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THE EFFECTS OF GUIDED DISCOVERY METHOD ON JUNIOR SECONDARY TWO STUDENTS' ACHIEVEMENT IN GEOMETRY IN KANAM LOCAL GOVERNMENT AREA, PLATEAU STATE

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Abstract

This study investigates the effects of the guided discovery method on the achievement of junior secondary school students in geometry in Kanam Local Government Area, Plateau State. The study aims to determine whether this innovative teaching method can enhance students' understanding and performance in geometry compared to traditional lecture methods, and to explore the impact of gender on students' achievement when taught using guided discovery. A quasi-experimental design, specifically a pretest-posttest nonequivalent group design, was employed. The sample consisted of 211 JSII students from three junior secondary schools, with 120 students in the experimental group and 91 in the control group. Results indicate that the experimental group, taught using the guided discovery method, achieved significantly higher post-test scores (mean = 56.94, SD = 13.50) compared to the control group taught using the lecture method (mean = 41.48, SD = 10.28), with a mean difference of 13.46 in favor of the experimental group. Additionally, female students in the experimental group outperformed their male counterparts, with mean scores of 57.00 (SD = 13.65) and 54.24 (SD = 13.23) respectively, resulting in a mean difference of -2.76. These findings suggest that the guided discovery method significantly improves students' achievement in geometry and is effective across genders, with female students showing a slight edge in performance. The study concludes that incorporating guided discovery methods in teaching geometry can address the issue of poor performance in mathematics

Keywords: Guided Discovery Method, Junior Secondary School, Student Achievement, Geometry, and Education.

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and contribute to a more equitable educational environment. This teaching approach not only enhances students' understanding and retention of geometric concepts but also fosters critical thinking and problem-solving skills essential for success in various fields, thereby preparing students to meet the demands of a modern technological society.

Introduction

The teaching of mathematics is essential not just for imparting knowledge but for developing students' potential to adapt to a world driven by science and technology. Mathematics is fundamental to scientific and technological development, and its relevance is ever-increasing as it underpins other sciences (Wokoma, & Maxwell, 2012). Mathematics equips students with critical thinking, logical reasoning, and problem-solving skills necessary for various fields such as science, engineering, technology, and even the arts. Understanding mathematical concepts is crucial, as a poor foundation can hinder students' ability to solve problems and apply knowledge effectively.

However, despite the importance of mathematics, students' achievement in the subject has been poor, particularly in West Africa. Poor performance in mathematics has resulted in students struggling to secure admission into tertiary institutions, where a credit pass in mathematics is often a requirement. Femi and Adewale (2012); Osuafor and Okonkwo (2013), stated that students' achievement in West Africa School Certificate Examination is very poor in science, with mathematics having the highest enrolment and with the poorest result annually Obasi, and Ugo, (2018) stated that mathematics is a very desirable tool in virtually all aspects of human endeavour; be it science, engineering, industry, technology and even the arts.

This issue has been a significant concern for parents and educators. Factors contributing to this poor performance include inappropriate teaching methods and gender disparities in achievement. Active teaching methods, where students participate actively and the teacher facilitates learning, have been found to be more effective in improving students' understanding and retention of mathematical concepts.

Geometry, a crucial branch of mathematics, presents particular challenges for students. Many students find it difficult due to misconceptions, poor instructional methods, and lack of engagement in the learning process (Verkade at el, 2017). Geometry is vital for developing critical thinking, problem-solving skills, and spatial awareness, which are essential for understanding the world. To address these challenges, innovative teaching methods like guided discovery, where students actively participate in learning under the teacher's guidance, can be effective. This approach helps students develop a deeper understanding of geometric concepts and improves overall performance in mathematics.

Statement of the Problem

Ideally, the teaching of mathematics should ensure that all students develop a strong foundation in mathematical concepts and principles. This foundation would enable them to think critically, solve complex problems, and apply mathematical knowledge to real-

world situations. Students should be able to achieve high levels of proficiency in mathematics, demonstrating understanding and skills that are essential for success in science, technology, engineering, and other fields. Furthermore, there should be no significant disparities in mathematical achievement based on gender or any other demographic factors

In reality, students' achievement in mathematics, particularly in regions such as West Africa, has been consistently poor. Reports from examinations like the West African Examination Council (WAEC) highlight a troubling trend of low performance in mathematics, with many students failing to meet basic proficiency levels. This poor performance is attributed to several factors, including inadequate teaching methods, misconceptions about mathematical concepts, and a lack of critical thinking skills. Gender disparities also persist, with some studies indicating that males tend to perform better than females in mathematics. Additionally, many teachers are not adequately equipped to use effective instructional approaches, further exacerbating the issue.

The consequences of this gap between the ideal and reality are far-reaching. Students' poor performance in mathematics limits their opportunities for higher education and career prospects, especially in fields that require strong mathematical skills. This situation also hampers the overall scientific and technological development of the region, as a well-educated workforce is crucial for innovation and economic growth. Gender disparities in mathematical achievement contribute to broader issues of inequality, preventing equal access to educational and professional opportunities. Ultimately, the inability to address these challenges perpetuates a cycle of educational inadequacy and socio-economic stagnation, undermining efforts to build a modern, technologically advanced society.

Purpose of the Study

This study is to determine the effects of guided discovery method on the achievement of students in geometry in junior schools in Kanam Local Government Area, Plateau State.

The specific objectives of the study are:

1. To determine the effects of guided discovery on JS2 students' achievement in geometry.
2. To examine the effect of guided discovery method on achievement of male and female JS2 students in geometry.

