EFFECT OF GUIDED DISCOVERY METHOD ON ACADEMIC ACHIEVEMENT AND INTEREST AMONG AGRICULTURAL SCIENCE STUDENTS IN SECONDARY SCHOOLS IN WUDIL EDUCATION ZONE, KANO STATE

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Abstract
The importance of agricultural science in sustainable food production as well as national development cannot be overemphasized. This study investigated the effect of guided discovery method on academic achievement and interest among agricultural science students in Secondary Schools in Wudil Education Zone, Kano State. The study adopted quasi-experimental research design. Four research questions and four null hypotheses guided the study. The population of the study was 3,125. Four intact classes, two control and two experimental groups served as sample of the study exposed to lecture method and guided discovery method respectively. Two instruments were used for data collection; Agricultural Science Achievement Test (ASAT) and Agricultural Science Interest Ratings Questionnaire (ASIRQ). The instruments were validated by three experts and reliability coefficient of 0.78 and 0.69 were obtained using Pearson product Moment Correlation Coefficient (PPMC) and Spearman Rank Order Correlation Coefficient respectively. Mean and standard deviation were used to answer the research questions while t-test was used to test the null hypotheses at 0.05 level of significance. Findings from the study revealed that guided discovery method was found to be an effective method in enhancing the academic achievement and interests of students in Agricultural Science and the method is gender friendly. It was recommended among others, that Kano State Ministry of Education should organize workshops for teachers so that they would be conversant in the use of guided discovery method.
Keywords: Agricultural science**,** academic achievement, interest

Introduction

Secondary School is the bridge between the primary and tertiary levels. The importance of secondary education made the Federal Government of Nigeria to state the broad aims of secondary education as preparation for useful living within the society and for higher education (Federal Republic of Nigeria [FRN, 2013]). Secondary school curriculum therefore contains subject that are capable of preparing its recipients to live a useful live in the society and also prepares them for higher education. One of the subjects that helps to achieve these objectives is Agricultural Science. Agricultural science is one of the vocational

subjects taught in senior secondary schools. It deals with teaching of the principles and knowledge of the cultivation of soil, production of crops and livestock for man's use. The method of teaching employed by most of Agricultural science teachers is lecture method. Lecture method is not efficient for improving students' academic achievement. Federal Ministry of Education in its National policy on Education (FRN, 2013) has discouraged the use of lecture method and recommended students centered method such as guided discovery method. Guided discovery method is a method of teaching in which students are guided by the teacher to find facts by themselves. It gives students the opportunity to investigate, use their discretion, contribute to knowledge, and get information individually or collectively to find a solution to a given task (Tofi, et al., 2023). The method involves active participation of students. Active participation of students during teaching and learning processes increases students' academic achievement and interests.

Nwakile et al. (2022) stated that interest reflects a central feature in the knowledge value system of a learner, meaning that learners' interests are influenced by the value they have for an activity or knowledge. Interest guides and encourages students to think critically and to keep trying until success is achieved. Interest and achievement correlate in teaching and learning process and have intra influence on each other; high interest improves students' achievement while high achievement promotes interest on the other hand low interest retards learning and results to poor academic achievement. Academic achievement is an important academic factor that has been identified to be influenced by teaching methods. Academic achievement refers to what students accomplish in their studies as well as how they deal with or complete various learning situation assigned by their instructor. According to the views developed by Emerhiona (2018), academic achievement refers to the degree or level of success or proficiency attained by students in some academic work. It refers to knowledge attained and skills developed during academic career which are assessed by school authorities with the help of teacher made or standardized tests. According to Igbonekwu and Ijeh (2023), difference opinions and views abound on the issue of gender and its effects on students' academic achievement. Gender refers to the varied socially and culturally constructed roles, qualities behaviour and so on that is ascribed to women and men by different societies. It is a psychological term describing behaviour and attributes expected of individuals on the basis of being born either male or female (Emerhiona, 2018). There is a strong concern of gender issue and agricultural production in Nigeria.

