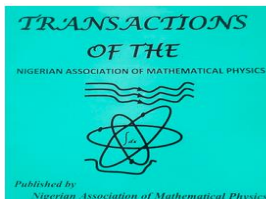


**Journal of
The Nigerian Association of
Mathematical Physics**
Journal homepage: <https://nampjournals.org.ng>



EFFECTS OF GUIDED INQUIRY INSTRUCTIONAL STRATEGY ON STUDENTS' ACHIEVEMENT AND RETENTION IN BASIC SCIENCE IN SECONDARY SCHOOLS

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ARTICLE INFO

Article history:

Received xxxxx

Revised xxxxx

Accepted xxxxx

Available online xxxxx

Keywords:

Guided Inquiry,
instructional strategy,
Achievement,
Retention and Gender

ABSTRACT

The study investigated the effects of guided inquiry instructional strategy on students' achievement and retention in Basic science in secondary schools. Six research questions and six null hypotheses guided the study. The design for the study was a quasi-experimental method. The population of the study comprised all the one thousand, one seven hundred and fifty basic science students of Model Schools in the Delta North Education Zone of Delta State. The sample for the study comprised One hundred and thirty four (134) secondary school Basic science students which was drawn through simple random sampling technique. This study was conducted in two Co-educational Secondary schools drawn for the study through simple random sampling. One of the Co-educational school was assigned to the treatment group and the other to the control group through the toss of coin. In each school intact classes were used for the study. The treatment group was taught Basic science concept using guided inquiry instructional strategy while the control group was taught using lecture (conventional) teaching method. The instrument used for data collection was Basic Science Achievement Test (BSAT) developed by the researcher. The reliability of the instrument was obtained using KR-20 and the reliability index yielded of 0.96. Research questions were answered using mean and standard deviation while the hypotheses were tested using the Analysis of Co-variance (ANCOVA) at an alpha level of 0.05. The result revealed that guided inquiry instructional strategy is superior to the lecture teaching method in facilitating achievement and retention in Basic science. There was no significant interaction between gender and instructional method in students achievement and retention in Basic science. The researcher therefore, recommended that guided inquiry instructional strategy should be used in junior secondary school teaching and learning of Basic science and there is need for an urgent curriculum review to accommodate guided inquiry instructional strategy as a method of instruction in the teaching of Basic science in junior secondary school.

Introduction

Science is as an indispensable tool that brings about development to any nation and as such, any Nation desiring to develop scientifically and technologically should not relegate in teaching and learning sciences in their schools. According to [1] science is an essential tool for any nation's progress and development. Science is the knowledge obtained from the systematic study of the structure and behaviour of the

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<https://doi.org/10.60787/jnamp-v66-312>

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physical world, especially by observing, measuring and experimenting and the development of theories to describe the results of these activities [2]. [5] viewed science as systematic and practical investigation of natural phenomena aimed at discovering more knowledge about the world. In Nigeria educational system, science is taught at basic education level as basic science specifically at junior classes, and science and technology in primary school level. This is made up of 9 year duration comprising 6 years of primary education and 3 years of junior secondary education.

Basic science is taught in a holistic way so as to express the integration of elementary biology, chemistry and physics as a scientific knowledge at the basic education level. According to [38] Basic Science is a revolutionary new introductory science curriculum developed and intended for students considering a career in science. Basic science emphasizes scientific literacy and research oriented learning. Basic Science is an approach to the teaching of science in which concepts and principles are presented so as to express the fundamental unity of scientific concepts, without any bias to the compartmentalized science. It is a subject which embraces all science subjects which includes Biology, Chemistry, Physics. It is a subject that cuts across the school curriculum and needed in all branches of sciences, applied science and social science.

Basic science equips learners for senior secondary school science subjects and future career in science related fields. [11] stated that basic science is a fundamental subject expected to provide the foundation of learning science at the senior secondary school level and subsequently for science-related courses at tertiary institutions.

