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Effects of Ethno-Science Teaching Strategy towards Improving Students Interest in Agricultural Sciences in Secondary Schools in Abia State

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Abstract: *The study investigated the effects of ethno-science teaching strategy on interest of students in Agricultural Sciences in Secondary schools. Two research questions were posed and two null hypotheses were tested at 0.05 level of significance. The Quasi-experimental design was employed. Using a purposive sampling technique. A sample of 132 Agricultural Science students which comprised 63 students randomly assigned to the Control group and 69 students randomly assigned to the Experimental group was used for the study. The 63 Agricultural Science students randomly assigned to the Control (Lecture group) comprised 35 male students and 28 female students. The 69 students assigned to the Experimental (Ethnoscience) comprised 38 male students and 31 female students. The sample of the study was drawn from 4 secondary schools selected from two Local Government area from One Education Zone. A face validated Measure of Agricultural Science Interest Scale (MASIS) was administered to both groups of students before and after the experiment. The reliability coefficient for the instrument was 0.83 which was derived using the Pearson's Product Moment Correlation Coefficient (PPMCC) statistics. Mean and standard deviations were used to answer research questions and ANCOVA statistics was used to test the null hypotheses. Findings revealed that ethno-science had a significant effect on the interest of students in Agricultural Science and gender was not a significant factor on students' interest in Agricultural Science. Based on the findings of this study, it was recommended that ethno-science should be adopted in teaching and learning process of Agricultural Science in secondary, since it was effective in improving the interest of students. Also gender should not be a discriminating factor when adopting ethno-science teaching strategy.*

Keywords: Ethno-science, Agricultural Science and Interest

Introduction

One of the vocational and scientific disciplines taught in secondary schools is Agricultural science. It plays a crucial role in the study of the production of food and raw materials used by humans. The science of cultivating crops and rearing of animals for human consumption and commercial purposes is known as agricultural science (Madu, 2012). Due to the growing importance of agriculture in Nigeria's economy, especially in light of the declining price of oil,the topic is highly valued in both our society and educational system. According to Ibe (2011), agriculture is a

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fundamental component of any country's economic and social growth. In Nigeria, it employs over 68% of the labor force and is one of the key sources of livelihood in Nigeria (Nwachukwu, 2016).

Studying agriculture and related courses like agricultural economics, animal science, crop science, and production require a solid understanding of agricultural science in secondary school. According to the Agricultural Science Curriculum (NERDC,2013), the goals of Agricultural Science include igniting and maintaining students' interest in agriculture, facilitating their acquisition of fundamental information and useful skills, and preparing them for careers in agriculture. Thus, secondary school agricultural science teachers are responsible for imparting knowledge, skills, and attitudes on pupils in the main fields of agriculture. Nonetheless, it is anticipated that the accomplishment of these goals will show in the students' growing interest in Agricultural Science.

Academic accomplishment and retention are strong indicators of how well a subject's objectives have been met, and they are influenced by a student's enthusiasm in the subject matter. According to Ewumi (2012), interest is defined as one's preferences, inclinations, and propensity to seek out and partake in particular activities. Aspirations and interest are terms that can be used interchangeably. Interest is a reflection of a person's feelings on a certain topic or body of knowledge (Harackiewicz, Smith & Priniski, 2018). As interest is the psychological condition of engaging or having the tendency to reengage in a certain material over time, it often refers to student attention, higher concentration, pleasant sentiments, and enhanced motivation to study (Okafor & Yewande, 2015). Goolsby (2013) posits that a student's interest in a subject will influence his or her academic achievement in that subject, hence developing a student's interest in that subject comes first and then encourages them to perform well academically. Stated differently, students' academic achievement and retention in a given subject are stimulated by their level of interest.

Over time, students' interest in Agricultural Science has been decreasing. Numerous issues, including a lack of a supportive environment, ineffective teaching strategies, teachers' attitudes toward their work, students' lack of enthusiasm in learning agricultural science, and students' time management, could be blamed for this. Although some noteworthy efforts have been made to address the waning interests, not much progress has been made. In a similar vein, Chukwu (2019) conducted research on the use of expository teaching methods to increase students' interest in agricultural science and discovered that these methods enhance students' interest and academic achievement in secondary education. Similar to this, Madu and Ebere, (2016) & Eme 2017) have demonstrated that the use of animation in agricultural science classes by specific teachers may have an impact on students' interest in the subject.