Agriculture in Nigeria remains an important sector that is used to drive the national economy. It is also capable of bringing food to the tables of its growing population, and it has the status of providing foreign currency, income for farmers and employment opportunities (Onanuga et al., 2021). Implementing active agricultural teaching strategies significantly improve students' academic achievement by enhancing their interests in learning. Nwakile el al. (2022) identified that lack of interest and the use of traditional

teaching methods such as lecture method are the major causes of students' poor academic achievement. Many agricultural science teachers teach the subject with low level of agricultural practices. The approach creates a wide discrepancy between the skills students ought to learn and what they actually end up learning. This condition calls for immediate actions. Agricultural Science teachers ought to use methods that engage students' participation and interest. Learners usually learn better when they search, discover, and build essential information themselves. It is based on this background that research was conducted to determine whether guided discovery method has effect on academic achievement and interest among Agricultural science students in secondary schools. Guided discovery method is an innovative teaching strategy that fosters cooperation among learners, guides and motivates them to explore information and concepts in order to construct new ideas, identify new relationships and create new models of thinking and behaviour.

Objectives of the Study

The study sought to:

i. examine the different between the academic achievement mean scores of students taught Agricultural Science using guided discovery method and those taught using conventional.
ii. find out the different between the academic achievement mean scores of male and female students taught Agricultural Science using guided discovery method.
iii. examine the different between the interest ratings mean scores of students taught Agricultural Science using guided discovery method and those taught using conventional lecture method.
iv. determine the different between the interest ratings mean scores of male and female students taught Agricultural Science using guided discovery method.

Research Questions

The following questions were generated to guide the study;

i. What is the different between the academic achievement mean scores of students taught Agricultural Science using guided discovery method and those taught using conventional lecture method?
ii. What is the different between the academic achievement mean scores of male and female students taught Agricultural Science using guided discovery method?
iii. What is the different between the interest ratings mean scores of students taught Agricultural Science using guided discovery method and those taught using conventional lecture method?
iv. What is the different between the interest ratings mean scores of male and female students taught Agricultural Science using guided discovery method?

Hypotheses

The following null hypotheses were formulated and tested at 0.05 level of significance.

HO_1: There is no significant different between the academic achievement mean scores of students taught Agricultural Science using guided discovery method and those taught using conventional lecture method.

HO_2: There is no significant different between the academic achievement mean scores of male and female students taught Agricultural Science using guided discovery method.

HO_3: There is no significant different between the interest ratings mean scores of students taught Agricultural Science using guided discovery method and those taught using conventional lecture method.

HO_4: There is no significant different between the interest rating mean scores of male and female students taught Agricultural Science using guided discovery method.

Methodology

This study investigated the effect of guided discovery method on academic achievement and interest among agricultural science students in Secondary Schools in Wudil Education Zone, Kano State. The study adopted quasi-experimental research design. Four research questions and four corresponding null hypotheses guided the study. The population of the study was made up of both male and female Senior Secondary two (SS2) students totaling 3,125 offering Agricultural Science out of which 294 students served as sample for the study which were made up of four intact classes, two control and two experimental groups consisting of 143 and 151 students respectively, selected from the population of the study using stratified random sampling technique. Both the control and experimental groups were given pre-test and post-test accordingly. Pre-test was used to assess the initial difference between the groups while post-test was given to both groups immediately after the treatment to ascertain the students' academic achievement and interests in Agricultural science. The control groups were exposed to Lecture method of teaching while the experimental groups were taught using guided discovery method. Two instruments were used for data collection; Agricultural Science Achievement Test (ASAT) and Agricultural Science Interest Ratings Questionnaire (ASIRQ), the instruments were validated by three experts and the reliability coefficient of 0.78 and 0.69 were obtained respectively, using Pearson product Moment Correlation Coefficient (PPMC) for ASAT and Spearman Rank Order Correlation Coefficient for ASIRQ. The period of data collection lasted for six weeks. Descriptive statistics of mean and standard deviation were used to answer the research questions, while t-test was used to test the four null hypotheses at 0.05 level of significance.

