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Assessment of Effectiveness of Ethnoscience and Collaboration Strategy on Students of Basic Science Education Academic Performance in Measurement in Jalingo Education Zone, Taraba State, Nigeria

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ABSTRACT

This study assessed the effect of ethnoscience and collaborative strategies on Basic Science students on academic performance of in Jalingo education zone of Taraba Statte. Three research questions and hypotheses were formulated and tested at 0.05 level of significance. The quasi experimental research was adopted. The population of the study was 2,828 Upper Basic level students of public schools. The sample was 80 students, consists of (male 38 female 42) selected through a random sampling technique to form two intact classes. Ethnoscience Measurement Performance Test (EMEPT) was used for the collection of data. Mean and standard deviation were used to answer the three research questions, while the three hypotheses were tested with ANOVA and t-test statistic tool. The research revealed that there was significant difference between students exposed to ethnoscience strategy and those who were taught using collaboration strategy. Based on the findings of this study, it is recommended that the use of ethnoscience strategy should be encourage at upper basic, hence it enhanced better performance. ethnoscience strategy is gender friendly, it should be encouraged among Males and Females students at upper basic level.

KEYWORDS: *Effectiveness, Ethnoscience, Collaboration Strategy, Basic Science, Academic Performance and Measurement*

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1. INTRODUCTION

The improvement of science literacy among citizens is a vital tool for economic, social and individual development in any country. In appreciation of this, the Federal Government of Nigeria emphasized the introduction of science subjects (Basic Science & Technology at the lower basic education programme and Basic education programme). This is to enable citizens acquire the knowledge of their environment, develop problem solving skills, develop desirable scientific attitudes, as well as increase their understanding of the role and functions of science in everyday life (NCCE, 2012). This implies that the knowledge acquired by learners in Basic Science could enable the learner to become useful to himself and the society at large.

Basic Science, formerly known as Integrated Science, is the form of science a child encounters during the Upper Basic education programme. It prepares students for the study of core science subjects (Physics, Chemistry, and Biology) at the Secondary School level. This implies that for a student to be able to study specialized science subject at the Secondary School level, she/he has to be well grounded in Basic Science at the primary school level. With this in mind, the Basic Science Curriculum was prepared with the following objectives to: provide students with a sound basis for continuing science education either in single science subjects or further Integrated Science; enhance the scientific literacy of the citizenry; allow students understand their environment in its totality rather than in fragments; and allow students to have general view of the world of science; (Danmole, 2011). Students' performance in Basic Science will go a long way in determining

their achievement in the subject, hence enabling them to contribute their quota to the scientific development of the nation and the world at large.

The increasing complexity of the world today imposes new and changing workforce requirements. This means that new workers will need ever more sophisticated skills in science, mathematics, engineering and technology which, in effect, require improved approaches to the teaching and learning of science. This explains why efforts are geared towards developing approaches that ensure the development of learners who would warm up to current workplace challenges. Consequently, Miles (2015) explains that academic success by science students requires that teachers implement a range of instructional strategies. This assertion informed the use of a number of innovative methods and strategies in the teaching and learning of science. For these methods and strategies to be effective, Bransford, Brown, Cocking, Donovan and Pellegrino as cited in Faasi (2017) highlight the importance of: using appropriate just-in-time learning stimuli; engaging students' preconceptions prior to teaching them new concepts; providing deep foundational knowledge; helping students make appropriate connections within the context of a conceptual framework; organizing knowledge in ways that facilitate information retrieval and application; allowing students more opportunities to define learning goals and monitor their progress in achieving them.