The objectives of basic science at the Junior Secondary School level include the acquisition of science process skills which includes observation, reporting, organization, measurement, classification and generalization of information and prediction skills [8] Despite the importance of basic science in the development of scientific knowledge in the nation's educational system, the performance of students in the subject in Junior secondary school certificate examination is not encouraging.

The poor performance in basic science at the junior secondary school level is a thing of concern, because of the role it plays in the subsequent learning of science at a higher level [21]. [37] noted that the academic performance of students in the Junior Secondary Certificate Examination (JSCE) Basic science in Nigeria Secondary school is a poor predictor of their later achievement in sciences at higher level of education. However, several reasons had been given for students poor performance in the subject to include socio economic factor, gender, lack of well-equipped laboratory, lack of qualified teachers and methods of teaching employed by teachers.

In most schools, science subject is taught using the traditional teaching methods [32]. [3] states that Basic Science as a school discipline in Nigeria educational system depends solely on the use of lecture methods of teaching instead of an activity based method of teaching. The lecture method is teacher centered and students are mostly passive learners. Traditionally, this method of teaching follows a pattern such that a teacher sees himself as the reservoir of knowledge, "therefore teaching is seen as telling and learning means passive listening" [1].

Some limitations which may prevail in traditional teaching method are; teaching in classroom using chalk and talk in one way flow of information, teacher often talk for an hour without knowing student's response and feedback, the materials presented is only based on lecture notes and textbooks, teaching and learning are concentrated on lecture method rather than practical aspects, there is insufficient interaction with students in classroom.

[34] imagined conventional teaching as the knowledge being poured from one receptacle into an empty one. He stated further that this attitude is based on the notion that being in a class in the presence of a teacher and listening attentively is enough to ensure that learning will take place.

Thus, this had created the teacher centered teaching methods with the teacher dominating at the expense of students not being encouraged to construct their own knowledge or take an active part in their learning. It must be noted that students' achievement and productivity in any course is a function of instruction, availability of instructional material, competence of teachers etc.

Globally, the list of methods of teaching Basic Science is inexhaustible due to the dynamism of knowledge, some teaching strategies are general to all subject and some are specific to some disciplines. [13]) suggested that students should be given the opportunity to be actively involved in the learning process. In an attempt to ensure result oriented delivery in school, [6] suggested the use of activity oriented strategies. The challenges for the teachers and educators are to adopt participatory value-oriented and innovative strategies for teaching Basic science in an efficient way. This need has necessitated new research into strategies that would focus on all the three domains of education; cognitive, affective and psychomotor. Such strategies should enhance positive interaction and friendship among students. Teachers and students need to work together so that Basic science concepts could be well understood. Achievement according to [1] is the scholastic standing of a student at a given moment. It has to do with the successful accomplishment of goal(s). The purpose of testing

an achievement is to help the teacher and the students evaluate and estimate the degree of success attained in learning a given concept. Academic achievement is the outcome of education, that is, the extent to which a student, teacher or institution has achieved their educational goals. Academic achievement is commonly measured by examination or by continuous assessment but there is no general agreement on how it is best tested or which aspects are most important, the procedural knowledge such as skills or the declarative knowledge such as facts. Whichever knowledge and whatever aspect that is being tested, academic achievement is the level of the individual attainment on learning task which may be high or low. The high and low attainment is due to individual differences and the individual differences influence academic achievement [37]. Individual differences in academic achievement have been linked to differences in intelligence and personality. Students with higher mental ability as demonstrated by Intelligent Quotient (IQ) test (quick learners) and those who are higher in consciousness (linked to effort and achievement motivation) tend to achieve highly in academic settings.

Academic achievement has become an index of child's future in this highly competitive world. It is one of the most important goals of the educational process. It is also a major goal, which every individual is expected to experience in all culture. Academic achievement is a key mechanism through which adolescents learn about their talents, ability and competences which constitute an important part of developing career aspirations. Although views vary as to whether there has been a decline in achievements, there is general agreement that students achievement is too low for the demand of an advanced technological society, that, more will need to be achieved as work becomes more technical and knowledge based. There is also a growing consensus that the low academic achievement of minority and poor students need to be improved greatly.

