

8<sup>th</sup> International Conference of School of Science and Technology Education (SSTE)

FEDERAL UNIVERSITY OF TECHNOLOGY, MINNA

8<sup>th</sup>

INTERNATIONAL  
CONFERENCE

OF SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION (SSTE)

ISBN: 979-978-52341-0-7

CONFERENCE  
PROCEEDINGS

THEME:

EMERGING TRENDS IN STEM AND TVET IN  
THE 21<sup>ST</sup> CENTURY

DATE 6<sup>th</sup> – 8<sup>TH</sup> OCTOBER, 2021



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Prior Knowledge of Students in Mathematics as A Predictor of Academic Achievement in Physics Among Senior Secondary School Students in Abaji, FCT, Abuja. **Haruna Salihu Suleiman, Idris Haruna Alhaji, Bilkis Abubakar Suleiman & Koroka M.U.S**

Biology Practical Activities as Medium for Improving Academic Achievement of Senior Secondary School Students in Bwari Area Council of Federal Capital Territory. **Hajara M., Amina M., Saliha A.M. & Koroka M.U.S**

Gender Issues and STEM Education in 21<sup>st</sup> Century. **Iroadimma, C. E, Isah, A. F & Koroka, M.U.S**

Assessment of Secondary School Science Teachers Pedagogical and Content Knowledge (TPACK) in Minna Niger State. **Eze Emmanuel Ifeanyi; Yaki, A. A.; & Bello R. M.**

Chemistry Teachers' Self-Awareness as Correlates of Classroom Management Practices in Kwara State Senior Secondary Schools. **Limangba, I. J, Haruna, H. O, Adigun, O. P & Salaudeen, R. W.**

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Application of Learning Styles in Technical Education: Meta-Learning Perception. **Alawode, O. D., Ekhalia, B. J., Akinpade, O. A. and Iliya Udu**

Assessment of Extrinsic and Intrinsic Motivational Factors Among Science Teachers Attrition and Retention in Minna Metropolis Niger State. **Haruna, H. A., Bashir A.U., & Hassan A.A.**

SUB-THEME: Instructional Approaches in STEM and TVET, Application of Technical Vocational Education and Training in Science Technology Engineering Mathematics for the 21<sup>st</sup> Century Learning in North Central Nigeria. **Agada, A. M, Okoh Miller Adaga D.**

Strategies for Improving Students' Acquisition of Practical Skills in Electrical Installation and Maintenance Work Trade in Technical Colleges in Sokoto State. **Abubakar, Lawali Bado., Mamudu, A., Dr. S. A. Owodunni.**

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Availability and Utilization of Educational Resources for Effective Teaching of Electrical/Electronics' Technology at Minna Innovation Enterprise Institute of Niger State. **Mamudu, A., Haruna, S. S.; Mansur, A.D.; Raymond, E.; & Saba, T. M.;**

Teaching Method for Technical and Vocational Training Education: A View into Project- Based Learning in Nigeria. **Owolabi Sunday Oluwatosin; Basheer Garba Fagge; Usman Nazifi Lawan; & Usman Adamu Jabdo**



## **Biology Practical Activities as Medium for Improving Academic Achievement of Senior Secondary School Students in Bwari Area Council of Federal Capital Territory**

**Hajara M<sup>1</sup>., Amina M<sup>2</sup>., Saliha A.M<sup>3</sup>. & Koroka M.U.S<sup>4</sup>**

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### **Abstract**

*This paper investigated Biology practical activities as medium for improving academic achievements of senior secondary school in Bwari Area Council of Federal Capital Territory. The study adopted pretest posttest non-randomized quasi experimental design. Four research questions and two hypotheses guided the study. One hundred and twenty (120) senior secondary school biology students were sampled from the population of 900 SS II students. Four schools were sampled out of 20 Government Secondary Schools in Bwari Area Council of FCT – Abuja. Instrument for data collection was Biology Achievement Test (BAT) consisting of 21 multiple choice test items was constructed. The instrument was validated by three expert one in measurement and evaluation and two from biology education. The reliability test was done using kuder – Richardson (K – R20) which gave a reliability index of 0.74. The research questions were answered using mean and standard deviation while the hypothesis were tested using t – test. The findings of the study showed that students taught biology using practical activities performed better than their counterparts using conventional method. The result also showed that gender has significant difference on students' performance when taught with practical activities. The researcher therefore recommended that teachers should employed practical activities in teaching biology to enhance students' performance.*

**Keywords:** Biology practical, academic Achievement, Biology students.

### **Introduction**

Science is the bedrock of civilization and development of any nation. Nigeria as one, has made various efforts towards the realization of science, technology and mathematics (STM) educational objectives. Some governmental agencies like Department for International Development (DFID) and academic bodies such as Nigerian Educational Research Development Council (NERDC) and Science Teachers Association of Nigeria (STAN) are working conscientiously to realize the objectives of science education in Nigeria to enable the students acquire scientific literacy. Scientific literacy is the ability of individuals to be well informed and consequently live satisfactorily and conveniently in a techno-scientific culture. This implies an ability to think critically, solve socio-scientific problems and take part in collective decision making and communicate effectively in a socio-techno-science culture (Mbajjorgu, 2014).

