

**EXTENT OF IMPLEMENTATION OF SAFETY PRACTICES IN BIOLOGY  
LABORATORIES AMONG SENIOR SECONDARY SCHOOLS IN MINNA  
METROPOLIS**

**BY**

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## **ABSTRACT**

*The topic of this study is the extent of implementation of safety practices among senior Secondary Schools in Bosso Local Government Area of Niger State. There has been a persistent decline in implementing safety practices to a large extent in the biology laboratories among senior secondary schools. This ugly trend has been of great concern to the government, educators and the society. The purpose of the study is to identify the extent of implementation and adherence to safety practices in biology laboratories. The design of the study was a descriptive survey research. The area of the study is Minna metropolis. The population of the study consist of 15 Secondary Schools from which 5 schools were selected from the population. The researcher randomly selected 100 respondents. A sample size of 75 students and 25 teachers was used. The instrument used for data collection was questionnaire. The data collected was analyzed using simple mean which significantly guided the study. The researcher found out that safety practices is poor and is not encouraging during practical. The researcher recommended that the Government should increase their funds in assisting the school management for a suitable laboratory building and the school administration should send science teachers for training through seminar and workshop.*

## **CHAPTER ONE**

### **1.0 INTRODUCTION**

#### **1.1 Background to the Study**

Biology is an important science subject and a crucial subject for science and technological development of any Nation (Ali, 2001). The essence of biology as a scientific subject lies in the fact that it is concerned with life processes and encompasses all biological sciences. Biology leads to proper understanding of the world around us, including its infinite natural resources. This is necessary for the realization of a healthy, productive and happy life which should be the ultimate aim of education (Ajayi, 2004). Having this at the back of our minds, the teaching and learning of biology should be accomplished with hands on activities as it forms the background to the study of a good number of applied sciences.

Practical demonstrations help in enhancing concept acquisition in pupils and in the long run, help to reduce the degree of abstraction usually ascribe to the sciences (Achunine, 1998). The laboratory thus, become an important educational medium of achieving this goal. A laboratory is often seen as a place where experiments in science are carried out (Ali, 1998). The biology laboratory is a room or a building in a school, college etc set aside for scientific investigation and conduction of practical activities in biology. The central role of laboratory instructions as identified by Voss (1982) is to provide illustrations of some basic principles and to teach the students the application of the principles so acquired. A high quality biology laboratory programme enables students to develop good judgments self reliance, critical thinking, technical, analytical as well as manipulative skills through personal contact with apparatus and materials (Ajayi, 2004).

Clark and Neave (1992) reported that laboratories are potentially “dangerous” places and only constant vigilance and efficient working techniques by all those using them can ensure that accident do not occur. A laboratory needs to be well organized so that a climate for investigating scientific concepts will exist. Such a climate ensures that the laboratory is safe for those using it. Since laboratory environment is for man, accidents and injuries are bound to occur. Therefore the teacher and all that are concerned in any science laboratory are responsibly committed to teaching his/her students how to handle chemicals and materials, so as to bring about reactions and/or results in a safe manner. The importance of safety measure in every activity of individual cannot be over emphasized. It forms an integral part of individual understanding. Laboratory activities demand adequate safety measures in order to overcome danger. This can be achieved either by the teachers or students. Aminu (1982) 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 material or device present in the laboratories. It is obvious that anyone who is not alert and safety conscious stand 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 practice and how to operate simple safety gadgets during emergency. Also there is the need that these safety gadgets be constantly checked to ensure proper functioning during emergency.

According to Bryd (1994) any curriculum established on the needs of the child must inevitably give attention to the field of safety or be guilty of neglecting learning experiences of the greatest possible significant. The emphasis in safety practices should be upon practical ways of preserving life. Most of the accidents, hazards, injuries that occurs in our secondary schools

biology laboratory result from; Inadequate knowledge of safety rules, insufficient skills where in persons attempt what is beyond their ability level, improper attitude or carelessness.

