Effects of Guided Inquiry Strategy on the Mathematics Achievement of Senior Secondary School Students

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ABSTRACT: In this study, the effect of a guided inquiry strategy (GIS) on senior high school students' mathematical academic achievement was examined in Ogun State Ijebu Ode Local Government Area. Students from all the public senior secondary schools in Ogun State's Ijebu Ode Local Government Area who were studying mathematics participated in this research, which had as its main objective to ascertain the impact of GIS on senior high school students' achievement in mathematics. One hundred (100) SSII Mathematics students made up the sample. The experimental and control groups were divided into two schools using the purposeful sampling technique. Based on their educational achievements, students were surveyed using the mathematics achievement test (MAT). *Analysis of Covariance was used to analyze the data.* This study showed that the effectiveness of GIS as a teaching strategy had a big impact on how well students did in mathematics. This research demonstrated that, when mathematics was taught using GIS, gender did not significantly affect students' overall academic achievement. The study's findings indicate that the approach significantly affects students' math achievement. According to research, mathematics teachers should always use a guided inquiry method while instructing their students. Mathematics workshops, exhibits, seminars, and conferences for teachers of mathematics should be frequently organized and sponsored by the educational ministries/departments. Teachers of science and mathematics should have a broad orientation on how to use the guided inquiry teaching technique.

Keywords*:* Guided inquiry teaching strategy, Academic Achievement, Gender, Mathematics, conventional approach, Students

1. INTRODUCTION

Science as a concept is a process that is geared towards problem-solving to enhance the living standard of man (Owolabi, 2014). He further reported that the branches of science are divided into formal, natural, and social sciences while mathematics is categorized under formal sciences which imply that mathematics is a science subject that is indispensable to technological advancement. Without the aid of mathematics and mathematical accomplishments that push scientific patterns and schemes towards high social norms, the field of science cannot advance even one step. This finally transforms the dark path of development into the light way of progress. (Ojabaro, 2021).

Asanre *et al.* (2021) reported that every skill in human endeavors, including politics, economics, science, and technology, is influenced by the mentally stimulating topic of mathematics. Thus, it serves as a framework for understanding and applying scientific ideas, demonstrating the significance of the topic. Despite the significant role that mathematics plays, educators fail to pay full attention to the teaching of the subject from the grassroots, and this result in to increase in students' low achievement as they further proceed in their educational journey. Abiodun *et al.* (2022) asserted that the Chief Examiners' Reports for the exams for the West African School Certificates on learners' performance in mathematics are nothing to write home about and reveal significant accomplishment score weaknesses.

According to Adeyemi (2018), achievement has to do with the completion of objectives and refers to a student's current academic position. The purpose of evaluating a student's achievement is to help the teacher and other students gauge how well they have understood a particular concept. Low achievement in mathematics calls for the attention of educators. Ojaobaro (2021) reported that students' low achievement has led many researchers in mathematics to investigate the reasons for this weak performance in the area and possible solutions to this problem. She further reported that poor achievement has been observed to be affected by inadequate effective teaching which ought to make learning easier and more meaningful.

According to the foregoing, Abiodun *et al. (*2022) asserted that the most frequently used strategy in secondary schools in Nigeria educating students in mathematics and other parts of the world is the teacher-centered teaching strategy. The inability of Mathematics teachers to make use of students centered teaching methods coupled with the abstract nature of Mathematics has caused most of the students to be performing below average in Mathematics. The teacher should put in place an effective method of teaching for purpose of arousing and sustaining students' achievement. Hence, the need to shift from conventional ways the subject is being taught by exploring more innovative learner-centered teaching-learning approaches.

The performance of mathematics students has remained subpar despite the development and use of many instructional strategies/methods recommended by researchers. Therefore, investigating the impact of the guided inquiry strategy (GIS) is crucial as a teaching style that may raise secondary school academic students' mathematics achievement. Consequently, the guided inquiry method is a teaching style in which teachers lead students in their quest for information. It is activity-focused and student-centered (Ojabaro, 2021). The approach improves students' levels of curiosity, self-assurance, originality, and problem-solving abilities, say Fatokun and Yalams (2017), which improves their performance in both theory and practice. Additionally, the technique aids students to develop more complex mental skills, such as developing hypotheses, planning experiments, synthesizing information, developing scientific attitudes, etc.