Base on the submission of Faasi (2017) noted that these innovative methods and strategies have been proved to be effective in other fields of study but, they do not seem to have been effective among science learners in traditional communities where differences exist between learners' everyday life and the world of science. A number of reasons have been adduced for this. Ogonnaya (2011), while analysing the situation in Nigeria affirms that the neglect of the diverse cultural activities and beliefs of the students and the failure of teachers to consider varied cultural resources of the students in teaching biology (and other sciences) remains one of the major reasons for the alienation of the students from sciences. The author further narrows the reason for poor achievement in science to lack of regard for the cultural belief of learners which greatly influence the attitude. Therefore, it was recommended that the use of ethno-scientific teaching approach for classroom instruction in science. It is therefore important that an approach that is practical and relates science concepts to the day-to-day life of the learners be developed. This is perhaps why Absalom (2011) maintains that learners in the traditional non-western setting believe that science that is taught in schools often seems not to be in line with their own meaning that the concepts look strange in the traditional environment. Abonyi, Achimugu and Adibe (2014) also notes that current instructional approaches in science education which did not take into consideration prior cultural beliefs seem to have contributed to poor concept formation and students interest in science.

The lack of academic success in the educational acculturation process has long been a perplexing and frustrating problem to educators dealing with science education in Africa. Approaches to education that relate to the cultural heritage, the environment, and the life style of the Africans have been considered vital and necessary by the emerging African leadership (Atwater in Abonyi, 2012). One of such approaches to culture-related education in the areas of science is ethnoscience. The Ethnoscience of the Africans refers to the materials, ideas, and beliefs from the African environment and technology. These are derived from the past and present cultural traditions of the people, which in turn evolved from myth, supernatural, popular and mystical realities and beliefs as well as from an ongoing acculturation process (Abonyi, 2012). This implies that the use of ethnoscience in the teaching and learning of science could improve students' performance in the subject. However, school location could influence the effectiveness of the use Ethnoscience in the study area.

School location has been a contentious issue in the determination of cognitive achievement in science education. Ndukwu in Fasasi (n d) maintains that schools located in urban areas are better positioned to attract more quality students and teachers who exhibit the readiness to take academic business seriously which will invariably impact on the students. Onah (2011) supports this empirically by finding out that schools in the urban areas achieved more than schools in the rural areas in science subjects. On the contrary, Bosede (2010) shows that school location has no effect on students' academic achievement in science. What is therefore the relationship between science students in urban and rural schools when ethnoscience instruction is used?

The ability of learners to remember what they were taught after some time is an important component of learning. It is referred to as retention. Retention refers to the ability to remember things Hornby and Bichi in Hussaini (2012) defined retention as the ability to retain and consequently remember things experienced or learned by an individual at a later time. Hence the need to develop learner friendly approaches that could make a learner see himself as a potential

scientist, explorer and finder of new knowledge through enquiry into his home environment, cultural practices and traditional beliefs that have relative bearing to science and science related practices. This is referred to as ethnoscience.

Review of Relevant Empirical Studies

Several empirical studies were carried out in the past related to ethnoscience include:

Peni (2011) investigated the Impact of Ethnoscience-enriched-instruction on Attitude, Retention and Performance in Basic Science among Rural and Urban Students. The study employed a pretest posttest quasi experimental design. A randomly selected sample of 213 students from 8 schools under the Bichi Education zone was used for the study. The schools were randomly assigned into experimental and control groups containing male and female schools from urban and rural locations. The experimental groups were taught concepts using Ethnoscience-enriched-instructions while the control groups were taught using lecture method. The groups were posttested to determine their academic performance and attitude after the treatment. They were furthers tested (post-posttest) to determine the retention of learnt concepts. Data were collected using the Basic Science Performance Test (BSPT), a 25 item multiple choice test with a reliability coefficient of 0.66; and the Students Attitude to Basic Science Questionnaire (SABSQ) developed on a five point Likert‟s scale with a reliability coefficient of 0.75. The data were analyzed to answer the research questions and test the null hypotheses. The research questions were answered using descriptive statistics. The hypotheses on academic performance were tested using the two way ANOVA and t-test statistic, while those on attitude were tested with Kruskal Wallis H test and Mann Whitney U test at 0.05 level of significance. The study found that Urban and Rural students in the experimental groups performed better than those in the control groups ($F(1, 209) = 287.63$; $p \leq 0.05$). It also found that the instructional process had enhanced the performance and attitude of students to Basic Science ($X2(3) = 133.05$; $p < 0.05$). Similarly, Urban and Rural students in the experimental groups had significantly better retention of learnt concepts ($F(1, 208) = 10.512$; $p < 0.05$). The study concludes that the instructional process is a viable innovation to the enhancement of rural and urban students‟ academic performance, retention of concepts and attitude to Basic Science and it is gender friendly.

