IMPACT OF GUIDED – INQUIRY TEACHING APPROACH ON THE ACADEMIC PERFORMANCE OF SENIOR SECONDARY SCHOOL PHYSICS STUDENTS IN DALA EDUCATION ZONE, KANO STATE

[1]ZAINAB A. LIADI, [2]DR M. K. FALALU & [3]PROF. M. M. ATADOGA
[1]Department of Physics, School of Secondary Education,
Federal College of Education Katsina
[2]Department of Science Education, Faculty of Education,
Ahmadu Bello University Zaria
[3]Institute of Education, Ahmadu Bello University Zaria

Abstract

This research paper investigates the impact of guided – inquiry teaching approach on the academic performance of senior secondary school physics students in Dala education zone, Kano state. The study explores the effectiveness of this teaching approach in enhancing students' understanding, problem – solving skills, and overall performance in the subject. The research design employed a quasi-experimental approach, with a pre- test- post – test control group design. Two intact classes of senior secondary school Physics students were randomly assigned to either the experimental (guided inquiry teaching approach) or control (conventional lecture approach) group. The research instruments' used for data collection was Physics Performance Test (PPT) on the concept of electricity. Both qualitative and quantitative data were collected and analyzed using Independent t- test. The result revealed that the experimental group, exposed to the guided inquiry teaching approach, demonstrated significantly better academic performance compared to the control group. Furthermore, students in the experimental group reported higher levels of satisfaction and engagement with the learning process.

Keywords: Guided – inquiry, teaching approach, academic performance, Physics

Introduction:

Physics education in Nigeria has often been criticized for its emphasis on rote memorization and lack of student engagement. The Convectional lecture approach tends to stifle students' critical thinking skills and their ability to apply scientific concepts to real world situations.

It is however, very disheartening and unfortunate that despite the significance of Physics to the field of science, students at all levels of education perform woefully in Physics examination which has been the source of worries and concern among scholars in science education. Bassey (2010), argues that several problems are associated with conventional method of teaching by Physics teachers which consequently result to poor performance of students in Physics.

Approaches used in teaching Physics have been identified as one of the factors contributing to the low students' performance in physics among other factors (American Association of Physics Teachers, (AAPT), 2009). Thus, a teaching approach that a teacher adopts may motivate students to learn and therefore affect their performance in Physics. Guided Inquiry Teaching (GIT) approach is used to describe teaching strategies that are driven by scientific inquiry (Kahn & O'Rourke, 2010). The approach is deeply rooted in constructivism teaching practices. It is student-centered rather than teacher-centered and offers students opportunities to be actively involved in experimenting, questioning and investigating. The approach has been considered as being capable of promoting performance among secondary school students since it creates interest in the process of acquiring scientific knowledge and skills opined by Gibson & Chase (2012). This study aimed to evaluate the

impact of guided inquiry on Physics students' learning outcomes in Dala secondary school.

Statement of the Problem

One of the major problem facing teaching and learning of Physics as one of the science subjects is that students' performance is poor for a while (Bello 2023). Reports in recent years indicated steady decline in candidates' academic performance in Physics. This can be seen from the analysis of School Certificate Examination for Physics in Kano State Nigeria presented in Table 1.1

Table 1.1 Analysis of WAEC (West African Examination Council) Result for Physics (2018 - 2022) of Kano State.

Year	Total number that sat for the exam	Total pass	% pass	Total failure	% failure
2018	38,766	17,875	46.11	20,891	53.89
2019	30,003	16,395	54.64	13,608	45.36
2020	32,567	15,777	44.03	16,790	55.70
2021	12103	9756	80.60	2347	19.40
2022	35,678	15987	44.80	19691	55.20

Source: (Kano State, Ministry of Education, 2022).

The fluctuations of students' academic performance in Physics justify the need to study on factors generating the unsatisfactory performance with a view to curve any unsatisfactory effect on students' overall development. Going down to the study area, students' performance in Physics in Dala Educational Zone of Kano State is presented in Table 1.2

Table 1.2 Analysis of WAEC (West African Examination Council) Result for Physics (2018 - 2022) of Dala Education zone of Kano State Nigeria

Year	Total number that sat for the exam	Total pass	% pass	Total failure	% failure
2018	2,345	1,098	49.79	1,247	50.21
2019	2,616	1,270	40.85	1,345	59.15
2020	3,560	1,790	58.48	1,770	48.91
2021	3,264	1,422	43.57	1842	56.44
2022	3,984	2,152	54.02	1,823	45.98

Source: (Kano State, Ministry of Education, Zonal Office Dala, 2022).

From Table 1.2 the students' performance has been fluctuating unsatisfactorily with almost half of candidates taking Physics failing. The unsatisfactory performance worst in study zone than in the overall state performance in Physics. Concerned with fluctuating poor performance on Physics, Ormerod, Bothomly and Wood (2011) observe that some of the senior science secondary school students find it difficult to study Physics, because of problems associated with teaching and learning the subject. These problems lead the students to low academic performance on the subject which leads the Physics itself into attrition. This may be due to negligence, lack of operating knowledge, lack of effective teaching strategy to teach Physics, among others (Onah & Ugwu, 2010). That is why present study sought to find out whether Guided Inquiry based teaching could improve on performance and interest of students in learning Physics.