Results

The data analysis of the findings of the research was carried out under descriptive analysis, testing of hypotheses and discussion of findings as presented bellow;

Research Question One: What is the different between the academic achievement mean scores of students taught Agricultural science using guided discovery method and those taught using conventional lecture method?

Descriptive statistics of mean and standard deviation were used to answer this research question and summary of the result was presented in Table 1.

Table 1: Mean and Standard Deviation of Students' Academic Achievement Scores in Experimental and Control Groups.

Groups	N	Pretest Mean	Standard Deviation	Posttest Mean	Standard Deviation	Mean Gain
Experimental Group	151	8.75	2.92	17.65	2.46	8.09
Control Group	143	8.73	2.83	11.99	2.25	3.26
Mean Difference		0.02		5.16		7.83
Total	294					

The results in Table 1 showed that the students taught Agricultural Science using guided discovery method have a pretest academic achievement mean score of 8.75 with a standard deviation of 2.92 and posttest academic achievement mean scores of 17.65 with a standard deviation of 2.46 while those taught using lecture method has a pretest academic achievement mean score of 8.73 with a standard deviation of 2.83 and posttest score of 11.99 with a standard deviation of 2.25. The students in the experimental and control groups had academic achievement mean gain of 8.09 and 3.26 respectively and with a mean gain difference of 7.83 in favour of the experimental group. This clearly revealed that students taught using guided discovery method have high academic achievement scores than those taught using conventional lecture method. The standard deviation for the experimental groups of 2.46 also shown that the students' responses were closely related. The reason for the difference in academic achievement might be linked to the fact that guided discovery method is activity-oriented teaching method that encourages active participation of students in class room activities and as well maximizes comprehension of subject matter.

Null Hypothesis One: There is no significant different between the academic achievement mean scores of students taught Agricultural Science using guided discovery method and those taught using conventional lecture method.

The independent t-test was used to test this hypothesis using post test scores. The summary of the result was presented in Table 2.

Table 2: Analysis of Independent t-Test on Students' Academic Achievement Scores in Experimental and Control Groups

Groups	N	Mean	SD	Df	t-value	P-value	Decision
Experimental Group	151	21.16	3.56	292	9.54	0.00	Rejected
Control Group	143	24.23	3.67				

Table 2 revealed that calculated t-value is 9.34 and p-value is 0.00. Therefore, the p-value of 0.00 is less than significant level of 0.05. Based on this evidence, the null hypothesis was rejected. This shows that there is significant different between the mean academic achievement scores of students taught Agricultural Science using guided discovery method and those taught using conventional lecture method.

Research Question Two: What is the different between the mean academic achievement scores of male and female students taught Agricultural Science using guided discovery method?

Descriptive statistics of mean and standard deviation were used to answer this research question and summary of the result was presented in Table 3.

Table 3: Mean and Standard Deviation of Male and Female Students' Academic Achievement Scores in Experimental Group.

Gender	**N**	**Pretest Mean**	**Standard Deviation**	**Posttest Mean**	**Standard Deviation**	**Mean Gain**
Male	82	8.56	2.75	17.52	2.63	8.96
Female	69	8. 79	2.84	18.12	4.47	9.33
Mean Difference		0.23		0.06		0.37
Total	151					

The results in Table 3 show that male students taught Agricultural Science using guided discovery method have a pretest academic achievement mean score of 8.56 with a standard deviation of 2.75 and posttest academic achievement mean score of 17.52 with a standard deviation of 2.63 while female students that also taught Agricultural Science using guided discovery method has a pretest academic achievement mean score of 8.79 with a standard deviation of 2.84 and posttest mean score of 18.12 with a standard deviation of 4.47. The Male and female students taught Agricultural Science using guided discovery method had academic achievement mean gain of 8.96 and 9.33 respectively with a difference of 0.37. This clearly revealed that there is no significant difference between the mean academic achievement scores of male and female students taught Agricultural Science using guided discovery method, although the

standard deviation for the female students for posttest mean score of 4.47 shown that the female students' responses were not closely related as that for male student with standard deviation of 2.63.

