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Implementation Of Safety Pratices In Biology Laboratories In Onitsha North Local Government Area Of Anambra State

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ABSTRACT

This study investigated the extent of the implementation of safety practices in Biology Laboratories in Onitsha North L.G.A of Anambra State. A survey research design was adopted for the study. The population comprised 1765 students and 10 Biology teachers randomly selected from 10 secondary schools in Onitsha North Local Government Area. Four research questions were answered. The instrument for data collection was questionnaire, a 4- point Likert scale questionnaire was used for data collection. This was validated by two experts one being a Biology lecturer from Biology Department, Nwafor Orizu College of Education, Nsugbe. The reliability of the instrument was established using Cronbach Alpha Coefficient which gave value of 0.76 and 0.78 respectively. Data collected were analyzed using mean. The results showed among others that students observe safety practice skills while in Biology laboratories, it also revealed that these safety skills help them to avoid accident in laboratories as well as help to improve the students' knowledge of the subject while it creates expertise on the side of the teachers. Based on the findings, it was recommended among others that students should be provided with safety gadgets in case of any danger. If provided with the adequate safety laboratory gadgets, students can practise a higher level of safety practices while in the laboratory.

Keywords: biology, safety practices, laboratories

INTRODUCTION

Biology is a very broad subject that employs various other sciences, like mathematics, physics and chemistry in understanding some complex realities. It is also a research- intensive field because it encompasses diverse subfields, requires hands- on experimentation, intersects with other scientific disciplines, continuously evolves with new technologies, and emphasized original research in graduate programs. Biology, as a field of science, helps us understand the complexities of living organisms, their interactions with each other and their environments, and the underlying mechanisms of life process, which is crucial for advancements in health, agriculture, conservation and biotechnology.

Biology is the scientific study of life and living organisms, encompassing their structure, function, growth, evolution, distribution and interaction with their environments. Hillis (2020),defined biology as the scientific study of life. It is a natural science that deals with the living things, how living things are structured, how it functions and what these functions are how it develops, how living things came into existence and how they react to one another and with their environment Umor, (2021). It is a pre-requisition subject for many science related courses that contributes immensely to the technological growth of the nation (Ahmed, 2022).

Safety practices are systematic procedures and guidelines designed to minimize risks and protect individuals from harm in various environments, ensuring a secure and effective operational framework.

According to the European Agency for safety and Health at work (2024), Safety is defined as the state of being safe, ie freedom from the importance of safety measure in every activity of individual cannot be over emphasized as they prevent injuries and illnesses, ensure compliance with regulations, build trust and reduce stress, enhance productivity, save costs, and promote a positive work environment. It forms an integral part of individual understanding. Laboratory activities demand adequate safety measures in order to overcome risk associated with hazardous materials, prevent accidents, compliance with regulations and promote culture of safety that enhance overall operational efficiency and protects the well-being of all individuals involved. This can be achieved either by the teachers or students Aminu(2019) maintain that most laboratory hazards can be reduced by good value judgment, careful manipulation, adequate supervision and most of all the knowledge of how to use the safety materials or device present in the laboratories. It is obvious that anyone who is not alert and safety conscious stands the greater risk of turning a minor hazard into an accident which might be fatal. To ensure safety in our biological science laboratories students and teachers should be well. Informed of the safety practices and how to operate simple safety gadget during emergency. Also there is the need that these safety gadgets be constantly checked to ensure proper functioning during emergency.

Laboratories serve as critical centers for scientific research, diagnostics and education, enabling the analysis of biological specimens, conducting experiments and supporting healthcare through accurate testing and data analysis. They play a vital role in disease surveillance, medical research and development of new technologies and treatments ultimately contributing to advancements in public health and safety. A school laboratory is an instructional facility for helping pupils learn what science is and how the scientists work (Archohold, 2019).

In the study of Biology, the equipments and facilities to which students are exposed are very important. It is believed that students with rich background in terms of exposure to many and varied equipment and facilities have advanced intellectual developments than the less privilege ones (Fafunwa, 2017).