The teacher should endeavor to inculcate safety knowledge and practices into their students, so that they can develop a philosophy of safety that emphasizes positive rather than negative habits (Bryd, 1994). Safety practices can be explained to mean the process of averting danger. (Hornby, 2003). It is obvious that anyone who is not safety conscious stands the greatest risk of turning a minor hazard into an accident which could be fatal. On this note, Bryd (1994) outlined some safety practices which include; development of habits which will prevent accidents, developing habits which will lead to happier healthier living.

## **1.2. Statement of the Research Problem**

Since the inclusion of laboratory experience in the teaching and learning of biology, the question of both staff and students during practical work have become crucial. Biology laboratories have been established in some Nigeria secondary schools without safety considerations in their designs and constructions (Abdullahi, 2000). Poor safety practices in biology laboratories have led to accidents such as glass breaking, skin contact with specimens and chemicals, injury, fire out breaks and even death. In the light of the above, it is therefore necessary to investigate the extent of implementation on safety practices in biology laboratories in using randomly selected secondary schools in minna metropolis.

## **1.3. Aim and Objectives of the Study**

The study aimed at examining extent of implementation of safety practices in biology laboratories among senior secondary school in minna metropolis.



1. The extent to which the general design and fittings of biology laboratories are relevant to safety.
2. The extent of availability of safety equipment and materials in biology laboratories.
3. The extent to which students implement the safety practices.

#### **1.4 Research Questions**

The study was guided by the following research questions:

1. To what extent do the type of design and fittings in the biology laboratories appropriate to ensure safety?
2. To what extent are safety equipment available in the biology laboratories?
3. To what extent do secondary school biology students implement safety practices during practical sessions?

#### **1.5 Significance of the Study**

The result of this study will provide information on how to implement necessary safety practices in biology laboratories. It is also of a great benefit to the students, Biology teachers, Educational administrators and higher institutions. Students would be educated on the observance of safety practices; the school authority and government would ensure that the needed fittings design and safety equipment's are supplied to the biology laboratories to ensure safety of laboratory users. In addition experienced laboratory attendants would be employed instead of drafting clerical assistants to act as laboratory attendants. Accidents are common in biology laboratories. Appropriate safety practices can reduce tremendously the rate of accidents and hence guarantee the safety of lives.

Teachers and students sometimes find themselves helpless when it come to safe handling of accident situation. Therefore, this work will provide students and teachers with knowledge and skills on safety measures in biology laboratories. The work will also enlighten students, teachers, science supervisors, and ministry of education on how to ensure safety practices in biology laboratories. This will also serve as a guide to many biological teachers and laboratory attendants on appropriate steps to take in biology laboratories. This work will serve as guide for references to any student that intends further work on this issue

### **1.6. Scope of the Study**

The geographical scope of this study is Bosso metropolis of Niger state, public secondary schools in Bosso metropolis was used for the study. The class used was SS3 and the choice of the biology laboratory while dependent variable are extent of implementation of safety practices while moderating variable is gender.

### **1.7. Operational Definition of Terms**

**Extent:** The point or degree to which something extends.

**Implementation:** The act of accomplishing some aims or executing some order.

**Safety:** The state of being certain that adverse effect will not be caused by some agent under condition.

**Practices:** A customary way of operation or systematics training by multiple repetition.

**Laboratory:** A workplace for the conduct of scientific research.

## CHAPTER TWO

### 2.0 LITERATURE REVIEW

In this chapter, relevant literature to the implementation of safety practices in biology laboratory among secondary school in minna. The major area reviewed under this study includes the following sub-headings below:

- Conceptual Framework
- Theoretical Framework
- Empirical Framework
- Summary of literature review

### 2.1 Conceptual Framework

#### 2.1.1 Concept of Biology

Biology, also referred to as the biological sciences, is the study of living organisms utilizing the scientific method (Howell and Elizabeth 2014) Biology examines the structure, function, growth, origin, evolution, and distribution of living things. It classifies and describes organisms, their functions, how species come into existence and the interactions they have with each other and with the natural environment. Four unifying principles form the foundation of modern biology: cell theory, evolution, genetics and homeostasis. Biology as a separate science was developed in the nineteenth century, as scientists discovered that organisms shared fundamental characteristics.