Basic Education Certificate Examinations (BECE) Chief Examiner's reports, [19] & [9] respectively) have attracted the concern of all stakeholders including the researchers. Most of the failures recorded in students' performance in Basic Science have been attributed to inadequate exposure of students to activities, inadequate preparation, and inability to comprehend questions, lack of effective methods of teaching science subjects, gender insensitivity and lack of qualified science teachers [7]. Consequently, [2] concluded that students' poor performance in science subjects in senior secondary certificate examination is attributed to students' poor knowledge of Basic Science. In view of the persistent low achievement, the researcher feels that the use of guided inquiry instructional strategies will

correct the anomaly. Therefore, the study focuses on the effects of guided inquiry instructional strategies on students' achievement and retention in Basic Science in secondary schools.

Guided inquiry is one of the most effective methods of active learner participation in learning process. According to [25] , [4], it creates situation in which students take the initiative to observe and question phenomena, pose explanations of what they see, devise and conduct test to support or contradict their theories, analyze data, draw conclusion from experimental data, design and build model or any combination of these. Guided inquiry instructional strategy is a project oriented pedagogic strategy based on social constructivist theory of learning. Thus, inquiry helps students to develop higher order thinking skills by prompting students to relate new knowledge to their previous knowledge, to think in both abstract and concrete terms, apply specific strategies to novel tasks and understand their own thinking strategies [25]. In guided inquiry instructional strategy, students learn not only concepts and principles, but self-directions, responsibility and social communication.

Guided inquiry instructional strategy has a prominent feature which the teacher provides the materials and problem to investigate, while students device their own procedure to solve the problem [20]. Students at this level should be skillful enough to be able to design their own investigations. However, the teacher is still considered the cornerstone; since he provides the inquiry driven questions. Guided inquiry is student approach and it is teacher facilitated.

The instruction was designed based on one of many instructional strategies that support inquiry-based science - the 5E learning cycle model, which includes five specific components as follows;

Engage – learners encounter the material, define their questions, lay the groundwork for their tasks, and make connections from new to known.

Explore – learners directly involved with material, inquiry drives the process, teamwork is used to share and build know ledge base

Explain - learners explains the discoveries and concepts that have been learned through written report

Elaborate - learners expand on their knowledge, connect it to similar concept, apply it to other situation- can lead to new inquiry.

Evaluate – on going process by both instructor and learner to check for understanding.

Lecture method is concerned with the teacher being the controller of the learning environment. Power and responsibilities are held by the teacher and they play the role of instructor (in the form of lectures) and decision makers (in regards to curriculum content and specific outcome) Lecture method is mostly employed by most science teachers because of some of its advantages which include the fact that it can be used to cover a large content area at a time and students are given the same content at the same time. Another major advantage is that it can be used to teach a large class which is a prominent feature in most Nigerian secondary schools. It has been observed that effective teaching may facilitate learning and make it more meaningful.

Retention is measured from achievement. This means that closely related to achievement is retention. [16] defined retention as the ability to remember experiences and thing learnt. Similarly, [15] posited that retention is the preservation of mind. This implies that the amount of knowledge learnt and kept, skill maintained or problem-solving behavior manifested consistently reflects what is retained. Thus retention of Basic science knowledge is the ability of a learner to keep and remember as well as recall or reproduce the acquired knowledge or some part of the knowledge after some period of time must have elapsed. Therefore, to improve the level at which

they retain the concepts of Basic science learnt, this study investigate the effects of guided inquiry instructional strategy on student retention of basic science concepts in schools.

The issue of gender is an important one in Science education especially with increasing emphasis on ways of boosting manpower for technological development as well as increasing the population of females in science and technology fields [26] [11] defined gender as socially learned patterns of behaviour that reflects emotional expression of attitudes that distinguishes males from females. Gender is the societal meaning assigned to male and female with a particular role that each should play. This is verifiable in relation to students' achievement in Basic Science and their achievement in science at senior secondary level because there is a general belief among Nigerians that males are superior to female in terms of physical physique, cognition, logical reasoning and academic achievement.