Laboratory according to the world book encyclopedia is defined as a facility designed for conducting scientific research and experiments. It is equipped with specialized instruments and tools to facilitate various scientific disciplines including chemistry, biology and physics. Laboratories provide controlled environments for experimentation, analysis and measurement, serving educational institutions, research organizations, and industrial applications. Science laboratory is not confirmed to a room. With sink and fitting for experiment but rather, it includes any place in the field, stream near school, garden or workshop especially equipped and set aside for the function it is intended to serve (Danazumi, 2022).

Practical works and safety practices are concurrently in laboratories. This is reflected in one of the objectives of the adequate practical teaching in biology science, which is to teach public how to handle safety materials that could be dangerous. Child center activity method is one of the recognized methods of teaching biology. This method of teaching ensures a high degree of student participation. The success of practical lesson and the realization of the positive goals of teaching biology in secondary school depend on the measure taken to measure the safety of both the students and teachers (Ahmed, 2018).

Conclusively, many lives can be saved if necessary safety measures are considered or taken appropriate in the biology lessons or practical's.

Statement of the Problem

Despite the critical importance of safety practices in biology laboratories to prevent accidents and ensure a safe learning environment, there is a noticeable lack of adequate safety measures and awareness among teachers and students in the Onitsha North Local Government Area. This inadequacy may lead to increased risks of accidents, injuries and health hazards during laboratory activities. Additionally, factors such as insufficient training, lack of safety equipment, and poor laboratory design. Further exacerbate these issues, therefore it is essential to evaluate the current state of safety practices in these laboratories

and identify gaps that need to be addressed to enhance safety standards and compliance with established regulation.

Purpose of the Study

The purpose of the study is to safeguard the well- being of students, enhance the quality of biology education, ensure regulatory compliance, and inspire a new generation of biologists by improving safety practices in secondary school biology laboratories in Onitsha North L.G.A of Anambra state.

Specifically, the study seeks to:

1. Find out the extent of application of safety practices in Biology Laboratories by students.
2. Improve the safety of students in Secondary School biology laboratories, by identifying shortcomings in safety practices and proposing solutions.
3. Determine the level of compliance of safety practice applications in biology laboratories by teachers and students.
4. Ascertain the benefits of safety practices in Biology laboratories for teachers and students

Significance of the Study

The study on the implementation of safety practices in biology laboratories in secondary schools holds significant implication for various stakeholders. It ensures that students can learn in a safe and secure environment, thereby enhancing their overall well- being and academic performance. This study also plays a vital role in providing educators and laboratory staff with the necessary training to promote safety and instill a culture of responsibility. Furthermore, it reduces legal and ethical liabilities for schools and contributes to the safety of the broader community. By inspiring students to pursue careers in the life sciences, it fuels the growth of the field and prepares them to tackle emerging biological and environmental challenges. Additionally, the study's findings can influence resources allocation, education policy, and reforms, leading to more effective science education and safer laboratory practices.

Overall, the significance of the study lies in its potential to create a safer more effective, and more inspiring learning environment for students, while also ensuring legal compliance, promoting community well-being and contributing to the growth and development of the field of biology.

Research questions.

1. To what extent are safety practices applied in Biology laboratories by secondary school biology students?
2. To what extent can the safety of students in secondary school biology laboratories be improved?
3. What is the level of teachers and students' compliance on the application of safety practices in biology laboratories?
4. What benefits do safety practices place on students while in Biology laboratories?

METHOD

The design for this study was survey research design. The population of the study consisted of 1965 students and 49 teachers. The sample size comprises 250 Biology students and 10 Biology teachers randomly selected from 10 secondary schools in Onitsha North Local Government Area. Structured questionnaire which was validated by experienced staff from department of biology and education, both from Nwafor Orizu College of Education Nusgbe. The instrument for data collection was questionnaire, a 4-point likert scale questionnaire was used for data collection. The reliability of the instrument was established using Cronbach Alpha Coefficient which gave value of 0.76 and 0.78 respectively. The researcher administered the questionnaires to the respondents, through direct delivery technique (DDT). This was to ensure high rate of questionnaire return at the end of the exercise, to ensure that respondent completed the questionnaires given to him/her rather than being influenced by others. Data collected were analyzed using mean. The mean rating of 2.50 was adopted as the point 2.50 is accepted while any score that is below 2.50 is rejected.