Null Hypothesis Two: There is no significant different between the academic achievement mean scores of male and female students taught Agricultural Science using guided discovery method.

The independent t-test was used to test this hypothesis using post test scores. The summary of the result was presented in Table 4.

Table 4: Analysis of Independent t-test of Male and Female Students' Academic Achievement Scores in Experimental Group

Groups	N	Mean	SD	Df	t-value	P-value	Decision
Male Students	82	24.51	2.42	292	5.56	0.41	Accepted
Female Students	69	23.67	2.39				

Table 4 revealed that calculated t-value is 5.56 and p-value is 0.41. Therefore, the p-value of 0.41 is greater than significant level of 0.05. Based on this evidence, the null hypothesis was accepted. This indicates that there is no significant different between the mean academic achievement scores of male and female students taught Agricultural Science using guided discovery method.

Research Question Three: What is the different between the interest ratings mean scores of students taught Agricultural Science using guided discovery method and those taught using conventional lecture method?

Descriptive statistics of mean and standard deviation were used to answer this research question and summary of the result was presented in Table 5.

Table 5: Mean and Standard Deviation of Students' Interest Scores in Experimental and Control Groups.

Groups	**N**	**Pretest Mean**	**Standard Deviation**	**Posttest Mean**	**Standard Deviation**	**Mean Gain**
Experimental Group	151	9.63	3.95	19.25	2.78	9.62
Control Group	143	9.60	2.88	1I.66	3.78	2.06
Mean Difference		0.03		6.59		7.53
Total	294					

The results in Table 5 show that the students taught Agricultural Science using guided discovery method have a pretest interest mean score of 9.63 with a standard deviation of 3.95 and posttest interest mean scores of 19.25 with a standard deviation of 2.79 while those taught using lecture method have a pretest interest mean score of 9,60 with a standard deviation of 2.88 and posttest

score of 11.66 with a standard deviation of 3.79. The students in the experimental and control groups had interest mean gain of 9.62 and 2.06 respectively and with a mean gain difference of 7.53 in favour of the experimental group. This clearly revealed that those students taught using guided discovery method have high interest scores than those taught using conventional lecture method. The standard deviation for the experimental groups of 2.79 also shown that the students' responses were closely related. The increase of interests for the experimental group might have been connected to the treatment of guided discovery method applied. Guided discovery method is an interactive learning strategy that enhances students' interests in learning process.

Null Hypothesis Three: There is no significant different between the interest ratings mean scores of students taught Agricultural Science using guided discovery method and those taught using conventional lecture method.
The independent t-test was used to test this hypothesis using post test scores. The summary of the result was presented in Table 6.

Table 6: Analysis of Independent t-Test on Students' Interest Scores in Experimental and Control Groups

Groups	N	Mean	SD	Df	t-value	P-value	Decision
Experimental Group	151	34.20	3.56	292	4.33	0.00	Rejected
Control Group	143	31.25	3.67				

Table 6 reveals that calculated t-value is 4.33 and p-value is 0.00. Therefore, p-value of 0.00 is less than significant level of 0.05. Based on this evidence, the null hypothesis was rejected. This shows that there is significant different between the interest ratings mean scores of students taught Agricultural Science using guided discovery method and those taught using conventional lecture method

Research Question Four: What is the different between the interest ratings mean scores of male and female students taught Agricultural Science using guided discovery method and those taught using conventional lecture method?
Descriptive statistics of mean and standard deviation were used to answer this research question and summary of the result was presented in Table 7

Table 7: Mean and Standard Deviation of Male and Female Students' Interest Scores in Experimental Group.