Biology is now a standard subject of instruction at schools and universities around the world, and over a million papers are published annually in a wide array of biology and medical journals.

Most biological sciences are specialized disciplines. Traditionally, they are grouped by the type of organism being studied: botany, the study of plants; zoology, the study of animals; and microbiology, the study of microorganisms

### **2.1.2 Concept of Biology laboratory**

So many researchers have defined laboratory in different ways but all the definitions come to give the same meaning. Ardo (2004) defines school laboratory as an instructional facility for helping pupils to learn what science is and how scientists work. Bello in Oguntona (2001) said that nature should be a laboratory and that learning of science should be through inquiry rather than dogma. This will help for logical, critical and independent thinking. Adeyemi (2006) sees science laboratories to be central to the teaching of science in the secondary schools. Akano and Nma (2003) defined laboratory as a place where people engage themselves in human enterprise to examine and explain natural phenomena. Laboratories have been found to be a primary vehicle for promoting formal reasoning, skills and students' understanding, thereby enhancing the desired learning outcomes in students. (Ogunleye, 1999). Proeter (1995) agreed to the view that laboratory is a room or building with specific equipment for doing scientific test of teaching science or a place where chemicals and medicines are produced.

According to Hornby (1995) laboratory is a room or building used for scientific research, experiment, testing. Laboratory is a place equipped for making tests or doing experimental work (Blood, Studdert and Gay, 2007). Laboratory is a place where scientific research and development is conducted and analysis performed (Britannica Concise Encyclopedia 1994–2010). Espindle (2004) sees laboratory as a room or building where scientific work or tests are carried on. According to Lewis (1995) a laboratory symbolizes a place to experiment with ones inner feelings, beliefs and fears. Wikipedia defines a laboratory as a facility that provides

condition in which scientific research, experiment and measurement may be performed. Omosewo (2010 a) defined laboratory as a place equipped for experimental study. She added that the world in the minds of most people is synonymous with scientific investigation, while Kamar (2009) sees laboratory as a place where the scientists do their work. He also added that it is a room that is well equipped for the purpose of carrying out practical work and allows students to have experiences that are consistent with the goal of scientific literacy. Mohanty (2007) opined that a laboratory is essential in the secondary schools to practice various experiments by the students and get convince about the fact, events, phenomena etc. Laboratories have been found to be scientists' workshops where practical activities are conducted to enhance a meaningful learning of science concepts and theories. (Olubor and Unyimadu, 2001). Laboratories have been found to be a primary vehicle for promoting formal reason skills and students understanding, thereby enhancing the desired outcome in students (Adeyemi,2006). From the above definitions, laboratory can be summarized as a place for students to practice various experiments so as to be convinced about scientific facts, events and phenomena. This place also enhances meaningful learning of science concepts and theories through hands on experiments.

### **2.1.3 Concept of safety practices**

Safety is the state of being safe and the condition of being protected from harm or the non-desirable outcomes. Safety can also refer to the control of recognized hazards in order to achieve an acceptable level of risk (Charles G. Oakes 2012). Safety practices are generally written methods outline on how to perform a task with minimum risk to people, equipment, materials, environment and processes. Safety practices are developed as a result of completing a hazard

assessment and laboratory or sector of construction. Some safety practices require specific procedures which clearly set out in a chronological order to each step in a process.

#### **2.1.4 Availability of functional laboratory facilities.**

Laboratory facilities are the material resources that facilitate effective teaching and learning in school laboratories ( Jaiyeoba and Atanda, 2005; Timilehin; 2010) posited that laboratory facilities are those things which enable a skillful science teacher to achieve a level of instructional effectiveness that far exceed what is possible when they are not provided.