RESULTS

Results of the study are presented in table according to research questions.

Research question One: *To what extent are safety practices applied in Biology laboratories by secondary school biology students?*

Table 1: Mean ratings on the extent of safety practices applied in Biology laboratories for secondary school Biology students.

S/N	Items Statements	SA	A	D	SD	X	Decision
1	Students wear safety spectacles of the laboratory	74	129	52	35	2.83	Accepted
2	Students use laboratory coat during experiment	112	125	37	16	3.15	Accepted
3	The laboratory environment is good enough to enhance the understanding of safety practices in the laboratory	64	79	96	51	2.54	Accepted
4	The students do carry out practical classes	79	102	69	40	2.52	Accepted
5	Students are careful not to smell the odour of chemical property	80	70	62	78	2.59	Accepted

Table 1, shows that items 1, 2,3,4,5, have the mean of 2.83, 3.15,2.54 and 2.59 respectively. All the mean were accepted because their mean range is above the cut off mark that is 2.5. Therefore, students apply safety range to a significant extent.

Research Question Two: *To what extent can the safety of students in secondary school biology laboratories be improved?*

Table 2: Mean rating on the extent can the safety of students in secondary school biology laboratories be improved.

S/N	Items Statements	SA	A	D	SD	X	Decision
6	Get to know your laboratory equipment best practices	65	129	72	28	3.86	Accepted
7	Be reassured you glassware is secure	109	81	93	7	3.33	Accepted
8	Fire prevention equipment and training available	69	112	48	61	2.65	Accepted
9	Everyone must wear personal protective equipment	112	125	37	16	3.15	Accepted
10	Keep proper safety documentation accessible	79	102	69	40	2.52	Accepted

Table 2 shows that items 6,7,8,9 and 10 have the mean values of 3.86, 3.33, 2.65, 3.15 and 2,52 respectively. This shows that safety practices of students in secondary school biology laboratories be improved to a significant extent.

Research Question Three: *What is the level of teacher's and students' compliance on the application of safety practices in Biology Laboratories?*

Table 3: mean ratings on the extent of teacher's and students' compliance on the application of safety practices in Biology Laboratories.

S/N	Items Statements	SA	A	D	SD	X	Decision
11	Teachers ensure that glass wares and other equipment's are kept away from the edge of the laboratory table	81	109	22	78	2.67	Accepted
12	Teachers make sure that gas leakage is avoided to prevent fire outage in the laboratory.	39	51	123	77	2.18	Accepted
13	Teachers conduct experiments in batches in the case of numerous students	129	97	34	30	3.12	Accepted
14	Teachers read out safety rules before commencing each laboratory class	33	57	132	68	2.19	Rejected
15	Teachers appoint group heads to help in monitoring the class	76	85	99	30	2.71	Accepted

Table 3, shows that items 11, 12, 13, 14 and 15, have the mean of 2.67, 3.12 and 2.71 respectively. Three (3) were accepted because their mean average is above the cut off mark 2.5 and two (2) rejected because their mean average is below 2.5 which is the cut off mark. Therefore, teachers ensure that glass wares and other equipment's are kept away from the edge of the laboratory table, teacher conduct experiments in batches in the case of numerous students, teachers appoint group heads to help in monitoring the class, but unfortunately teachers do not make sure that gas leakage is avoided to prevent fire outage in the laboratory and teachers do not read out safety rules before commencing each laboratory class.

Research Question Four: *What benefits do safety practices place on students while in Biology Laboratories?*

Table 4: mean ratings on the extent of benefits do safety practices place on students while in Biology laboratories.