The teaching of Basic Science in schools in Nigeria can only be result-oriented when students are learning properly and teachers are favorably disposed using the appropriate methods and materials in teaching the students. Positive results could be achieved when curriculum planners, government and other stakeholders of education in general and Basic science in particular plays their role effectively. It is on this note therefore that the study sought to examine the effects of guided inquiry instructional strategy on student academic achievement and retention in Basic Science in Secondary schools.

Statement of the problem

This study is inspired in response to students' persistent declined performance in Basic science in secondary schools. This perhaps can be partly attributed to inadequate instructional methods adopted by Basic science teachers. [30] noted that guided inquiry teaching method when fostered in different ways can ultimately and positively affects students understanding, achievement and retention in Basic science. Inquiry teaching method is chosen for this study because; even though it is highly scientific in nature it is hardly practiced in our secondary school [36]. Basic science as a science subject is bulky in nature because it consists of all the sciences. It has been observed that the science teachers use lecture/conventional method in teaching to enable them cover the syllabus within the stipulated time; and this did not give room for proper understanding of basic science. Therefore, the rush over the topics to cover the syllabus could be responsible for the poor achievement in Basic science. It has been shown that if the right method or methods is used in teaching Basic science, then problem of poor achievement can be minimized [12]; [9]. It is also evident from the Basic Education Certificate Examinations (BECE) in the last three years that Basic Science students' results have been poor [19]; & [9]. Most of the failures recorded in students' achievement in Basic Science have been attributed to inadequate exposure of students to activities, inadequate preparation, and inability to comprehend questions, lack of effective methods of teaching science subjects, gender insensitivity and lack of qualified science teachers [7]. In the light of this, Basic science teachers need to seek suitable ways of tackling this failure in Basic science if they are to halt the drifts of science students to art and social sciences. In order for the method used for teaching to be effective, the Basic science teachers need to be conversant with guided inquiry teaching strategies that take recognition of the magnitude of complexity of the concepts to be covered. It is as a result of these problems that the researcher is prompted to investigate the effects of Guided Inquiry Instructional strategy on students achievement and retention in Basic science in secondary schools.

Research questions

The following research questions guided the study.

1. What are the mean achievement scores of students taught with guided inquiry instructional strategy and those taught with convectional teaching method?
2. What are the mean achievement scores of male and female students' taught basic science with guided inquiry instructional strategy?
3. What are the interaction effects of method and gender on students' achievement in Basic science?
4. What are the mean Retention scores of secondary school students' taught Basic science using guided inquiry method?
5. What are the mean Retention scores of male and female students' taught Basic science with guided inquiry instructional strategy?
6. What are the interaction effects of methods and gender on secondary schools students' Retention taught Basic science using guided inquiry instructional approach?

1.7 Hypotheses

The following null hypotheses were formulated to further guide the study.

HO₁: There is no significant difference in the mean achievement score of students taught Basic Science using guided inquiry instructional strategy and those taught using lecture teaching method.

HO₂: There is no significant difference in the mean achievement scores of male and female students' taught Basic Science using guided inquiry instructional strategy.

HO₃: There is no significant interaction effect of method and gender on students mean achievement in Basic science.

HO₄: There is no significant difference in the mean retention scores of students in Basic Science taught with guided inquiry instructional strategy and those taught with convectional teaching method.

HO₅: There is no significant difference in the mean Retention scores of male and female students taught Basic Science using guided inquiry instructional strategy.

HO₆: There is no significant interaction effect of method and gender on students' retention in Basic science.

Methodology

Research Design

This study employed quasi-experimental design. In a quasi experimental study, there is no random assignment of subjects. Intact classes were used for the study. The specific design the researcher used for this study is a pretest posttest non equivalent control group design. There was treatment group (where students will be taught using guided inquiry instructional method) and control group (where students were taught using conventional (chalk-talk) teaching method). The design is presented thus:

$$\begin{array}{c} Y^b \quad x \quad Y^a \\ Y^b \quad -x \quad Y^a \end{array}$$

y^b = Measurement taken before treatment (pretest)

y^a = Measurement taken after treatment (Posttest)

x = Instructional simulation approach

$-x$ = Conventional approach

Population of the study

The population of the study is one thousand seven hundred and fifty (1750) which comprised all public junior secondary school two (J.S.S2) students offering Basic Science in Delta North Education Zone of Delta State. The choice of the public school is because they all have peculiar students' behaviour and use the same curriculum.