Ugwuanyi (2015) carried out the study designed and conducted to determine the effects of ethnosciencebased instructional model (ESBIM) on students' academic achievement and interest in Senior Secondary Biology. The study employed a non equivalent control group quasi-experimental design. The sample for this study comprised of two hundred and twenty three SSI Biology Student. The study was conducted in six government co-education secondary schools in Nsukka Education Zone of Enugu State. The schools were drawn through a stratified random sampling. In each school, one intact class was drawn for the study through a simple random sampling making a total of six intact classes. Out of the six schools, three schools were assigned to the experimental group while the remaining three schools were assigned to the control group. The experimental group was taught Biology using the ethnoscience based instructional model while the control group was taught Biology using the lecture method. Two instruments Biology Achievement Test (BAT) and Biology interest scale (BIS) were constructed and validated and reliability of internal consistency and stability were established (0.96 and 0.835 respectively) before using them for data collection. The BIS and BAT were used to collect data for students' Achievement and interest respectively. The research questions were answered using mean and standard deviation while the hypotheses were tested at ($P<0.05$) using analysis of covariance (ANCOVA). The result revealed that the ethnoscience based instructional model is superior to the lecture method in fostering interest and achievement among the students. The study also revealed that the use of ethnoscience based instructional model does not show any significant difference in the achievement and interest of male and female students. Thus the use of ESBIM will not only help arrest the problem of male being regarded as high achiever, in science-related courses but will also encourage the female students to enroll in such courses.

According to Faasi (2017) prior cultural knowledge has been identified as a factor responsible for underachievement in science in traditional communities where differences exist between learners' everyday life and the world of science. Therefore, the purpose of this study was to investigate the main effect of Ethnoscience instruction and moderating effects of school location and parental educational status on students' cognitive achievement in science. It employed pretest-posttest, non-equivalent control group quasi-experimental design. Engaged in the study were 352 Junior Secondary School 1 students (aged 9–12 years) from two schools, each in urban and rural areas of Ìbàdàn, southwestern Nigeria. Instruments used are: Teachers Instructional Guide on Ethnoscience instruction, Teachers Instructional Guide on Modified Lecture

Method and Basic Science Cognitive Achievement Test (r=0.83). Three null hypotheses were tested at 0.05 level of significance. Data were analyzed using ANCOVA. Significant main effect of treatment was recorded on cognitive achievement in science [F(1,339)=431.95; p<0.05] with Ethnoscience instruction group performing better than the control group. Effect size of treatment was strong (=0.63). Ethnoscience instruction is effective in promoting learners' cognitive achievement in science and is recommended as an instructional method for learners especially in traditional communities.

Yovita, Sarwanto and Fahru (2019) analyzed the students' critical thinking ability through the implementation of Ethnoscience Instruction (EI) using Critical thinking rubrics based on the International Critical Thinking Essay Test (ICTET). This study employed a quasi-experimental design consisting of two classes: experimental and control. The population in this study were XII grade students in several Senior High Schools in Surakarta which students are categorized to have high, intermediate and low critical thinking skills in the academic year of 2018/2019. Respondents were selected by the cluster random sampling technique. Data were analyzed by using descriptive method to describe the level of the students' critical thinking ability. Findings revealed the difference between experimental class and control class with the following details: purpose (15.83%), questions (13.63%), information (8.63%), point of view (13.98%), assumptions (5.08%), concepts (6.79%), conclusions (8.90%), and implication (10.62%). The present study is similar to the study under review in areas such as variable, study design and sampling technique. Scientific legacy is still to be a problem to students worldwide. Even though this competency is very important for students to an important role in science, technology and society advancement.