The problem of lack of adequate instructional facilities in Nigerian schools is dated back to the beginning of formal education in Nigeria and the provision of educational facilities was not given adequate and proper attention it deserved (Adesina 1990). He further said the resultant effect was overcrowding of pupils in the schools leading to overstressing of available spaces and facilities. Oyetunde (2008) was of the view that the problem of lack of school facilities or inadequate school facilities is affecting all State Secondary Schools in the federation. Ahmed (2003) revealed that in most of the nation's Secondary Schools, teaching and learning take place under a most non conducive environment, lacking the basic materials and thus hindered the fulfillment of educational objectives. Lack of adequate facilities such as text books, workshops, ill equipped classrooms, laboratories and libraries are among the probable causes of student's poor performance in examination. Despite the fact that practical work is a unique source of teaching science, it is widely acknowledged that laboratory equipment are lacking in most schools (Omosewo, 2010b). She also concluded from her studies that practical work was difficult to organize as a result of lack of apparatus. Onawola (1982) reported lack of qualified teachers in addition to lack of equipment for laboratory work and also reported lack of adequate equipment most especially in established schools. Some researchers have found shortage of laboratory

facilities as the cause of students' failure in science skills because their teachers were unable to conduct practical as they would like to and this always has inevitable consequences for students' learning. The shortage of laboratory facilities could have serious implication on the quality of school output (Adeyemi 2006). Onah and Ugwu (2010) revealed that the constraint to quality science education in Nigeria is inadequate laboratory equipment and facilities in our schools.

## **2.2 Theoretical Framework**

The study considered psychological learning theories such as the Brunner's theory of instruction, it also considered theories of Educational Administration and management such as the system theory and scientific management theory as being pertinent and are presented as follows

### **2.2.1 Brunner's theory of instruction**

Bruner, a cognitive and developmental psychologist viewed human being as information processors, thinkers and creators of ideas (Brunner cited in Eze, 2006). Brunner's major concern was to determine how individuals actively select, retain and transform information which is the main essence of learning. The theorist pointed out that acquisition of knowledge in whatever form is active process because by nature man actively interacts with his environment adjusting it to suit his purpose. Bruner also believed that a person actively constructs knowledge by relating incoming information to previously acquired psychological frame of reference. The theorist stressed that an individual is not a passive or reactive organism but one who actively selects information in order to achieve valued goals (Brunner cited in Ezenwa, 2011)

Bruner's ideas about learning can be related to the extent of implementation and adherence of safety practices in Biology Laboratories since both require active participation of the learner.

Also the theorist pointed out that a learner actively constructs his knowledge by relating new content being learnt to previously acquired information as well as uses his information in future circumstances. This can equally be applied to extent of implementation and adherence of safety practices in Biology Laboratories since students relate their previous knowledge with the learnt safety practices before implementing and adhering to it.

### **2.2.2 The Systems Theory**

In this theory an organization is seen as a social system which can be further sub-divided into subsystems each having a supra system which constitute its environment. There is a believe that the only meaningful way to study an organization is to study it as a system. That is why ( Nwankwo 1982) in (Okpala Oka 2009) defined a system as a unit with series of inter-related and inter-dependent parts such that the interplay of any part affects the whole. A system can therefore be regarded as a structure with inter-dependent parts. For example, with the educational system, there is other sub system as Primary, Secondary and Tertiary sub-systems. It is based on the concept of system that the system theory was developed. Consequently looking at Biology Laboratory system, the system theory is relevant to the implementation and adherence of safety practices in biology laboratories because, the entire Biology Laboratory set up is a system, where the concept of interaction and interdependence of parts with others is applicable. According to ( Edem 2006) , in any social system, all the subsystems work towards the maintenance of the life of the social system as a whole, the survival of which depends on its capacity to maintain consistency in the processes and relationship within and outside the system. To survive, the system and its subsystem must be open, that is, they must have the capacity to relate to and exchange matter with their environments, unlike a closed system which cannot do so. Hence the



extent of implementation and adherence of safety practices in Biology Laboratories depends on the whole Biology Laboratory system.