Sample and sampling techniques.

A total of one hundred and thirty-four (134) secondary school basic students were used for this study. These comprised both the treatment and control groups. Two co-educational secondary schools were drawn for this study through simple random sampling. One of the mixed schools was assigned to treatment group while the remaining one was assigned to the control group through the toss of a coin. In each school that were drawn for this study all the intact classes of JSSII was used for the study. The distribution of the sample is presented in the Table below

Table 1: *Distribution of research subjects in treatment and control group*

Groups	Distribution of subjects		Total
	Male	Females	
Treatment Group	30	40	70
Control Group	28	36	64
Total	58	76	134

3.5 Instrument for data collection

Basic Science Achievement Test (BSAT) was used for data collection. The Basic Science achievement Test (BSAT) consists of 30 multiple choice objective questions based on the topics used for the study. The test items were developed using basic science text books based on the content to be taught in the lesson. The four topics that were taught to students are (i) Photosynthesis (2) Digestion (3) Respiration (4) Circulation. These topics were chosen because they can be taught by guided inquiry and expository method of instruction, and they are in JS 11 Basic science curriculum.

Method of data analysis

The research questions were answered using adjusted means and standard deviation. The hypotheses were tested at 0.05 level of significance using Analysis of Covariance (ANCOVA). ANCOVA were used so as to take care of the initial differences across the group as well as increasing the precision due to the extraneous variable which is reducing error variance. The pre-test score was used as co-variant to the post test score of achievement and retention

RESULTS AND DISCUSSION

All the results are presented in the tables according to the research questions and hypotheses.

Research Question

Research Question One

What are the Mean Achievement Scores of Students taught Basic Science with guided inquiry instructional strategy and those taught with conventional teaching method?

Table 2: *Effects of guided inquiry method on Students mean achievement in Basic Science*

SN	Methods of Instruction	N	Adjusted Mean	SD
1	Guided Inquiry	70	34.53	5.57
2	Conventional Method	64	22.20	3.06

Source: Researcher's field work, 2021

Summary of the results presented in table 2 reveal that students taught basic science using guided inquiry instructional method had mean achievement score of 34.53 with a standard deviation of 5.57. While those taught with conventional instructional method had a mean achievement of 22.20 with standard deviation of 3.06 implying that students taught basic science with guided inquiry instructional method has a higher mean achievement score than those taught basic science with conventional instructional method.

Research Question 2:

What are the Mean Achievement Scores of male and female Students taught basic science with guided inquiry instructional strategy?

Table 3: *Mean Achievement Scores of male and female Students taught basic science with guided inquiry instructional strategy*

SN	Gender	N	Adjusted Mean	SD
1	Male	30	36.70	7.38
2	Female	40	32.90	2.84

Source: Researcher's field work, 2021

Summary of results presented in table 3 reveal that mean achievement score of male students taught basic science using guided inquiry instructional approach is 36.70 with a standard deviation of 7.38. While the female students had a mean achievement score of 32.70 with a standard deviation of 2.84. Based on this, the male students taught with guided inquiry approach obtained a higher mean achievement score than their female counterpart.

Research Question 3

What is the Interaction Effects of Methods and gender on students mean achievement in Basic Science?

Table 4: *Interaction Effects of Methods and gender on students mean achievement in Basic Science*

SN	Methods	Mean achievement scores	
		Males	Females
1	Guided Inquiry	36.70	32.90
2	Conventional Method	22.93	21.64

Source: Researcher's field work, 2021

Summary of results presented in table 4 reveal that there is no interaction between gender and teaching method on students mean achievement score in basic science. Result presented in table indicated that guided inquiry approach is higher than that of the conventional approach at the two levels of gender (male and female).