Arif, Nurlaila, Rilia, Parham and Eko (2020). Analyzed the effect of project-based learning by using ethnoscience learning sources of Banjarese traditional food on students' scientific legacy. By using Pre-test Posttest nonequivalent control design, the study involved 35 and 33 senior high school students as a control and an experimental group respectively. The experimental group applied project-based learning, while the control group used expository learning strategy. The study concluded that students scientific legacy of the experimental group was significantly higher than the control group one. The students' legacy in both classes increased from the low to high categories. It needs to be explored more broadly other element of ethnoscience to improve meaningful learning and students scientific legacy.

Yuliana, Muhammad, Cahyono, Widodo and Irwanto (2020). Scientific literacy plays an important role in catalyzing science learning in the 21st century. Unfortunately, previous evidence revealed that students' scientific literacy tends to be unsatisfactory. This study investigated the effect of ethnoscience-themed picture books embedded in context-based learning (EthCBL) on students' scientific literacy. In this quasi-experimental research, 58 (35 girls and 23 boys) fifth-grade students in a public elementary school in Indonesia were selected using purposive sampling. Twenty-nine students (19 girls and 10 boys) were assigned as an experimental group and 29 students (16 girls and 13 boys) were assigned as a control group.

Dwi, Yuberti, Henita, Ilmi, Mehadi (2020) study stated that Ethnoscience learning has become the focus of researchers in various regions. It provides a mixed-nuance of culture and science. This learning is a breakthrough in the world of education because it combines science and culture. This research aimed to identify the influence of Ethnoscience learning on students' scientific literacy. The method employed was a meta-analysis. This data source was ten research articles obtained from the Scopus database based on specific search criteria. The analysis was done through 5 stages, namely Orientation, Conceptualization, Investigation, Discussion, and Conclusion. Based on the analysis of the research results, Ethnoscience learning significantly increased students' scientific literacy. Therefore, Ethnoscience learning in schools is very important to improve students' scientific literacy skills in developing science education for students in the 21stcentury and to keep environment.

Dike and Rowland (2020) carried a study on Ethno science- Based Instruction and students' performance in Basic Science in Abua/Odual Local Government Area, Rivers State was investigated. Two objectives and two research questions and two hypotheses guided the study. A quasi-experimental of pretest, posttest non-randomized control group design was adopted. A sample of 91 Junior secondary school II students drawn from two out of 12 public schools in their intact classes. Instrument Basic Science Performance Test (BSPT), which comprised 20-item multiple choice questions, was validated; a reliability index of 0.81 was obtained using K-21. A validated lesson plan used by research assistants and guided by the researchers formed the framework of instruction. The data obtained was analyzed with the necessary statistics (mean, standard deviation, t-test and

ANCOVA). The results showed an enhancement of performance of students using ethno-science based instruction; which further showed no significant difference in gender comparison. Based on the findings, conclusion and recommendations were made, encouraging the use of Ethno-science based instruction in science teaching.

Abumchukwu, Eke and Achugbu, (2021) investigated the effects of ethnochemistry instructional strategy on secondary school students' achievement in chemistry. Two research questions guided the study and three hypotheses were tested. The design of the study was quasi-experimental. The population of the study was 2,345 senior secondary school year two (SS2) chemistry students, out of which 94 were involved in the study. The instrument for data collection was Chemistry Achievement Test (CAT) validated by experts and which had a reliability coefficient of 0.73 established using Kuder-Richardson formula 20. The finding of the study revealed that there was significant difference in the mean achievement scores of the students in favour of ethnochemistry instructional strategy and gender had no significant influence of students' achievement. The present study is similar to the study under review in the areas such as study design, study variables and method of data collection. However, the current study is different in population, sample size and statistical tool used in the data analysis. Therefore, this study investigated the effectiveness of the Ethnosience instruction approach on the students and academic performance in Measurement in Basic Science within Jalingo education zone of Taraba State.