However, the issue of students' diminishing enthusiasm in studying agricultural science continues to exist. These led Madu, Offorma, Ebere, and Duke-Natreabo (2017) to assert that the decrease in students' interest in agricultural science in our schools raises questions about the methodology of instruction and, as a result, calls for a thorough investigation aimed at determining the most effective teaching strategies that will boost students' interest in the subject. This means that Teachers of Agricultural Science face a problem in finding an intervention or creative ways to improve students' interest in the subject, their academic performance, and their high retention rate. A few of these student-centered teaching strategies are ethno-science, idea mapping, the discovering method, co-operative learning, the target task approach, peer tutoring, and competitive

teaching. Thus, the current study aimed to investigate how students' interest in Agricultural Science could be enhanced by integrating an ethno-science teaching style with a student-centered approach. Teaching techniques are a range of approaches that educators can use to improve instruction and learning, which will raise students' interest and academic performance in the topic. The traditional way (Lecture method) of teaching is often the most widely used teaching strategy in the secondary school system during the teaching and learning process. The lecture approach is one of the most used teaching strategies, but it hasn't yielded the expected outcomes (Omachonu & Offorma, 2018). When using the lecture method of instruction, the instructor typically takes the front of the room and yells out material pertinent to the subject matter.

The lecture technique is used to instruct secondary school pupils. Students' poor performance in the course over the years indicates that Agricultural Science has not been successful in generating the needed interest in them. Based on this, Madu, Offor, Ebere, and Duke-Natrebo (2017) found that teaching agricultural science to students through lectures has not resulted in the level of enthusiasm that was expected. In order to help students understand any concepts, subjects, or ideas being taught in Agricultural Science, teachers should implement student-centered teaching strategies. A variety of student-centered teaching strategies, such as the ethno-science teaching strategy, are used to teach agricultural science.

The area of indigenous knowledge known as ethno-science focuses on how human interaction with the environment and technological advancements that improve communal survival are used to convey scientific ideas. It investigates how people interact with their environment and creates reality by tying advanced scientific (chemical) knowledge to culture (Ugwu & Diove, 2016). According to Abonyi (2013), ethno-science is the body of knowledge that examines how local socioeconomic development processes interact with local perceptions, practices, skills, and ideas as well as their underlying cosmologies. The term "ethno-science" describes the objects, concepts, ideologies, and technological advancements found in a particular community or setting that have their roots in the customs and cultural practices of the pupils. These developed from ongoing acculturation in the environment as well as from myth, supernatural, and mystical realities (Abiam, Abonyi, Ugama, & Okafor, 2016). Thus, ethnoscience suggests a culturally aware education that provides access to understanding the issues surrounding natural phenomena through indigenous methods.

Additionally, a comprehensive strategy to the integration of ethno-science in secondary education is required to boost students' interest in agricultural science by examining the impact of gender as a moderating component. In this study, gender refers to how students are categorized as male or female during the teaching and learning process. Being male or female is referred to as gender (Allahnana, Akande,Vintseh, Attah & Alaku, 2018). Chukwu (2019) defines gender as the roles, behaviors, or social or cultural traits that males and females are recognized for in society. 'Gender describes the personality traits, attitudes, conduct, values, relative power, influence, roles and expectations (femininity and masculinity) that society ascribes to the two sexes on a differential basis', according to Ezeh (2013). In light of this, gender is a psychological word as well as a cultural construct that society has created to distinguish between the roles, behaviors, and mental and emotional characteristics of men and women.

Education experts and psychologists continue to disagree on the relevance and controversy surrounding the impact of gender on students' interest in agricultural science. In this regard, Ebere (2015) found that male students scored better on interest in agricultural sciences than did female

students. Similarly, Madu (2012) discovered that male students do better in agricultural science than female students since the former are more interested in the subject. In a similar vein, research by Madu, Offorma, Ebere, and Duke-Natrebo (2017) found that while teaching Agricultural Science through concept mapping strategy and lecture method, there is a substantial difference in the mean interest and achievement scores of male and female senior secondary school students. Therefore, researchers continue to be concerned about the gender differences that occur in various science-related disciplines and contribute to the differences in academic accomplishment between male and female students. Based on these premises, a gender influence investigation as designed in this study would help clarify the issue of how gender affects students' interest in, academic performance in, and retention of Agricultural Science when taught using the ethno-science teaching strategy.