Research Question 4

What is the Mean retention Scores of Students taught with guided inquiry instructional strategy and those taught with conventional teaching method?

Table 5: *Effects of guided inquiry method on Students mean retention in Basic Science*

SN	Methods of Instruction	N	Adjusted Mean	SD
1	Guided Inquiry	70	35.16	5.89
2	Conventional Method	64	20.88	2.94

Source: Researcher's field work, 2021

Summary of results presented in table 5 reveal that students taught with guided inquiry instructional strategy had mean retention score of 35.16 with a standard deviation of 5.89 while those taught with conventional approach had mean retention score of 20.88 with standard deviation score of 2.94. This implies that students taught basic science with guided inquiry approach has higher retention scores than those taught with conventional instructional approach.

Research Question 5

What is the Mean retention Scores of male and female students taught Basic Science with guided inquiry instructional strategy?

Table 6: *Mean retention Scores of male and female Students taught basic science with guided inquiry instructional strategy*

SN	Gender	N	Adjusted Mean	SD
1	Male	30	37.17	7.68
2	Female	40	33.65	3.48

Source: Researcher's field work, 2021

Summary of results presented in table 6 reveal that mean retention scores of male students taught using guided inquiry instructional method had mean retention score of 37.17 with a standard deviation of 7.68 while the female counterpart had a mean retention score of 33.65 with a standard deviation score of 3.48. This implies that male students taught with guided inquiry strategy obtained a higher mean retention scores than their female counterpart.

Research Question 6

What is the interaction effect of methods and gender on students mean retention in Basic Science?

Table 7: *Interaction Effects of Methods and gender on students mean retention in Basic Science*

SN	Methods	Mean Retention Scores	
		Males	Females
1	Guided Inquiry	37.17	33.65
2	Conventional Method	21.54	20.36

Source: Researcher's field work, 2021

Summary of results presented in table 7 reveal that there is no interaction effect between gender and teaching method on students mean retention scores. As shown in the table above, it simply implies that guided inquiry instructional strategy is superior to the conventional instructional method at the two levels of gender (male and female).

Hypotheses

HO₁: There is no significant difference in the mean achievement scores of students taught Basic Science using the guided inquiry instructional strategy and those taught using expository teaching method

HO₃: There is no significant interaction effect of methods and gender on students mean achievement scores in Basic Science

Table 8: Test of significance of difference in students mean achievement scores in Basic Science by methods and interaction

Sources of Variation	Sum of Squares	DF	Mean Squares	F	Sig of F
Covariates	251.454	1	251.454	13.358	.000
Main Effects	5090.709	2	2545.354	135.216	.000
Method	4890.900	1	4890.900	259.818	.000
Gender	224.101	1	224.101	11.905	.001
2-way Interactions					
Method & Gender	38.305	1	38.305	2.035	.156
Explained	5380.467	4	1345.117	71.456	.000
Residual	2428.339	129	18.824		
Total	7808.806	133	58.713		

Source: Researcher's field work, 2021

For hypothesis 1, the ANCOVA table 8 shows that the level of significance (0.05) is greater than the significance of F (0.00). The decision rule is to reject the null hypotheses when the alpha level is greater than the significance of F. Since the level of significance is greater than the significance of F value, the null hypothesis was rejected. The researcher therefore, concludes that there is a significant difference in the mean achievement scores of students taught basic science using guided inquiry instructional strategy and those taught using conventional teaching method. For hypothesis 3, results presented in table 7 reveals that for the two way interaction, the significance of F value at 0.05 alpha levels is 0.156. Based on the decision rule, the researcher upholds the null hypothesis and concludes that there is no significant interaction between instructional approaches and gender on the mean achievement scores in Basic science.