2. Materials and Methods

2.1. Area of the Study

The study area was carried out in Jalingo education zone, Taraba State, Nigeria. Jalingo Education Zone one of the education zone among the ten education zones in the state. The area was suitable for the study because it consists of several cultural practices and understanding which will permit the Ethnoscience instruction approach, availability of instructional media and qualify teachers in Basic Science.

2.2. Population of the Study

The population of the study was all upper basic three (3) within rural and urban schools in Jalingo education zone. These upper basic three (3) was coeducational schools to enable the researchers obtained gander participation in the experimental and control groups during the study.

2.3. Sample and Sampling

Two secondary schools was drawn from the secondary schools in Jalingo education zone of Taraba State through a simple random sampling. A total of eighty (80) upper basic three students drawn from two intact classes were involved in the study. In each school selected intact class of upper basic three Students were used. Out of the two secondary schools that was used for the study, one was assigned to the treatment group while the other was assigned to the control group through a simple toss of coin. In all, 40 students were used for treatment group and 40 students for control group.

2.4. Instrumentation

The Ethnoscience Measurement Performance Test (EMPET) was used in the study. Two tests was used to measure achievement of students, one a pretest which was used to test students' pre-requisite knowledge in topic (Measurement in Basic Science) related to the one which was covered during the study. The post-test was measured students' performance at the conclusion of the study. The objectives test was set to determine the achievement of the students before treatment and after the treatment. The pre-test assessed students' achievement on the topic list out for the research. The post-test was also assessed students' achievement on these topic. The Energy Flow Achievement Test consists of thirty (20) items was used to cover the topic. The multiple choice questions with five options each (A-E) will be used.

2.5. Validation of the Instrument

The instrument, Ethnoscience Measurement Performance Test, (EMPET) and the lesson plans was undergo validation from experts in Basic science lecturers and measurement and evaluation in order to determine its effectiveness in measuring what it was expected to measure.

2.6. Reliability of the Instruments

The reliability co-efficient for instrument was determined using the Kuder-Richardson Formula 21 which determines the suitability of the instruments for the study.

2.7. Administration

To control for possible pre-existing differences in overall ability between the treatment and control groups a pretest was administered to both groups before the commencement of the experiment in the respective schools. The treatment group was taught with Ethnoscience instructional strategy while the control group was taught with conventional approach using the same content outline for three weeks. Two tests were used to measure achievement: one a pretest will be used to test students' pre-requisite knowledge in the topic (measurement) related to the ones covered during the study. The post-test measured students' achievement at the conclusion of the study.

2.8. Method of Data Analysis

Data collected was analyzed using mean and standard deviation in answering research question. Hypothesis 1 was analysed using analysis of variance while 2 and 3 T-test statistics was used to test at 0.05 level of significance. The choice of the ANOVA and t-test statistic tool for hypothesis testing is because of their ability to identify differences that exists between two independent groups.

3. Results and Discussion

This chapter contains data analysis, result presentation and discussion. The analysis involves statistical testing of the research questions and hypotheses stated in chapters one and three. The level of significance 0.05 Level used for the analysis is $p \leq 0.05$. This level of significance forms the basis for retaining or rejecting each of the null hypotheses.

3.1. Data Presentation, Analysis and Interpretation

The data collected for the purpose of this study were analyzed based on the research questions using mean and standard deviation.

3.1.1. The first Question 1:

What is the mean score of Basic Science students' length measurement using ethnoscience and collaborative instructional strategy in urban and rural schools in Jalingo education zone?

The descriptive statistics of mean and standard deviation were used to answer this research question and the summary of the results is presented in Table 1.