Despite the importance of agricultural science to the growth of the country's economy, students' enthusiasm in the subject is still low, which has over time led to their poor academic performance. The traditional teaching approach, such as the lecture style used by the professors to teach Agricultural Science, may be the cause of the students' reported diminishing interest in the subject. In light of this, it is vital to investigate how students' interest in Agricultural Science is affected by the moderating variable of gender and how the ethno-science teaching style affects this interest.
Two research questions were posed for study which were as follows;

1. What is the mean interest scores of the senior secondary school students in Agricultural Science when taught using ethno-science teaching strategy and lecture method?
2. What is the mean interest scores of senior secondary school male and female students in Agricultural Science when taught using ethno-science teaching strategy and lecture method?

Hypotheses

The two null hypotheses were tested at 0.05 level of significance.

1. There is no significant difference between the mean interest scores of the senior secondary school students in Agricultural Science when taught using ethno-science teaching strategy and lecture method.
2. There is no significant difference in the mean interest scores of the male and female senior secondary school students in Agricultural Science when taught using ethno-science teaching strategy and lecture method.

Methodology

A pretest-posttest non-equivalent control group design was incorporated into the quasi-experimental research design. Abia State served as the study's location. 12,458 senior secondary school two (SS2) students from all 251 government-owned secondary schools in Abia State were included in the study's population (Abia State Secondary Education Management Board (SEMB), 2023). There were 5789 female students and 6669 male students among the 12,458 senior secondary students. For the study, a sample of 132 students majoring in agricultural science was selected, with 69 students randomly assigned to the experimental group and 63 students randomly assigned to the control group. There were 28 female students and 35 male students among the 63 Agricultural Science students who were randomly allocated to the Control (Lecture group). There were 31 female students and 38 male students among the 69 students assigned to the Experimental (Ethnoscience) course. Four secondary schools chosen from two Local Government areas within One Education Zone made up the study's sample. The stratified random sampling method was utilized to choose the four secondary schools. Using basic random selection, one whole class from

each school was selected for the investigation. Two of the four schools were placed in the treatment group, and the two other schools were placed in the control group. Stratified random sampling was used to assign the schools to the treatment and control groups. One whole class from each school was selected for the study using a simple random sampling method.

The researcher's Measure of Agricultural Science Interest Scale (MASIS) which was adopted from Rotgans (2015) and adapted served as the data gathering tool. The The Departments of Agricultural and Vocational Education, Education Measurement and Evaluation, and Science Education provided three of the experts who face validated the instrument; their modifications and comments were entirely implemented. The test –retest method was used to determine the stability of the instrument. The researcher administered the first instrument to a sample of students which were not part of the study and re-administered same instrument to the same sample after two weeks interval. The scores of the first administration and second administration was computed using the Pearson's Product Moment Correlation Coefficient (PPMCC) statistic was used to evaluate the reliability coefficient of the Measure of Agricultural Science Interest Scale (MASIS), which came out to be 0.83.

Lesson plans on the topics (Irrigation and drainage; Farming systems and farm implements) for both the experimental and the control groups were used for the study. The experimental procedure began with the training of the four Agricultural science Teachers. This lasted for one week. The teachers were trained on the use of two teaching methods which the lecture method and ethno-science were teaching strategy. Also the contents, objectives and activities of the students were discussed during the training. The students were pre-tested before the teaching by the trained Agricultural Science Teachers under the supervision of the researcher, after which the Measure of Agricultural Science Interest Scale (MASIS) was administered to both the control and experimental group to measure the level of their interest. The Measure of Agricultural Science Interest Scale (MASIS) was administered to both the control and experimental group after the experiment. The scores for both tests were collected and the teachers collated the responses of the respondents and interpreted responses to generate numerical values. The mean were used to answer the research questions while analysis of covariance (One way ANCOVA) was used to test the hypotheses at the 0.05 alpha levels. The decision for answering research question is on the basis of comparing mean interest scores, as higher mean interest score indicates high improvement. Meanwhile the decision for testing the null hypotheses was that values below 0.05 was rejected while values above 0.05 was retained.