S/N	Items Statements	SA	A	D	SD	X	Decision
16	Students learn to perform the experiment alone in the laboratory	65	125	72	28	3.86	Accepted
17	Student that apply safety practices in the laboratory understand the negative effects of hazardous chemicals	90	100	42	58	2.77	Accepted
18	Students breed the spirit of carefulness	129	97	34	30	3.12	Accepted
19	Safety practices helps the students both in the laboratory and in the wider society among themselves.	76	85	99	30	2.71	Accepted
20	Safety practices helps breed easy and fast experimental results.	94	96	53	47	2.82	Accepted

Table 3, shows that items 11, 12, 13, 14 and 15, have the mean of 3.86, 2.77, 3.12, 2.71 and 2.82 respectively. All the mean were accepted because their mean coverage is above the cut off mark that is 2.5. Therefore, its shows that students have a good knowledge of the importance of safety practices in the laboratory.

Summary of major findings

From the research questions that have been analyzed, the following were results discovered. The researcher found out:

- That safety practices are significantly applied in biology laboratories by secondary school biology students.
- Safety of students in secondary school biology laboratories in significantly improved.
- The level of teacher's and student's compliance on the application of safety practices in Biology laboratories are very high .
- There are a lot of benefits of safety practices on students while in Biology laboratories.

DISCUSSION OF FINDINGS

Research question one revealed that safety practices are applied in biology laboratories by secondary school Biology students. The table 4.1 shows the mean value of biology teachers and students' responses to the research question one, which demonstrate that the current safety practices put in place by the school are being obeyed by the teachers and students. This finding agrees with Schnelder, (2013) who found out that safety laboratory practices in Biology laboratories help boost students' knowledge in Biology and biology equipments because they know the names of all the equipment and reagents and they adequately use the laboratory equipment.

Research question two revealed that safety practices of students in secondary school biology laboratories can be improved. The table 4.2 shows the responses and mean value of the response of the teachers and students which indicates that students now know the laboratory equipment and its best practice, they are

always assure that glassware are secure, all students and teachers now wear protective equipment, and also keep proper safety documentation accessible. Based on research conducted by Prayitno (2017), the student's low knowledge of laboratory equipment and materials is due to the limited time allocation for explaining the name, function, procedure to use the laboratory equipment and the characteristics of laboratory chemicals. The manual used in practicum activities only lists the equipment and materials without explaining the name, function, procedure to use the equipment as well as the characteristics of laboratory chemicals.

Research question three revealed the level of teachers and students' compliance to the application of safety practices in Biology laboratories. The table 4.3 show that teachers and students ensure that glass wares and other equipment's are kept away from the edge of the laboratory table, teachers and students conduct experiments in batches in the case of numerous students, they also appoint group heads to help in monitoring the class. This agrees with Caesac,(2011) who revealed that safety practices in the laboratory will ensure safety of lives to both the teachers and students, it will also reduce spoilage to the laboratory equipment. But regrettably, teachers and student do not make sure that gas leakage is avoided to prevent fire outage in the laboratory and also do not read out safety rules before commencing each laboratory class.

Research question four reveal the benefit of safety practices place on students while in Biology laboratories. 4.4 shows that student learn to perform the experiment alone in the laboratory, students that apply safety practices in the laboratory understand the negative effects of hazard our chemicals, students breed the spirit of carefulness, safety practices help the students both in the laboratory and in the wider society among themselves, safety practices help breed easy and fast experimental results. This is in line with Onawola, (2014) who revealed that even though teachers face the problems of lack of equipment in the laboratory, optimum use and preservation of the available laboratory equipment are the top priorities of teachers.

CONCLUSION

Safety practices will help boost students' knowledge of safety in Biology laboratory and expose them on the need to be more safety conscious with laboratory equipment and other chemicals. This will help in the attainment of the stated aim and objectives of education for the citizenry. If Biology teacher apply the knowledge gained on safety practices in the laboratory, a lot of degree will be averted during practical classes.

RECOMMENDATIONS

Having the findings of this study in mind, the researcher submits the following recommendations.

Based on the findings, the following recommendation were made:

1. Government should equip each school's laboratory with safety gadgets and other laboratory equipment.
2. A monitoring team should be set up to ensure that the safety practices are applied during biology practical classes.
3. Every school should have an accident record book. This is very vital in keeping the records of accidents that occurred in the laboratory.
4. Teachers should attend seminars, workshops and conferences where they can acquire more knowledge on safety practices in biology laboratory classes.

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