Ojabaro (2021) reported that the teaching strategy allows students to progress step-by-step from the identification of a problem, defining the problem, formulating a hypothesis, collecting data, verifying the results, generalizing, to the drawing of conclusions. Additionally, guided inquiry teaching is technologically and scientifically oriented, and it prioritizes the learner's constructive mental ability in all instructional processes, Harbor-Peters (2014).

The gender problem in Nigerian society, particularly in the educational system, is another issue that has to be addressed. Recent years have seen a wide range of opinions from educators on gender and success, particularly in mathematics. While some believe that male students succeed more than female students, Ojabaro (2021) argues that success is a variable that relies on a number of variables, including socioeconomic background and teaching style.

In agreement with Ojabaro, Asanre *et al.*, (2021) reported that despite efforts by educational stakeholders to address the underrepresentation of women at the highest levels of mathematics, gender concerns in mathematics

achievement and aptitude have remained a subject of worry. However, studies have demonstrated that there are other forces and settings that work apart from gender, making it impossible to simply explain gender issues in the acquisition of mathematics, which in turn, affect gender issues in the learning of mathematics.

2. PROBLEM STATEMENT

Concern among teachers of mathematics and researchers has been raised by the learners' persistently poor performance in mathematics on both internal and external exams. This tendency is thought to be caused by a number of variables, including instructional tactics used in education, such as the lecture style, insufficient mathematical process abilities, and a lack of confidence in solving mathematical issues. The literature that is now accessible on mathematics teaching methodologies points to the need of using cutting-edge instructional techniques like the guided inquiry approach. To improve the achievement of learners, additional research is needed into the most effective ways to teach certain subjects in the mathematics curriculum. Haven't talked about the need for a new teaching strategy, it is in light of the above that this research is to examine how guided inquiry technique affects senior high school students' academic achievement in mathematics.

3. OBJECTIVES

This study's main goal is to determine how the guided inquiry technique affects senior secondary school mathematics academic achievement of students. The study specifically intended to:

I. Examine the effects of using guided inquiry approaches in the classroom on the senior secondary school academic achievement of students in mathematics.
II. Examine the impact of Gender on senior secondary students' academic achievement in Mathematics.
III. Evaluate the impact of treatment and gender on students' achievement in mathematics at the senior high school level.

4. HYPOTHESES

The following hypotheses were developed and put to the test at a significant level: p 0.05

H_{o1}: Guided inquiry teaching methodologies do not appear to have any observable substantial impact on students' achievement in mathematics at the senior high school level.

H_{o2}: Gender has no clear, meaningful impact on students' math proficiency at the senior secondary school level.

H_{o3}: Gender and guided inquiry teaching methodologies have no obvious significant interaction effects on students' achievement in mathematics at the senior secondary school level. .

5. METHODOLOGY

Pre-test, Post-test, and Control groups made up the quasi-experimental design of this study. Due to its prevention of bias and the fact that student views are captured at many points during the research, this design and approach are seen to be suitable. Data for the study were gathered using the Mathematics Achievement Test (MAT) by asking students about their academic performance. The student's biographical information is in the first section, and the

items are in the second. The instrument was revalidated by a senior colleague and secondary sources for face and content validity. The instrument's dependability was assessed using a split-half method, and a coefficient of reliability of 0.78 was found. In Ijebu ode local government area of Ogun State, 100 senior secondary school students from two senior secondary schools, Nigeria, made up the study's population. They were chosen by purposive sampling. A 50-student entire class from each school was used. The experimental group was one of the schools, while the other was the control group. Before introduction of the teaching technique in the experimental group—while the traditional approach was employed in the control group—both groups received pre-test. For a few weeks, the experimental group received treatment and after that, both groups received a post-test. Analysis of Covariance (ANCOVA) was utilized to evaluate the collected data.

6. FINDINGS

H_{o1}: Guided inquiry teaching methodologies do not appear to have any observable substantial impact on students' achievement in mathematics at the senior high school level.