Table 1: Mean and Standard Deviation of Posttest Scores of Urban and Rural Students in Experimental and Control Groups

Location	Treatment	N	Mean	SD	MD
Urban	Experimental	40	17.71	3.66	8.3498
	Control	40	9.36	4.17	
Rural	Experimental	40	17.16	2.68	8.4500
	Control	40	8.71	3.52	
Urban	Experimental	40	17.71	3.27	0.5478
Rural	Experimental	40	17.16	2.68	

The result in Table.1 presents a comparison of the means of experimental and control groups in the study. The urban experimental group recorded a mean score of 17.71 and a standard deviation of 3.66 in contrast to the urban control group with a mean score of 9.36. The mean difference between the two groups was 8.35. Similarly, the rural experimental group recorded a mean score of 17.16 and a Standard Deviation of 2.68 in contrast to the rural control group with a mean score of 8.71 and a mean difference 8.45. The two comparisons showed that there was relatively marked difference in performance between experimental groups and control groups in favor of the experimental groups that had higher means. However, the comparison of the performance means scores of experimental groups in urban and rural schools revealed a mean difference of 0.55. The difference in the scores between the experimental and control groups is an indication of the potency of ethnoscience strategy at enhancing academic performance among subjects in the experimental groups. Similarly, the performance of experimental group is an indication that the treatment had the potency of enhancing academic performance between urban and rural student.

3.1.2. The second Question 2.

What is the mean performance score of male and female students taught measurement using ethnoscience and collaborative instructional strategy in Jalingo education zone?

The descriptive statistics of mean and standard deviation were used to answer this research question and the summary of the results is presented in Table 2

Table 2: Mean and Standard Deviation of Posttest Scores of male and female Students in Experimental and Control Groups

	Gender	N	Mean	SD	MD
posttest	Male	38	16.54	3.41	0.91
	Female	42	15.63	3.58	

The results in Table 2 revealed that the means of female (15.63) and male (16.54) students' performance scores were relatively close with a mean difference of 0.91 in favor of the males students that had higher mean than that

of the female males. This showed that ethnoscience strategy had enhanced performance of concepts among female students than male students.

3.1.3. The third Question 3.

What is the interaction effect of gender and treatment on the students' performance in measurement using ethnoscience and collaborative instructional strategy in Jalingo education zone?

The descriptive statistics of mean and standard deviation were used to answer this research question and the summary of the results is presented in Table 3

Table 3: Mean and Standard Deviation of Posttest Scores of interactive effect of gender and treatment on Students in Experimental and Control Groups

Group	Gender	N	Mean	SD	MD
Experimental	Male	38	29.81	6.80	
	Female	42	29.74	5.64	0.07
Control	Male	38	16.55	4.40	
	Female	42	20.08	7.52	3.53

Table 3 shows the interaction effect of gender and treatment on students' performance in measurement. It shows that male students of the experimental group had a post-test mean score of 29.81 with a standard deviation of 6.80 while the male students of the control group had a post-test mean score of 16.55 with a standard deviation of 4.40. Similarly, female students of the experimental group had a post-test mean score of 29.74 with a standard deviation of 5.64 while female students of the control group had a post-test mean score of 20.08 with a standard deviation of 7.52. This shows that both male and female students of the experimental group had higher post-test mean scores than the male and female students of the control group.

3.2. Hypothesis Testing

In this section each hypothesis is re-stated, and the result of data analysis carried out to test it is presented. Each hypothesis of the study was tested at .05 level of significance.

