

Investigating the Implementation of Safety Practices in Biology Laboratories among Students and Lecturers of Colleges of Education in North Central, Nigeria

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ABSTRACT

The provision of a safety and functional laboratory is one of the major keys to successful learning of biological science. For the fact that, the inclusion of laboratory experience in the teaching and learning of biology, is vital. So, the question of safety of both staff and students during practical is worth paying attention to. The study investigated the implementation of safety practices in biology laboratories among students and lecturers in Colleges of Education in North-Central, Nigeria. Descriptive survey research design was used. The population of the study consists of all the 3,616 biology students and 96 lecturers within thirteen (13) public colleges of education in North Central. Multistage Sampling Techniques was used. Each state formed a cluster. Simple random sampling technique was used to draw the sample of 333 students and 56 lecturers. A Questionnaire with the reliability index of 0.76 obtained using Cronbach's Alpha method after trial testing was used. Data collected was analyzed using descriptive statistics which involved Mean and Standard Deviation. Hypotheses were tested using t-test. The result revealed that, biology students and lecturers comply with safety practices during practical sessions. However, on the part of Male and Female biology students, the result indicated a significant difference between them in which female students displayed a high level of compliance than the male. On the other hand, result from biology lecturers (Male and Female) indicated an insignificant difference between the two of variables. From the above finding, the study recommended that, students should be more safety conscious when it comes to laboratory activities. Lecturers should maintain the habit of good safety practices and improve on their knowledge of modern safety techniques. Seminars and workshops should be organized through which students and lecturer's safety knowledge is updated on regular bases or interval.

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INTRODUCTION

Science education remains the major navigator and cradle of any egalitarian society globally. Biology is an important science subject and a crucial subject for science and technological development of any Nation (Ali, 2014). Biology education plays important role in human development in various areas such as medicine,

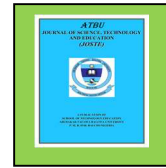
agriculture, environmental protection, food security and many more. The study of biology as a science course that is concerned with life processes is mainly accomplished through practical activities usually performed in well-equipped laboratories (Kuddus, 2013). Biology laboratory work is an active and interactive ways of teaching and learning method, which requires

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students to be involved in observing or manipulating real objects and materials, have a distinctive and central role for the development of students' understanding of biological concepts, improving their cognitive skills, developing positive attitudes as well as stimulate students to greater efforts of achievements (Hunt, Koender and ynnil, 2012). Laboratory activities are essential in the teaching of biology, as it stimulates students' interest as well as developing their scientific skills (Dillon, 2013). Safety perhaps, is an important prerequisite in general science and science education in particular. Having a safe and secure laboratory environment is a prime concern in conducting practical work and investigations in the field of science (Kadriya, 2017). Paying more attention to this aspect can minimize a lot of mishaps.

More so, the teaching of biology as a science subject in the laboratory is faced with some problems. Such problems include: the increasing number of students' enrollment into science courses in higher institutions which forced the limited facilities as well as teachers available to reduce allotted time to practical to minimal or even omit practical activities (Imogie, 2010). Some Teachers find it difficult during laboratory activities to supervise and teach large classes and combine the practical effectively with normal class lessons. On the part of Students, some of them have the problem of comprehending what is taught without the complementary laboratory activities in the area of biological science (Mayer, 2012). Most laboratory resources are sometimes lost, damaged or carelessly stored or handled. In some of these colleges, storage facilities are limited or not available entirely. In most cases, students are not allowed to make use of biology laboratories outside practical hours due to fear of damage or loss of valuable materials or otherwise in the laboratories.

Statement of the Problem

Several studies reveal that, laboratory safety is a growing concern in colleges of education and other tertiary institutions in Nigeria. Laboratories are been seen without safety considerations as an over-riding factor that viably

result to accidents. Poor safety practices among biology students in the laboratories, has been an issue of concern (Onu, Osuafor, and Obiator, 2022). These raised a lot of questions in respect of the students' adherence to safety rules and the overall general conduct when it comes to practical session or activity (Imogie, 2010). The number of professional lecturers in colleges of education is limited whereas competent and experienced lecturers sometimes cannot put in their best (their time, energy and resources) to achieve a sound biology practical due to their tie schedule, excess work load as well as limited quantity and quality of safety equipments.

