students ($F(1,96) = 0.07, p = 0.77, p > 0.05$). The partial eta squared effect size (=0.00) suggests that the heuristic approach made no discernible impact on the variance of achievement scores among male and female students. Consequently, the hypothesis stating no significant difference in achievement scores among male and female students instructed in algebra using the heuristic approach at the upper basic school level in the Jalingo education was not rejected.

Discussion of Findings

Research indicated a significant disparity between the mean accomplishment scores of students instructed in Algebra by the heuristic approach and those taught via the lecture technique, demonstrating that the heuristic approach markedly improved students' performance in Algebra. Subsequent hypothesis testing demonstrated a substantial disparity between the two groups regarding students' post-test results, as indicated by the F-statistic of 157.86 and a p-value of 0.00, signifying statistical significance. This aligns with Fasasi (2015), whose research indicated that students subjected to the Heuristic Teaching Approach outperformed those instructed using the Lecture Approach. This aligns with the findings of Yusuf, Bako, Guga, and Yakub (2020), who determined that the heuristic method is successful for teaching Economics in senior secondary schools. The results of Okechukwu and

Umeh (2014) that the heuristic approach surpasses the lecture method in enhancing students' success in linear algebra align with the outcomes of this study. The findings corroborate the conclusions of Ajai, Iyekekpolor, and Hanawa (2022), indicating that pupils instructed in Eng-Hau outperformed those taught just in English. Conversely, study question two, which assessed mean differences between genders, indicated that the accomplishment score of male students (40.03) surpasses that of female students (35.64). Consequently, although girls had superior pretest scores compared to males, male students exhibited an increase of 4.33 in accomplishment scores relative to their female counterparts following the posttest. The posttest mean scores of males exceeded those of females, with a mean gain difference of 0.03 favoring male students following the posttest. The hypothesis testing demonstrated that the mean difference between males and females was not significant. The absence of a notable difference may be attributed to both genders experiencing comparable conditions without any preferential treatment. This conclusion aligns with Ajai's (2015) reports, which indicated no significant difference in the mean achievement scores of male and female students instructed in algebra using PBL. The results of this study align with those of Elaigwu, Agbo-Egwu, and Abari (2023), which indicate that the accomplishment scores of male and female students were not statistically significant.

Conclusion

The study finds that employing a heuristic approach in algebra instruction significantly enhances students' success compared to the lecture technique. The research also determines that the gender of pupils did not significantly influence accomplishment results. The study's findings indicate that students' success in Mathematics is significantly influenced by the instructional strategy employed by the instructor. The debate on gender disparities in accomplishment remains polarized, since this study concurs with certain experts while contradicting others. It is essential for Mathematics educators to enhance their instructional techniques. This is particularly applicable to secondary school Mathematics educators, as the contemporary pedagogical approach and assessment criteria foster erroneous perceptions of intelligence among students, resulting in the success of rote learners while disadvantaging the more intellectually capable individuals. The instructional methods employed by Mathematics teachers significantly influence students' approaches to responding to public examination problems.

Recommendations

Consistent with the study's results and conclusions, the following recommendations were proposed:

The heuristic teaching technique need to be embraced by Mathematics educators and should receive greater emphasis from inspectors of the Ministry of Education.

The government should encourage Nigerian mathematics textbook authors to revise their works in accordance with the Heuristic Teaching Approach to enhance student-friendliness.

Workshops should be organized by school administrators in conjunction with the Ministries of Education to instruct teachers on the successful use of the heuristic method to teaching Mathematics in secondary schools. Mathematics educators should get refresher courses from specialists in the Faculty of Education at state universities about the implementation and utilization of the Heuristics teaching approach in all secondary schools.

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