Biology as a branch of science is the study of plants and animals. The knowledge of biology as a subject by secondary school students makes them well informed and motivated to assume roles in which the practical and theoretical aspects are used in unraveling some basic problems of life (Ude, 2011). But biology curriculum contains a lot of abstract concepts like photosynthesis, osmoregulation, genetics and osmosis. These causes frequent problems in conceptual instruction in biology lessons. The Chief Examiners' Report of WAEC and NECO 2013, 2014 and 2015 indicate poor performance of students in the sciences, biology inclusive. This calls for urgent



attention if we are to meet up with the challenging and rapidly growing wealth of scientific knowledge and sustainable development goals (SDG).

There is urgent need for innovations in our method of instruction. There should be a renewal of biology curriculum which will base on constructivist learning approach. Constructivism argued that knowledge can be obtained by individuals' active interaction and meaning can be formed based upon their experiences (Ibe, 2012). Students should therefore set up work and observe the concepts in biology lessons on their own through practical activities in the laboratory. Students tend to understand better when they have practical experiences, when they are involved in experiments; they tend to understand better and come to develop interest in biology as a course (Watts 2013).

Sam (2015) asserted that practical activities can be regarded as a strategy that could be adopted to make the task of a teacher (teaching) more real to the students as opposed to abstract or theoretical presentation of facts, principles and concepts of subject matter using varieties of instructional materials/equipment to drive lesson home. The use of practical activities (approach) to the teaching of biology should be compulsory for biology teachers so as to produce students who can acquire the necessary knowledge, skills and scientific competence needed to meet the scientific and technological demands of the society.

Nzewi (2016) and Aina (2018) observed that the laboratory is an indispensable organ of the school if effective teaching and learning of science subjects are to be achieved and laboratory is a room or building or a special period of time equipped and set apart for practical or experimental studies to take place". Ude and Onah (2017) said, "it is an instructional facility used by the teacher to help students learn about science and how scientists investigate the world around them. It provides learners with opportunities to design and execute investigation, engage in scientific reasoning, manipulate equipment, generate record and analyze data and then discuss results. This implies that science teaching and learning cannot be completely done in a secondary school where there is no equipped laboratory. This is the problem with government schools in rural areas. Practical activities help learners to understand more because the way human nature is, things done by self is difficult to be forgotten because the picture of the incident is always registered in the brain.

According to Ibe (2012), the American Association for the Achievement of Science (AAAS) developed a programmed known as 'Science a Process Approach (SAPA). This programmed was designed to improve children's skills in the process of science. The experimental approach provides the opportunity for students to seek information using experimental procedures. It calls for careful observation and interpretation of data and has the qualities of questioning, investigating and confronting the unknown. It is for the above reasons that the researchers decided to investigate the effect of practical activities on the academic achievement of senior secondary school biology students.

The incorporation of biology practical activities has been identified as the foundation of a good scientific programme which allows students in the school to have experience which are consistent with the goals of scientific literacy. Practical biology constitutes a major part in biology education and not taught properly, the education of students in other sciences might be affected negatively. Hence practical activities are very important for biology education but some obstacles like time,



money, stress and availability of equipment militate against its effective and efficient use in secondary schools in Bwari Area Council of Federal Capital Territory. Students taught biology theoretically without the practical aspect tend to lack scientific inquiry skills and invariably perform poorly in both internal and external examinations

The following research questions guided the study:

1. What is the difference in the mean and standard deviation scores of students taught biology using practical activities and manual (non-practical activities)?
2. What is the difference in the mean and standard deviation of male and female students taught biology using practical activities?

### Research Hypotheses

Two null hypotheses tested at 0.05 level of significance guided the study:

H<sub>01</sub> There is no significant difference between the mean achievement scores of students taught biology with practical activities and those taught using manual.

H<sub>02</sub> There is no significant difference between the mean academic achievement scores of boys and girls taught biology using practicals activities.

### Research Methodology

The study adopted a quasi-experimental design of non-randomized pretest – posttest, consisting of two schools used for the control group and two schools for experimental group. The population of the study consists of 900 students in 20 public secondary schools in Bwari Area Council of Federal Capital Territory. Purposive random sampling was employed to select 4 schools from Kubwa, Bwari, Mpape and Shere. 30 respondents from each of the selected schools make up a total of 120 respondents. The instrument for data collection was Biology Achievement Test (BAT) developed by the researcher based on the biology topic taught, food tests in food nutrients, selected from SS2 biology curriculum. This instrument was subjected to face and content validation by two experts in science education and measurement and evaluation. The reliability of the instrument BAT was determined using Kuder-Richardson (K-20). A reliability coefficient of 0.74 was obtained. Data was analyzed using mean and standard deviation for the research questions and ANOVA for testing the null hypothesis.

### Results

Research Question 1: What is the difference in the mean and standard deviation scores of students taught biology using practical activities and manual (non-practical activities)?

Table 1: Mean and standard deviation of biology students' scores of students taught biology using practical activities and non-practical activities.