HO₂: There is no significant difference in the mean achievement scores of male and female students taught Basic Science using the guided inquiry instructional strategy

Table 9: Test of significance of difference in students mean achievement scores in Basic Science for treatment group by gender only

Sources of Variation	Sum of Squares	DF	Mean Squares	F	Sig of F
Covariates	81.077	1	81.077		
Main Effects (GENDER)	208.524	1	208.524	7.544	.008
Explained	289.600	2	144.800	5.239	.008
Residual	1851.843	67	27.639		
Total	2141.443	69	31.035		

Source: Researcher's field work, 2021

For hypothesis 2, results presented in Table 9 reveals that level of significance value of (0.05) is less than significance of F value of (0.08). Based on the decision rule, the researcher upholds the null hypothesis and concludes that there is no significant difference in the mean achievement scores of students taught Basic science using guided inquiry instructional strategy.

4.2.4 HO₄: There is no significant difference in the mean retention scores of students taught Basic Science using the guided inquiry instructional strategy and those taught using expository teaching method.

HO₆: There is no significant interaction effect of methods and gender on students mean retention scores in Basic Science

Table 10: *Test of significance of difference in students mean retention scores in Basic Science by methods and interaction*

Sources of Variation	Sum of Squares	DF	Mean Squares	F	Sig of F
Covariates	9517.934	1	9517.934	6183.124	.000
Main Effects	45.071	2	22.536	14.640	.000
Method	37.319	1	37.319	24.243	.000
Gender	1.556	1	1.556	1.011	.317
2-way Interactions					
Method & Gender	.308	1	.308	.200	.656
Explained	9563.313	4	2390.828	1553.151	.000
Residual	198.575	129	1.539		
Total	9761.888	133	73.398		

Source: Researcher's field work, 2021

For hypothesis 4, results presented in Table 10 reveal that level of significance (0.05) is greater than significance of F value of (0.00). The decision rule is to also reject the null hypothesis when the level of significance is greater than the significance of F. The researcher concludes that there is significant difference in the mean retention scores of students taught Basic science using guided inquiry instructional strategy and those taught with conventional instructional method.

For hypothesis 6, results presented in Table 9 reveal that alpha level of (0.05) for the two way interaction is less than significance of F Value of 0.656. Based on this, the researcher upholds the null hypothesis and concludes that there is no significant interaction between instructional approach and gender on the mean retention scores in Basic science.

HO₅: There is no significant difference in the mean retention scores of male and female students taught Basic Science using the guided inquiry instructional strategy

Table 11: *Test of significance of difference in students mean retention scores in Basic Science for treatment group by gender only*

Sources of Variation	Sum of Squares	DF	Mean Squares	F	Sig of F
Covariates	2277.009	1	2277.009	1302.438	.000
Main Effects (GENDER)	3.129	1	3.129	1.790	.185
Explained	2280.138	2	1140.069	652.114	.000
Residual	117.134	67	1.748		
Total	2397.271	69	34.743		

Source: Researcher's field work, 2021

For hypothesis 5, results presented in Table 11 reveal that alpha level of (0.05) is less than significance of F Value of (0.185). Based on the decision rule, the researcher upholds the null hypothesis and concludes that there is no significant difference in the mean retention scores of the male and female students taught Basic science using guided inquiry instructional strategy.

Recommendations

Based on the findings of this study the researchers made the following recommendations:

1. Since guided inquiry instructional strategy was more effective in teaching basic science and enhancing student's achievement and retention in basic science, the Ministries of Education should ensure that textbook authors incorporate guided inquiry instructional strategy in the instructional methods for junior secondary schools.
2. Basic science teachers should adopt the use of guided inquiry instructional strategy in the teaching of Basic science at the junior secondary school level. This instructional strategy may ensure students active participation, self-discovery of knowledge, promote students retention as well as interaction with the learning materials during the teaching –learning process.
3. The curriculum planners should ensure that they incorporate guided inquiry instructional strategy in basic science curriculum, as it will help to promote students' achievement and retention in Basic science.

Conclusion:

Students taught Basic science with guided inquiry instructional strategy had higher mean achievement and retention scores than those taught basic science with conventional approach, it is therefore concluded that guided inquiry instructional strategy enhance students achievement and retention in Basic science. Guided inquiry instructional strategy is therefore a superior instructional strategy as measured by the students mean achievement and retention scores.

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