Results

Table 1:Mean and Standard deviation scores of Pretest and Post test scores of students interest in Agricultural Science when taught using ethno-science teaching strategy and lecture method

Teaching Method	Number of Students	Types of Test				Achievement Gains
		Pre-test		Post test		
		$\bar{X}$	S.D	$\bar{X}$	S.D	
Ethno-science (Experimental)	69	1.78	0.25	3.13	0.20	1.35
Lecture Method (Control)	63	1.52	0.28	1.96	0.40	0.44

The data presented in Table 1 indicated that students taught Agricultural Science using the ethno-science teaching strategy had a mean interest score of 1.78 and a standard derivation of 0.25 in the pre-test and a mean interest score of 3.13 and a standard deviation of 0.20 in the post test, making a pre-test posttest gain to 1.35. The Table also shows students taught using lecture method had a mean interest score of 1.52 and a standard deviation of 0.28 in the pre-test and a mean of 1.96 and a standard deviation of 0.40 in the post-test with a pre-test post-test gain of 0.41. Hence the students taught Agricultural Science had a better mean interest scores than the students taught using lecture method, thus there is an improvement in the mean interest score of students in Agricultural Science when taught with ethno-science teaching strategy than the lecture method.

Table 2: Mean and Standard deviation scores of Pretest and Post test scores of male and female students interest in Agricultural Science when taught using ethno-science teaching strategy and lecture method

Teaching method	**Types of test**	**Gender**							
		Male				**Female**			
		No. of Student			**Interest gain**	**No. of students**			**Interest gain**
			$\bar{X}$	**S.D**	$\bar{X}$		$\bar{X}$	**S.D**	$\bar{X}$
Ethno-science	Pre-test	38	1.75	0.27	5.11	31	1.83	0.20	9.47
	Post Post test		3.11	0.19			3.15	0.18	
Lecture Method (Control)	Pre-test	35	1.59	0.31	3.53	28	1.43	0.22	58.12
	Post test		1.92	0.39			2.01	0.40	

The data presented on the table 2 indicated that the male students in the experimental group had a mean interest score of 1.75 and a standard deviation of 0.27 in the pre-test while in the post-test, the male scored a mean interest score of 3.11 and a standard deviation of 0.19. The result also shows that the female student in the experimental group had a mean score of 1.83 and a standard deviation of 0.20 in the pre-test of experimental group which is higher than that of male students in the pre-test of experimental group, while the female students also had a mean interest score of 3.15 and a standard deviation of 0.18 in the post-test of the experimental group, which is higher than that of the male students in the post-test score in the experimental group. Thus the female students had a better interest mean scores than the male students when taught using the ethno-science teaching strategy.

The data presented in table 2 also indicated that male students had a mean interest score of 1.59 and a standard deviation of 0.31 in the pre-test of the control group which was lower than the pre-test of the experimental group, while in the post-test, the male students had a mean interest score of 1.92 and a standard deviation of 0.39 which was lower than the experimental group. The result also shows that the female students had a mean interest score of 1.43 and a standard deviation of 0.22 in the pre-test of the control group which is lower than that of the male students score in the pre-test of the control group, while the female students had a mean score of 2.01 and a standard deviation of 0.40 which is higher than that of the male students in the post-test of the control group. In summary, the female students developed better interest in Agricultural Science than their male counterparts when taught using ethno-science teaching strategy.

Table 3: Analysis of Covariance (ANCOVA) of the significant difference in the mean interest scores of the senior secondary school students in Agricultural Science when taught using ethno-science teaching strategy and lecture method

Sources of Variation	Type III sum of square	Df.	Mean sum of square	*F.Cal*	Significance
Corrected model	49.109[a]	2.	22.554	222.494	0.000
Intercept	16.295	1	16.295	176.645	0.000
Pre-test	0.270	1	0.270	2.922	0.090
Teaching method	32.808	1	32.808	355.646	0.000
Error	11.900	129	0.092		
Total	930.656	132			
Corrected total	57.009	131			

a R square = .791 (adjusted R squared = 0.788)

The data on table 3 shows that the teaching method (lecture method and Ethno-science) is a significant factor in the mean interest scores of the students in the Agricultural Science Achievement Test, this is because the p-value of 0.000 is less than 0.05. Thus, this implies that there is a significant difference in the mean interest scores of the senior secondary school students in Agricultural science when taught using ethno-science teaching strategy and lecture method, as the students taught Agricultural Science using Ethno-science teaching strategy developed significant interest in the study of Agricultural Science than the students taught with lecture method. This is because he null hypotheses which state that there is no significant difference in the mean interest scores of the senior secondary school students in Agricultural Science when taught using ethno-science teaching strategy and lecture method was rejected.