Group	No	Pre-test		Post-test		
		X	SD	X	SD	Mean
Experimental Group	60	9.69	2.48	17.20	1.60	7.51
Control	60	9.88	2.05	16.59	1.88	6.71



Group	
Total	120

Table 1 shows that the pretest and posttest of the experimental group mean score are 9.69 and 17.20; and standard deviation scores of 2.48 and 1.60 respectively. However, the control group has pretest and posttest mean scores of 9.88 and 16.59 with standard deviation scores of 2.05 and 1.88 respectively. The mean gain for the experimental group is 7.51 while that of control group is 6.71 indicating superiority of the experimental group over the control group. This shows that use of practical's as a method of teaching biology help students develop scientific skills for problem solving.

Research Question 2: What is the difference in the mean and standard deviation of male and female students taught biology using practical activities?

Table 2: Mean and standard deviation scores of male and female students taught biology using practical activities.

Gender	N	Pre-test			Post-test	
		X	SD	X	SD	Mean
Male	60	9.13	1.73	14.86	1.55	5.73
Female	60	8.36	2.08	17.18	2.30	8.82
Total	120					

Table 2 shows that the pretest and posttest mean scores of the male are 9.13 and 14.86 with standard deviation of 1.73 and 1.55 respectively. The female has the pretest and posttest mean scores of 8.36 and 17.18, and standard deviation of 2.08 and 2.30 respectively. The mean gain for the male is 5.73 while that of the female is 8.82. This shows that female students perform better in practical work than their male counterparts.

### Hypothesis One:

H<sub>01</sub>: There is no significant difference between the mean achievement scores of students taught biology with practical activities and those taught using manual.

Table 3: Analysis of variance (ANOVA) for the mean achievement score of students taught biology with practical activities and those taught using manual.

Source of Variance	Sum of Squares (SS)	Degree of Freedom (DF)	Mean Square	F-Ratio
Between groups	153.60	2	76.8	2.13
Within group	18060.02	120	36.12	
Total	18213.62	198		

Table three showed the ANOVA table for the achievement scores of students taught with practical activities and those taught using manual. The calculated f-ratio is 2.13 and f-critical value for the 2-degree of freedom is 3.00. Since, the f-ratio calculated value (2.13) is less than the f-critical (3.00). Therefore, the null hypothesis of no significant difference between those taught with



practical activities and those taught using manual was not rejected. This meant that the difference among the means of those taught with practical activities and those taught using manual is not statistically significant.

**Hypothesis Two:**

Ho<sub>2</sub>: There is no significant difference between the mean academic achievement scores of male and female students taught biology using practical activities.

Table Four: Analysis of variance (ANOVA) for the mean and academic achievement scores of male and female students taught biology using practical activities.

Source of Variance	Sum of Squares (SS)	Degree of Freedom (DF)	Mean Square	F-Ratio
Between groups	133.50	2	67.08	3.13
Within group	17071.09	120	34.21	
Total	18033.62	198		

The table showed the ANOVA table for the mean academic achievement scores of male and female students taught biology using practical activities. The calculated f-ratio was 3.13 and f-critical value for the 2-degree of freedom was 2.90. Since, the f-ratio calculated (3.13) is higher than f-critical value (2.90). The null hypothesis of no significant difference between the male and female students taught biology using practical activities was rejected. This implied that the difference among the means of those male and female students taught biology using practical activities is statistically significant.

**Discussions**

Students in the experimental group that is those taught biological concepts using practical activities performed better than the control group (those taught without practical activity method). The active involvement of students in practical activities may have helped in enhancing and facilitating students' academic achievement in biology. The result also revealed that there is great difference between the experimental and control group in development of scientific skills for problem solving. This is in line with National Academy of Sciences (2010) which recommended that practical work was found to achieve higher than the non-practical in biology. The result of the null hypotheses from the ANOVA of the experimental group and control group with t-calculated 5.36 and t-critical 0.361 indicates that there is significant difference between the two groups. This is in line with Kibirige&Tsamago (2013) who recommended the use of practical method in fostering students' acquisition of science process skills.

In gender disparity, the study revealed that girls performed better than boys when taught using practical activities because the t-test used for the null hypothesis testing indicated that there is significant difference between the mean scores of boys and girls; and t-calculated (3.277) greater than t-critical (0.361 at 28 degree of freedom).

**Conclusion**

The results of the study indicated that significant difference exist between experimental and control group which suggests that students in the experimental group performed better than those taught



without practical activities. It was also found out that female students achieved higher than the male students in biology practical activities.

### **Recommendations**

Science students should be exposed to practical activities to enhance their academic achievement. Teachers should encourage students to develop interest in practical activities by engaging them in practical's and providing instructional materials that will challenge them to be involved actively and collaboratively during practical activities. Biology teachers should also train the science students on the use and proper handling of instructional materials to facilitate the process of transmitting knowledge, ideas and skills in biology practical activities. Government should equip laboratories while principals should provide biology teachers with fund for consumables. They should also sponsor biology teachers for STAN workshops/conferences.

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*8<sup>th</sup> International Conference of School of Science and Technology Education (SSTE)*

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