3.2.1. Null Hypothesis 1.

There is no significant different in the mean score of Basic Science students' length measurement using ethnoscience and collaborative instructional strategy in urban and rural schools in Jalingo education zone

To test the hypothesis, the posttest performance scores of the experimental and control groups were subjected to Two Way Analysis of Variance. The result is shown in Table 4a

Table 4a: Two Way Analysis Variance for Posttest Scores of Subjects in the Experimental and Control Groups.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Collaborative	380.69a	3	126.90	98.14	0.001
Intercept	368.36	1	368.36	2.863	0.001
Location	18.82	1	18.82	11.46	0.023
Treatment	371.20	1	371.20	287.63	0.001
location * treatment	0.13	1	0.13	0.01	0.919
Error	269.11	80		12.91	
Total		429.00	80		
Corrected Total		64.80	78		

Significant at p>0.05

From Table 4a, the calculated F (1, 78) = 287.63; $p \leq 0.05$ revealed that there is significant difference in the academic performance of students in the experimental and control groups. Thus the null hypothesis is rejected. To establish the point of difference, the data was further subjected to Scheffe's multiple comparison. The summary of the comparison is in Table 4a.

Table 4b: Scheffe's Multiple Comparisons of the Posttest Performance Scores of Students in Experimental and Control Groups of Urban and Rural Schools.

(I) groups1	(J) groups1	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
Lower Bound			Upper Bound			
Experimental Urban	Control Urban	8.36*	0.67	0.001	6.45	10.25
Control Urban						
Experimental Rural	0.55	0.72	0.911	-1.50	2.54	
Control Rural	9.00*	0.68	0.001	7.08	10.92	
Experimental Rural	-7.83*	0.72	0.001	-9.85	-5.81	
Control Rural	0.65	0.68	0.826	-1.28	2.57	
Experimental Rural	Control Rural	8.47*	0.73	0.001	6.43	10.52

Result of the multiple comparisons (Table 4a) showed no significant difference in all the experimental groups at $p > 0.05$; however, it has persistently showed a significant difference between the schools in experimental groups and control groups at different p values. To be clearer, Table 4b further grouped the means into homogenous subsets in which schools in the experimental group are found clustered in a subset with higher mean scores while schools in the control group were clustered into a subset with lower mean scores. Thus the null hypothesis one was rejected. That is, there is significant difference in the academic performance of students taught with ethnoscience and those taught using collaborative strategy. This showed that the experimental groups had performed better than the control groups. It also confirms that ethnoscience is a viable approach to enhancing students' academic performance.

3.2.2. Null Hypothesis 2:

There is no significant different in the mean performance score of male and female students taught measurement using ethnoscience and collaborative instructional strategy in Jalingo education zone.

To test null hypothesis 2, the scores of the male and female students from both urban and rural schools of the experimental group were subjected to Independent Sample t-test statistic. The summary of the analysis is presented in table 5

Table 5: Present t-test Analysis of Posttest Scores Among Male and Female Schools of the Experimental Group.

Gender	N	Mean	Std. Deviation	df	t.cal	t.crit	P-value	Decision
Female	42	17.70	3.21					
				78	1.31	0.129	0.19	Not. Sig
Male	38	17.24	3.44					

From Table 5, the calculated $t(78) = 1.31$; $p > 0.05$ showed that there was significant difference between the academic performance of male and female students in both urban and rural schools of the experimental group. Hence, the null hypothesis is retained.

4.3.3 Null Hypothesis 3: There is no significant difference in the mean score of the interaction effect of gender and treatment on the students' performance in measurement using ethnoscience and collaborative instructional strategy in Jalingo education zone

The t-test was used to test this hypothesis, and a summary of the result is presented in Table 6

Table 6 Present t-test Analysis of posttest mean score of the interaction gender and treatment of Experimental group in measurement

Group	N	Mean	SD	df	t.cal	t.crit	P-value	Decision
Males posttest	38	25.14	3.21	78	1.546	0.127	0.000	Not sig
Females posttest	42	23.50	4.82					

Table 6 shows that the p is 0.127 which is greater than alpha $\alpha = 0.05$ with degree of freedom (df) = 78. This means that there was significant difference between the posttest scores of male and female exposed to ethnoscience teaching strategy. This implies that the performance level of male exposed to ethnoscience teaching strategy and their female counterparts is in favour of the male in this work. Therefore, null hypothesis three was retained.