Gender	**N**	**Pretest Mean**	**Standard Deviation**	**Posttest Mean**	**Standard Deviation**	**Mean Gain**
Male	82	6.41	2.88	14.54	2.01	8.13
Female	69	7.31	2.90	15.12	2.32	7.81
Mean Difference		0.90		0.42		0.32
Total	151					

The results in Table 7 revealed that male students taught Agricultural Science using guided discovery method have a pretest academic achievement mean score of 6.41 with a standard deviation of 2.88 and posttest interest mean score of 14.54 with a standard deviation of 2.01 while female students taught Agricultural Science using guided discovery method has a pretest interest mean score of 7.31 with a standard deviation of 2.90 and posttest mean score of 15.12 with a standard deviation of 2.32. Male and female students taught Agricultural Science using guided discovery method had interest mean gain of 8.13 and 7.81 respectively with a difference of 0.32. This clearly revealed that there is no significant difference between the mean interest scores of male and female students taught Agricultural Science using guided discovery method. The standard deviation for the male and female students for posttest mean score of 2.01 and 2.32 respectively show that the students' responses were closely related.

Null Hypothesis Four: There is no significant different between the interest rating mean scores of male and female students taught Agricultural Science using guided discovery method.

The independent t-test was used to test this hypothesis using post test scores. The summary of the result was presented in Table 8.

Table 8: Analysis of Independent t-test of Male and Female Students' Academic Achievement Scores in Experimental Group

Groups	N	Mean	SD	Df	t-value	P-value	Decision
Male Students	82	18.77	2.07	292	3.44	0.34	Accepted
Female Students	69	17.94	2.32				

Table 8 revealed that calculated t-value is 3.44 and p-value is 0.34. Therefore, p-value of 0.34 is greater than significant level of 0.05. Based on this evidence, the null hypothesis was accepted. This implies that there no significant different between the mean interest scores of male and female students taught Agricultural Science using guided discovery method.

Discussion of Findings

The findings of this study show that there was a significant difference between the mean academic achievement scores of students taught Agricultural Science using guided discovery method and those taught using lecture method in favor of the students taught using guided discovery method. It was also observed that there was no significant difference between the mean academic achievement scores of male and female students taught Agricultural Science using guided discovery method. These results are consistent with findings of Yusuf (2020) and Tofi et al. (2023) who found that students taught using guided discovery method performed better than those students taught using lecture method.

Furthermore, they revealed that there was no significant difference observed between male and female students' achievement taught using guided discovery method. However, the finding is not in agreement with Akintunde et al. (2023) who revealed that female students taught Agricultural Science using guided discovery instructional methods recorded a higher achievement mean score than male counterpart. The findings of the study further revealed that students taught using guided discovery method have high interest scores than those taught using conventional lecture method. It was also discovered that there was no significant difference between the mean interest scores of male and female students taught Agricultural Science using guided discovery method. These findings agree with that of Yusuf (2020) who discovered that guided discovery method made students to put in more interest thereby achieving higher than those taught with other conventional method and Akpan et al. (2020) who discovered that guided discovery method has no effect on gender.

Conclusions

The following conclusions were drawn from the findings of the study:

1. Guided discovery method was found to be an effective method in enhancing the academic achievement of senior secondary school students in Agricultural Science.
2. Guided discovery method is gender friendly as it enhances academic achievement of both male and female students in Agricultural Science.
3. Guided discovery method was found to be an effective method in enhancing the interests of senior secondary school students in Agricultural Science.
4. Guided discovery method is gender friendly as it enhances interests of both male and female students in Agricultural Science.

Recommendations

The following recommendations were made based on findings of the study;

1. Agricultural science teachers should be encouraged to incorporate guided discovery method in their teaching processes as a way of improving academic achievement and interests of students.
2. Kano State Ministry of Education should organize workshops and seminar for Agricultural science teachers so that they would be conversant in the use of guided discovery method in teaching and learning processes.
3. Curriculum planners for secondary school Agricultural Science should incorporate guided discovery method as a teaching strategy so as to improve students' academic achievement and interests in agricultural science.
4. The Management of Secondary Schools in Kano State should provide adequate Agricultural Science teaching and learning materials in order to enable agricultural science teachers adopt guided discovery method in their teaching processes.

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