Table 4: Analysis of Covariance (ANCOVA) of the significant difference in the mean interest scores of the male and female senior secondary school students in Agricultural Science when taught using ethno-science teaching strategy and lecture method.

Source of variation	Type III sum of square	Df.	Mean sum of square	*F.Cal*	Significance
Corrected model	45.119[a]	4	11.280	120.483	.000
Intercept	15.983	1	15.983	170.720	.000
Pre-test	0.252	1	0.252	2.689	.104
Teaching Method	32.009	1	32.009	341.903	.000
Gender	0.004	1	0.004	0.041	.840
Teaching Method * Gender	0.006	1	0.006	0.062	.804
Error	11.890	127	0.094		
Total	930.656	132			
Corrected total	45.875	131			

a. R square = .791 (adjusted R squared = 0.785)

The data on table 4 shows that gender is not a significant factor in the mean interest scores of the students in the Agricultural Science achievement test when taught using the ethno-science teaching strategy and lecture method. This was indicated by the p-value of 0.840 which is greater than 0.05 at 0.05 level of significance, this indicate that we retain the null hypotheses which implies that there is no significant difference between the mean interest scores of the male and female senior secondary school students in Agricultural Science when taught using ethno-science teaching strategy and lecture method. The data also show the interactional effect of gender and teaching

method is not significant with p value of 0.804 which is greater than 0.05, this indicates that there is no significant interactional effect in the mean interest of the male and female senior secondary school students in agricultural science when taught using ethno-science strategy and lecture method.

Discussion of Findings

This study found that there was an improvement in the mean interest scores of students in Agricultural Science when taught using ethno-science teaching strategy and lecture method, this as those taught using the ethnoscience teaching strategy had an improvement in mean interest than thosetaught with lecture method. Meanwhile the testing of the corresponding hypothesis revealed that there is a significant difference in the mean interest scores of the senior secondary school students in Agricultural Science when taught using ethno-science teaching strategy and lecture method. This finding was in agreement with the findings of Okwara and Upu, (2017) whose findings revealed a significant difference in the mean interest scores of students taught using ESIA and their counterparts taught using demonstration teaching. This finding is in consonant with the findings of Aderson (2009) and Ugwuanyi (2015) and Ugwu (2018) who in their different studies at different times reported there is a significant difference in the mean interest scores of student taught with ethno-science approach and those taught with conventional methods. In the other hand this study disagrees with James (2006) who found out that cultural oriented instructional approach do not have a significant influence on students' interest in science. However this study shows that ethnoscience instructional approach is effective in teaching Agricultural science because it arose and sustained students' interest in Agricultural science.

This study revealed that the female students developed better interest in Agricultural Science than their male counterparts when taught using ethno-science teaching strategy. Furthermore, the result of the corresponding null hypothesis revealed that there is no significant difference between the mean interest scores of the male and female senior secondary school students in Agricultural science when taught using ethno-science teaching strategy and lecture method. This finding also agrees with the findings of previous researchers like, (Nwosu, 2001; Nwagbo, 2011 & Ugwu, 2018) who found out that gender had no significant influence on the acquisition of science process skills among secondary school biology students. It also agrees with Mari, (2002) who submitted that there was no significant difference in the interest and performance of male and female students in all the schemata except in the schemata of correlation reasoning in which males performed better than the females. This result is in agreement with the findings of Nwagbo, (2011) and Ugwu (2018) who found no significant interaction between instructional methods and gender on interest, performance and, acquisition of science process skills respectively.

Recommendations

- Teachers should be taught how to utilize the ethnoscience teaching strategy in the teaching and learning process of Agricultural Science since it has been found to improve the interest, academic Achievement and retention of students in Agricultural Science.
- The Male and female students should be exposed to training in ethnoscience teaching strategy without discrimination, since the evidence is that the use of the strategy significantly improves their interest, achievement and retention in Agricultural Science.

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