Research Questions

The following research questions guided the study:

1. To what extent do biology Students comply with Safety Practices during practical sessions?
2. To what extent do biology Lecturers comply with safety practices during practical session?

Hypotheses

This following research Hypotheses guided the study:

- H₀₁** There is no significant difference in the implementation of safety practice between male and female biology students.
- H₀₂** There is no significant difference in the implementation of safety practice between male and female biology lecturers.

RESEARCH METHODOLOGY

The study used Descriptive Survey Research Design. The population of the study comprised of all the 3,616 biology students and 96 biology lecturers across all the 13 public Colleges of Educations in the North Central, Nigeria. Multistage Stage Sampling Techniques was used, as each state formed a cluster followed by Simple random sampling technique which was used to draw the sample of 333 students and 56 lecturers as participants of the study via the use of research

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advisor (2006) table. Safety Practice Questionnaire which was face and content validated by experts in the field of science education for appropriateness of items with the reliability index of 0.76 after trial test was used to address the research questions.

RESULTS

Data collected was analyzed using descriptive statistics that involved the use of mean

and standard deviation. While t-test, was used for testing the null hypotheses at 0.05 level of significance.

Research Question One: To what extent do biology students comply with safety practices during practical sessions in Colleges of Education in North Central?

Table 1: Mean and Standard Deviation of Student's compliance to Safety Practices during practical instruction in Colleges of Education in North Central

S/No	Items Description	N	Mean	Std. D	Remarks
1.	The students adhere strictly to the instructions given to them before and during practical session	333	3.46	1.191	Moderate Ext.
2.	The students wear their laboratory coat before entering the laboratory	333	3.05	1.186	Moderate Ext.
3.	The students wear flat shoes to the laboratory	333	3.47	1.054	Moderate Ext.
4.	Students confine long hair and avoid loose clothing	333	3.29	1.160	Moderate Ext.
5.	Students know how to check and spot when something goes wrong, and to whom they should report any problems	333	3.55	1.056	Moderate Ext.
6.	Students are given adequate orientation/enlightenment before accessing facilities	333	2.57	1.156	Low Ext.
7.	Students make use of hand gloves during the conducts of practical	333	2.72	1.088	Low Ext.
Average Mean			3.02		

Mean ≥ 3.00

Table 1 shows Student's Compliance to Safety Practices in biology laboratory during practical session. The outcome of the mean values indicated positive responses of the biology Students in relation to Safety Practices during Practical sessions. The students adhere strictly to the instructions given to them before and during practical session. The students wear their laboratory coat before entering the laboratory. Students also know how to check and spot when something goes wrong, and to whom they should report problems if any. However, Students are not given adequate orientation/enlightenment before

accessing facilities. So also, Students do not make use of hand gloves during the conducts of practical (considering the obtained mean of 2.57 and 2.72). The overall mean shows that, with the limited of safety equipment/resources availability in the laboratories, biology Students comply with safety practices during practical session.

Research question two: To what extent do Lecturers in biology department of the colleges of education comply with safety practices during session?

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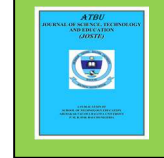


Table 2: Mean and Standard Deviation of Biology Lecturers on compliance to safety practices during practical sessions in Colleges of Education in North Central

Items Description	N	Mean	Std. D	Remarks
1. Lecturer supervise the learners during practical activities in the biology laboratory	333	3.65	1.067	Moderate Ext.
2. The Lecturer gives out detailed instructions to the student before and during practical work	333	3.04	1.163	Moderate Ext.
3. Reagents used during practical are Labeled	333	3.23	1.149	Moderate Ext.
4. In the case of biological agents, lecturers plans specify appropriate decontamination and disinfection procedures	333	3.46	1.109	Moderate Ext.
5. Lecturers do not give students adequately training in regards to safety procedures on how to contact the emergency services.	333	2.60	1.086	Low Ext.
6. Smoking, eating, drinking and the application of cosmetics are not been prohibit in the lab	333	2.50	1.124	Low Ext.
Average Mean		3.08		