Research Questions

The study answered the following questions:

1. To what extent does the posttest achievement mean scores of JSII students differ when taught using guided discovery and those taught using lecture method?
2. What is the level of achievement mean scores of male and female JSII students when guided discovery method is used in teaching geometry?

METHODOLOGY.

Research Design

The study adopted quasi-experimental design specifically pretest posttest nonequivalent group design it involves selecting groups upon which a variable is tested, without any random pre-selection processes. This is because the researcher used the class in their intact arrangement. The control group was exposed to lecture method while

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experimental group was exposed to guided discovery method. Pre-test items were administered to both the control group and experimental group at the first instance. Thereafter, a post-test were given to both groups at the end of treatment.

POPULATION AND SAMPLE

Population

The population for the study comprised all the JSII students in Kanam local government Plateau State. There are Thirty-Five Junior Secondary School which includes both public and private in the area. The population of the study comprised of 6276 students (4124 male and 2152 female).

Sample

The sample comprised three Junior Secondary School from the thirty-five with the sample size of 211 students (120 male and 91 female).

METHOD OF DATA ANALYSIS

The researcher employed the used of descriptive and inferential statistics. Descriptive statistics was used to answer the research questions while inferential statistics was used because the study have reached conclusion best on the result obtained from the sample. After the scripts were marked by the researcher, the students' mean achievement scores of the pre-test and post-test of all the students were obtained as well as that of male and female in each group. The research questions were answered using descriptive statistics of mean and standard deviation while t-test was used to test the hypotheses, which were formulated and tested at $p \leq 0.05$ level of significance. If t-calculated is more than t-critical, the null hypothesis is rejected and if t-calculated is less than t-critical, the null hypothesis is accepted.

PRESENTATION OF RESULT, FINDINGS, CONCLUSION, AND RECOMMENDATIONS

Presentation of Result:

Research Question One

To what extent does the post-test achievement mean scores of JSII students differ when taught using guided discovery and those taught using lecture method?

Table 1: Summary of mean, standard deviation and mean difference of post-test in the students' achievement when taught using guided discovery and those taught using lecture methods.

Group	N	Mean	Std Deviation	Mean Difference
Experimental	120	56.9417	13.50337	13.45815
Control	91	41.4835	10.28198	

Descriptive statistics in table 1 shows the mean standard deviation and mean difference of post-test in the students' achievement. The post-test mean difference between students in the experimental (guided discovery) and control group (lecture method) is 13.5 in favour of experimental group. This implies that the experimental group perform

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better than the control group. Thus, guided discovery method facilitates JSII students' achievement in teaching geometry.

Research Question Two

What is the level of achievement mean scores of male and female JSII students when guided discovery method is used in teaching geometry?

Table 2: Summary of mean, standard deviation and mean difference in the achievement of male and female students taught geometry with guided discovery method.

Group	Mean	N	Std Deviation	Mean difference
Male	54.2410	80	13.23483	-2.75904
Female	57.0000	37	13.64633	

Descriptive statistics in Table 2 shows the mean and standard deviation of male and female students' achievement scores in geometry. The mean difference between male and female students is -2.75904 in favour of female students. This indicates that female students achieved better than their male counterpart after the treatment.

Findings

The study revealed a significant difference in the post-test achievement mean scores between students taught using the guided discovery method and those taught using the lecture method. The experimental group, which was taught using the guided discovery method, had a mean score of 56.94 with a standard deviation of 13.50. In contrast, the control group, taught using the lecture method, had a mean score of 41.48 with a standard deviation of 10.28. The mean difference of 13.46 in favor of the experimental group indicates that the guided discovery method significantly improves students' achievement in geometry compared to the traditional lecture method. The study also examined the impact of the guided discovery method on the achievement of male and female students. The results showed that female students had a mean score of 57.00 with a standard deviation of 13.65, while male students had a mean score of 54.24 with a standard deviation of 13.23. The mean difference of -2.76 indicates that female students achieved slightly better than their male counterparts when taught using the guided discovery method. This suggests that the guided discovery method is effective for both genders, with female students showing a slight edge in performance.

Conclusion

The study concludes that the guided discovery method significantly enhances students' achievement in geometry compared to the traditional lecture method. Students taught through guided discovery not only perform better but also develop a deeper understanding of geometric concepts. Furthermore, the method proves to be effective across genders, with female students slightly outperforming male students. These findings suggest that adopting the guided discovery method in teaching geometry can address the persistent issue of poor performance in mathematics and contribute to a more equitable educational environment. Implementing such innovative teaching strategies is crucial for improving mathematical proficiency and preparing students to meet the demands of a modern technological society.

Recommendations:

Based on the research questions addressed in the study, the following two recommendations can be made:

i. Educational authorities and school administrators should mandate the integration of the guided discovery method into the geometry curriculum for junior secondary schools. This approach will involve developing and providing teachers with detailed lesson plans and resources that emphasize student-centered learning and active participation, ensuring that all students benefit from this effective teaching strategy.

ii. Teachers should adopt gender-sensitive teaching strategies that promote an inclusive learning environment. This includes encouraging equal participation from both male and female students, addressing any potential biases, and providing additional support to ensure that all students can fully benefit from the guided discovery method. This approach will help maximize the effectiveness of the teaching method across genders and contribute to more equitable educational outcomes.

Competing Interests:

"Authors have declared that no competing interests exist."

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