In Biology Laboratory System, three main levels can be identified first, the technical function which are the actual processes of teaching second, the managerial system or administration whose functions are to mediate between the school and outside world as well as to administer the schools internal affairs and third, the community system, a wider social system, which prescribes conditions for the control of the activities of the school so that it can reach its goals and be acceptable to public.

### **2.2.3 The scientific management theory.**

The scientific management being one of the earliest administrative theories emphasized productivity at the expense of the human worker. All actions are intended to increase the productivity of the worker. For example, encouraging overtime work and pressurizing people seen only as a work harder. A worker is seen only as a worker who has no independent decisions about their work. The manager had the overall authority and control over him.

### **2.3 Empirical Studies**

According to the advance learners English dictionary, to organize means to coordinate and prepare for an activity while to manage means to organize or to deal with something that one has or controls (Osborne 2008). He stated that laboratory organization begins by providing the necessary facilities, services and materials while the stage where the provided facilities, services and materials have to be looked after adequately and made available for use is seen as laboratory management.

Furthermore, (Iwang 2010) pointed out that laboratory management consists of controlling the use of laboratory materials and facilities in order to make the laboratory a safe place for all the people making use of it. He also pointed out that making the school laboratory a safe place for teachers and students to work is a very essential aspect of laboratory management. (Mbanugo 1999), suggested that the science teachers' activities during practical classes should include handling of chemicals, labeling of containers, transferring of liquids, water mixing and cleaning of glass wares. In his own view, he maintained that poisonous and highly toxic substances must be labeled and kept in a locked cupboard or store while apparatus and laboratory materials should be used only for purposes sanctioned by the teacher. Students must not be allowed to perform unauthorized experiments. He further explained that waste solid must be put in trash bins provided and not in sinks; liquid substance should not be tasted without definite instruction from the teacher. Again the working environment in the laboratory should be conducive so as to ensure safety.

(Ogbodo 2010) He discovered that the type of personnel employed as laboratory attendants do not help matters in terms of maintaining safe and good working environment. He identified the lack of qualified laboratory technicians as the cause of the unsafe practices and problems which exist in the biology laboratories. He reported that another factor that hinders good laboratory environment and instruction is unqualified science teachers. The qualified science teachers employ laboratory management skills and knowledge to a large extent than the lowly experienced science teachers.

### **2.3.1 Teacher's Role in Maintaining Safety Practices in Biology laboratory**

(Ogbodo 2010) pointed out that all items that clearly pose danger to student should be removed or controlled by the laboratory assistant. A very good way of avoiding accidents during

laboratory activities is to prompt them to students before they occur, highlight all possible dangers if any before the beginning of each laboratory activities The teacher should be observant by going round the laboratory while students are carrying out laboratory activities and fully equipped first aid boxes should be kept in the vicinity of everybody in case of any accident.

### **2.3.2 Location, Shape and Design of biology Laboratory**

The biology laboratory can be on its own or part of a building .It can be a part of bungalow or a storey building .If part of a storey building , it can be upstairs or downstairs .It should be on its own, a separate building bungalow or a storey building preferably, located towards the east end of the school compound. It should be separated and a little distance away from other buildings in the school compound for some reasons, such as

1. In future it can be expanded when the need for that arises and requirements are available.
2. To protect other school facilities and their users from radiation, smells, fire, explosion and other hazards that might come from the laboratory.
3. To reduce noise and other forms of distraction that might come from the classroom, offices, workshops, hostels, playgrounds etc to interfere with instructions and activities in the biology laboratory.
4. To avoid damages, injury or losses that could be caused by stay game and sports equipment from playing ground if located close to the laboratory.
5. To enhance safety of the laboratory and its equipment from thieves, fire out break from other facilities. It is better to burglar- proof and guide it better when it is separated from other facilities. (Ezugwu2017)

Good modern reliable building materials are used to construct the walls and floor of the laboratory while Asbestos or aluminum are used for the roof and the ceiling. The floors of a biology laboratory should be even and smooth. The laboratory hall proper can be square, rectangular, U- or semi-circle or T-shaped.