Mean ≥ 3.00

Table 2 shows Lecturer's compliance to Safety Practices in biology laboratory during practical session, the outcome of the mean values indicated positive responses of the biology Lecturers in relation to Safety Practices during Practical sessions. These includes supervising students on the conduct of core practical, all reagents are labeled. On the other hand, it was revealed that most of the biology Lecturers does not give Safety instruction/warning during the conducts of practical. The biology Lecturers also, do not introduce or expose students to adequate training in regards to safety procedures specifically how to contact the emergency

services considering the output (mean value of 0.46) obtained which is below the benchmark. In the same vein, biology lecturers do not observes students habits like eating, application of cosmetics and its likes during practical session. The overall mean shows that, biology lecturers also comply with safety practices during practical session.

H₀₁ There is a significant difference in the Implementation of safety practice between Male and Female Biology Students in biology laboratories in north central Nigeria.

Table 3: T-test on Compliance with Safety Practice between Male and Female Students

VARIABLES	N	Mean	SD	DF	t	P-value	Remark
Male students	179	22.5810	4.72715	331	-3.118	0.006	Rejected
Female students	154	24.1364	4.07939				

P < 0.05

Table 3 shows a computed independent t-test for the differences in mean performance scores for the implementation of safety practice between male and female biology students in biology laboratory of colleges of education in North-Central. The result indicated a significant difference between the two variables (t (331) = -

3.118, p = 0.006 < 0.05). Therefore, the null hypothesis was rejected.

H₀₂ There is no significant difference in the implementation of safety practice between male and female biology lecturers in the laboratories.

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Table 4: T-test on Compliance with Safety Practice between Male and Female Lecturers

VARIABLES	N	Mean	SD	DF	T	P-value	Remark
Male lecturers	29	29.6207	2.09444	56	9.493	.361	Accepted
Female lecturers	27	24.9259	1.54237				

P>0.05

Table 4 shows a computed independent t-test for the differences in mean performance scores of implementation of safety practice among male and female biology lecturers in biology laboratories in colleges of education in North-Central. The result indicated insignificant difference between the two variables ($t(54) = 9.493$, $p = .361 > 0.05$). Therefore, the null hypothesis was accepted.

DISCUSSION OF FINDINGS

The study unveiled that, the extent to which biology students comply with safety practices during practical session. The obtained indicated that, biology students comply with safety practices in biology laboratories in colleges of education in north central Nigeria. The conduct or level of both female and male biology student's compliance was on the average. However, the null hypothesis (H_{01}) shows that, female biology students have higher compliance level when it comes to safety adherence than the male biology students. Thus, there is a significant difference between the female and male biology students in the compliance with safety practices in biology laboratories in colleges of education in north central Nigeria. This happened to be in line with the revelation made by Ayeni (2020). The disparity between genders may likely be more pronounced or noticed when adequate safety equipments are made available in the colleges' laboratories.

The finding also disclosed that, biology lecturers also comply with safety practices in the laboratory during practical sessions. However, biology lecturers do not give adequate safety instruction to the students as well as deterring them from eating, applying cosmetics and it's like during practical session. This coincides with the findings of Ngozika and Ezeobi (2024). The null hypothesis (H_{02}) also unraveled that, there is no significant difference in the safety compliance

between female and male biology lecturers in colleges of education in north central during practical session.

Finally, the study provided an in-depth understanding of the current state of safety practices and has the potentials to inform future initiatives and policies aim at promoting safety and the well being of both students and lecturers in biology laboratories in Colleges of Education in the North Central.

RECOMMENDATIONS

The following recommendations were outlined based on the research findings:

1. Student (most especially male) should be given adequate orientation/enlightenment on the need to maintain and improve on safety rules and adherences (safety practices) while in the laboratory.
2. Lecturers should maintain the habit (tempo) of good safety practices and improve on their knowledge of modern safety techniques.
3. There should be an avenue through which biology students and lecturer's safety knowledge are updated. This could be through seminars and workshops that might be on regular bases or interval.

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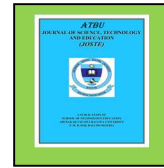
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