Objectives of the Study

i. determine the difference between the mean Academic Performance in Physics of Senior Secondary School Students taught with Guided - Inquiry Teaching approach and those taught using Conventional Method in Dala Education Zone,

ii. determine the difference between the mean Academic Performance in Physics of both male and female Physics Students taught with Guided - Inquiry Teaching Approach and those taught using Conventional Method in Dala Education Zone,

Methodology

The research design in this study was pre-test, post-test quasi-experimental design. To carry out this research work, the Physics Performance Test (PPT) was designed using questions from the West African Examination Council Question papers (2015-2020), The instrument was administered to the sample as pre-test, before treatment to determine their equivalence in ability, and the scores from the pre-test was used to place the students in the same prior knowledge level. The experimental group was taught using guided inquiry based teaching while the control group was taught using conventional method without any enhancement. Specify test was administered as post-test after six weeks.

The target population of this study comprises all Senior Science Secondary School Physics Students (SSII) of Dala Education Zone. There are 38 senior secondary schools in the zone with a total number of 8,288 students. Out of which 4587 students are Boys and 3701 are Girls. Among other characteristics noticeable of the population is their age variation which ranges from 15years –17years.

The reliability of Physics Performance Test (PPT) was tested (PPMCC) statistics, the scores were used to calculate the reliability coefficient r = 0.70.

Presentation of Result

The result of the study contain analyzed data for answering research questions using Mean and Standard Deviation. To test for significant differences, t- test were used to analyzed obtain data

Answering the Research Questions

Research question one: What is the difference between the mean academic performance scores of students taught Physics using Guided – Inquiry Teaching Approach and those taught using Conventional method in Dala Education Zone ?

Table 1: Mean and Standard Deviation of Students of Experimental and Control Groups.

Variables	Group	N	Mean	Standard Deviation	Mean difference
Post- test	Exp.	62	39.95	13.89	1.09
Post - test	Control	58	29.58	12.79	

Table 4.1 shows that students taught using guided inquiry teaching strategy have the high mean score than their counterpart. To test significance of the difference null hypotheses one was tested and result presented in Table 2.

H_{01}: : There is no significant difference between the mean academic performance scores of students taught Physics using guided – inquiry teaching approach and those taught using conventional method in Dala Education Zone.

Table 2: Summary of t-test Analysis of Mean Performance Scores of Experimental and Control Groups

Group	N	X	S D	P-value	Decision

Exp.	62	39.95	13.89		
				0.000	NS
Control	58	29.58	12.79		

Not Significant at P > 0.05 level

The p- value obtained is 0.000 which is less than 0.05 level of significance. Hence the null hypothesis was rejected. Hence, the hypothesis one was rejected and we retain the alternative hypothesis. This implies that differences in academic performance scores between students taught using guided inquiry teaching strategy and conventional method is significant in favour of the guided inquiry group.

Research Question Two: What is the difference between the mean academic performance of male and female students taught Physics using Guided-Inquiry Teaching Approach and those taught using Conventional method in Dala Education zone

Table 3: Summary of Mean and Standard Deviation on Academic Performance of both Male and Female Students in the Experimental Group and Control Group after the Experiment.

Variables	Group	N	Mean	S D	Mean difference
Post-test	Exp.	62	79.90	26.86	
					1.84
Post-test	Control	58	59.17	25.01	

The Table 3 indicate that the academic performance of experimental group of Physics male and female students taught using guided inquiry teaching approach have the high mean score than the academic performance of control group of Physics students. To test significant difference, null hypotheses three was tested and result presented in Table 4

H_{02}: There is no significant difference between the mean academic performance score of male and female Students taught Physics using Guided - Inquiry Teaching Approach in Physics in Dala Education Zone.

Table 4: Summary of Independent t-test Analysis of both Male and Female Physics Students Mean Performance' Scores of Experimental and Control Groups after the Experiment:

Group	N	X	S D	P-value	Decision
Exp.	62	79.90	26.86		
				0.19	NS
Control	58	59.17	25.01		

Not Significant at P > 0.05 level

The p- value obtained was 0.19 which is greater than 0.05 level of significance. Thus, the null hypothesis was retained. Hence, the hypothesis two was retained and we reject the alternative hypothesis.

The findings from the study indicated significant difference in the mean scores between the students exposed to guided - inquiry teaching approach and those taught using conventional method. There is significant difference in the Academic Performance of Senior Secondary School Physics Female and Male Student in Dala Education zone exposed to guided inquiry teaching approach and those taught same concept using conventional method.

Major Findings

The followings are the major findings from this study:

1. The mean scores between the students exposed to guided inquiry teaching approach and those taught using conventional method.
2. The Academic Performance of Senior Secondary School Physics Female Student in Dala Education zone exposed to guided inquiry teaching approach and those taught same concept using conventional method that was not been carried out in Dala Education Zone.
3. The Academic Performance of Senior Secondary School Physics Male Student in Dala Education zone exposed to guided inquiry teaching approach and those taught same concept using conventional method.

Conclusions

Based on the outcome of this study, the following conclusions were made:

1. Guided inquiry teaching approach was effective on the academic performance of senior secondary school Physics students.
2. Also guided inquiry teaching approach can improve the academic performance of both male and female Physics students in senior secondary school.

Recommendations

Based on the findings of this study, the following recommendations are made;

1. The study found the use of guided inquiry teaching approach was effective in promoting the academic performance, thus; teachers should be encouraged to adopt the use of guided inquiry teaching approach in physics concepts where prior knowledge is lacking.
2. Coeducational schools should encourage the use of guided inquiry teaching approach as its gender friendly. All gender could benefit from the use of guided inquiry teaching approach during instructions.
3. Professional Associations such as Science Teachers Association of Nigeria (STAN), Nigeria Institute of Physics (NIP) should adopt the use of guided inquiry teaching approach by science teachers to bridge the gap between prior knowledge and the new learning materials to be learnt.

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