3.3. Discussion Findings

Based on the data analyzed in this study, the following findings were obtained: There was significant difference between students exposed to ethnoscience strategy and those who were taught using collaboration strategy; there was significant difference between the academic performance of male and female students in both urban and rural schools of the experimental group also here was no significant difference between the mean scores of male and female students exposed to ethnoscience teaching strategy. This implies that the performance level of male exposed to outdoor teaching strategy is almost the same with their female counter parts.

The objective of this study was to investigate the Assessment of effectiveness of ethnosience and collaborative strategy on students of basic science education and academic performance in measurement inJalingo education zone of Taraba State, Nigeria. To achieve this, two groups of students were formed, the experimental and control groups. Students in experimental group were exposed to ethnosiecnce teaching strategy while those in control group were exposed to collaborative strategy. The two groups of students were taught same concept (measurement). The dada of this study where based on performance of students in Ethnoscience Measurement Performance Test (EMPET).The results of posttest was used to compare their performance according to the variable being measured which were analysed according to research hypotheses developed for the study. This unit presented explanation of results obtained from the hypotheses tested and acknowledged the published works of other authors to be stated herein after.

Table 4 revealed that the ethnoscience teaching strategy enhanced academic achievement of experimental group. This confirmed the findings of Yuliana, Muhammad, Cahyono, Widodo and Irwanto (2020) which stated that knowledge gains were found to be significant with experimental group using ethnoscience centre based learning teaching strategy more than their counter part that were strictly taught in the class using lecture method. In the study conducted by Abumchukwu, Eke and Achugbu, (2021) investigated the effects of ethnochemistry instructional strategy on secondary school students' achievement in chemistry confirmed that that there was significant difference in the mean achievement scores of the students in favour of ethnochemistry instructional strategy Fasasi (2017) indicated the Significant main effect of treatment on cognitive achievement in science [$F(1,339)=431.95$; $p<0.05$] with Ethnoscience instruction group performing better than the control group. This implies that the experimental group taught measurement concepts using the ethnosience approach retained the learnt concept higher than the control group taught the same measurement concepts using the collaborative strategy.

Table 5 showed that there was significant difference between the academic performance of male and female students in both urban and rural schools of the experimental group. Students taught using ethoscience teaching strategy retained more measurement concepts than those taught using collaborative strategy. This agrees with the study of Peni (2015) investigated the Impact of Ethnoscience-enriched-instruction on Attitude, Retention and Performance in Basic Science among Rural and Urban Students. The author found that Urban and Rural students in the experimental groups performed better than those in the control groups. Similarly, Urban and Rural students in the experimental groups had significantly better retention of learnt concepts. The study concludes that the instructional process is a viable innovation to the enhancement of rural and urban students" academic performance, retention of concepts and attitude to Basic Science and it is gender friendly. However, table 6 showed that there was no significant different between male and female experimental and control groups taught using ethnoscience and collaborative teaching strategies. This study is in conformity with the work of Eke and Achugbu, (2021) who said gender has on significant influence on the students' achievement in Chemistry when taught using ethnoscience strategy. This implies that the ethnoscience instructional process is a viable innovation to the enhancement of rural and urban students' academic performance of measurement concepts to Basic Science students and it is gender friendly.

4. Conclusion

Generally, it was confirmed that there was high significant difference between the mean scores of experimental and control groups in measurement concept. In addition, there was high significant difference between experimental and control groups in urban and rural students' performance. There is no significance difference between male and female in learning measurement concept using ethnoscience strategy. However, it was statistically shown that ethnoscience strategy favored experimental group in learning measurement concepts.

5. Recommendations

Based on the finding of the study recommendations were made that teaching and learning strategy involving local elements should be encouraged at

upper basic schools where this is often neglected; the use of ethnoscience strategy should be encourage in upper basic, hence it enhanced better performance; Ethnoscience strategy is gender friendly, it should be encouraged among Males and Females students at upper basic level and all materials needed for carrying out ethnoscience stratedy should be provided by government and cooperate organizations because it motivates students to learn effectively.

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