Table 1: Analysis of Covariance of treatment and academic achievement

Source	Types III sum of Squares	Df	Mean Square	F	Sig	Decision
Corrected Model	29079.208[a]	5	4846.535	37.383	.000	
Intercept	23408.678	1	23408.678	180.559	.000	
Pretest	10741.689	1	10741.689	82.854	.000	
Method	4042.685	1	4042.685	31.183	.000	S

The calculated F value for the guided inquiry teaching strategy's impact on math achievement is 31.183, as shown in the table above. At.000, this figure is substantial. Consequently, it is decided that the null hypothesis is insufficient. This indicates that guided inquiry teaching approaches have a substantial primary effect on students' senior secondary school mathematics achievement.

Ho_2: Gender has no clear, meaningful impact on students' math proficiency at the senior secondary school level.

Table 2: Analysis of Covariance

Source	Types III sum of Squares	Df	Mean Square	F	Sig	Decision
Corrected Model	29079.208[a]	5	4846.535	37.383	.000	
Intercept	23408.678	1	23408.678	180.559	.000	
Pretest	10741.689	1	10741.689	82.854	.000	
Method	4042.685	1	4042.685	31.183	.000	S
Gender	19.867	1	19.867	.153	.696	NS

According to the table above, the computed F value for the association between gender and academic achievement is.153. At.696, this number is not noteworthy. The null hypothesis is thus accepted. This indicates that gender is not a significant factor in determining students' achievement in mathematics and that there is no significant main influence of gender on students' academic success in mathematics at the senior secondary school level.

H_{O3}: Gender and guided inquiry teaching methodologies have no obvious significant interaction effects on students' achievement in mathematics at the senior secondary school level

Source	Types III sum of Squares	df	Mean Square	F	Sig	Decision
Corrected Model	29079.208[a]	5	4846.535	37.383	.000	
Intercept	23408.678	1	23408.678	180.559	.000	
Pretest	10741.689	1	10741.689	82.854	.000	
Method	4042.685	1	4042.685	31.183	.000	S
Gender	19.867	1	19.867	.153	.696	NS
Interaction	31.331	1	31.331	.476	.491	NS
Error	16205.671	125	129.645			
Total	501714.000	132				
Corrected Total	45284.879	131				

The determined F value for the interaction between gender and strategy on learners' performance in mathematics is .476, as shown in the table above. At.491, this number is not noteworthy. It has been decided to accept the null hypothesis. This indicates that neither gender nor strategy alone has a significant effect on a learner's achievement in mathematics.

7. DISCUSSION

The results showed that guided inquiry teaching approaches have a substantial primary impact on students' senior secondary school scholastic progress in mathematics and that the strategy has a considerable influence on students' mathematics achievement. This outcome is consistent with prior research by Fatokun and Yalams (2017), who found that guided inquiry methods improved the achievement of learners in the field of mathematics. Also with Asanre *et al.,* (2021, 2018) they also found out that instructional strategy improves the achievement of students academically in mathematics. Furthermore, results showed that at the senior secondary level, gender has no discernible impact on students' achievement in mathematics; this conclusion is consistent with that of Abiodun *et al.,* (2022). which revealed gender has no major impact on the academic achievement of students in secondary schools since what counts in teaching and learning mathematics is the quality and efficacy of the instructional technique, not the learners' gender but the result is against the result of Ogunfowote and Asanre (2019) which revealed that the major influence of gender on students' math proficiency is large. Last but not least, the results

indicate that students' academic progress in mathematics at the senior secondary level is unaffected by the relationship of gender and approach. This finding is consistent with a study by Asanre *et al.,* (2021) that discovered no treatment and gender relationship.

8. Conclusion and Recommendation

Based on the results, the guided inquiry method of instruction has been found to have a considerable impact on senior secondary school students' capacity for mathematics at Ijebu ode local government public schools. Therefore, it is advised that all teachers constantly use a guided inquiry technique while instructing their pupils. Additionally, given that teachers are not often trained in guided inquiry teaching methods, ministries and departments of education should finance workshops, seminars, conferences, and in-service training programs to support and inspire math teachers. Additionally, they need to support and inspire math educators, notably by offering conducive learning environments, math labs, and quality teaching resources.

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