In the biology laboratory the largest space is the hall, where the learners interact with the science curriculum, instructional materials and the teacher. It is the actual learning environment. The hall is equipped with tables, cupboard, racks shelves, tools as well as real conventional science laboratory materials, tools, equipment, apparatus and gadgets which the learners and teacher work with.

Ideally, the laboratory hall is designed to have large double doors at opposite ends to enhance free movement into and out of the laboratory hall. The windows are large, low and oppositely located.

According to (Maria Harris 2018) a biology laboratory is an expensive investment and is expected to last for many years. A well designed laboratory will impact generations of students, teachers and technicians.

According to ( Omiko 2007) he sees the biology laboratory as the heart of a good scientific program which allows students to have experiences which are consistent with the goals of scientific literacy. This implies that science teaching and learning cannot be completely done in a secondary school where there is no well-designed and equipped laboratory.

### **2.3.2 Gender Difference in Science**

Some of the reasons for the implementation of safety practices in biology laboratory are: to give first-hand information about scientific concepts and theories, make teaching and learning

meaningful, expose the students to how scientists work, and improve the performance of students in science. Laboratories in science education (especially chemistry, biology and physics education) are important places where the students have chances to implement theoretical knowledge into practice. At the same time students find chances to improve their creativity and thinking skills as well as hands – on skills in laboratories. In this regard, providing laboratory facilities of the desired level and meeting prospective teacher’s needs and expectations would directly influence their satisfaction. Elliot and Shin (2002) indicate that satisfaction has direct impact on motivation. Motivation is also directed with students’ performance and achievement. In this regard, it can be concluded that satisfaction might have impact on students’ motivation and thus success. Erdogan, Usak, and Ozel (2009) asserted that gender did not contribute to the satisfaction of students in both Biology and Chemistry departments because the overall mean score of both groups showed no significant mean difference between male and female students. Obasanya and Omosewo (2010) reported that there was no significant difference in the utilization of laboratory facilities (instructional facilities) and the students’ performance in physics. Okoboh, Ajere and Eule (2001) study on sex difference in academic achievement in primary school pupils in English Language and Mathematics observed significant difference between female and male students in the two subjects and significant difference was in favour of female students.

#### **2.4 Summary of Literature Review**

Laboratory as an instructional facility for helping pupils to learn what science is and how scientists do their work needs facilities such as equipment and materials. From the studies of some researchers, these facilities will bring about improvement in the performance of the students, and if the facilities are adequate, well managed and allowed to be used by the students.

According to Asiabaka (2010) facility management is an integral part of overall management of school. The actualization of goals and objectives of education require the provision, utilization and appropriate management of the facilities, He added.

The literature reviewed indicated that most of the senior secondary school Biology laboratories in some state are not equipped and some of the science teachers are not qualified to manipulate the facilities. These have lead to the poor academic performance of students in biology. With more secondary schools springing up, students' enrolments are in the increase and more equipped laboratories are expected to be built. From the literatures reviewed so far, no research has been conducted on the relationship between laboratory safety practices and academic performance of Biology students in the Senior Secondary Schools in Niger State. Therefore, there is the need to investigate the relationship between the laboratory safety practices, their utilization and academic performance of Senior Secondary school students in Biology in Niger State and how laboratory functionality can enhance students' learning, thereby bringing about good performance in Biology.

## **CHAPTER THREE**

### **3.0 RESEARCH METHODOLOGY**

#### **3.1 Research Design**

The research design of this study is a descriptive survey which according to Nworgu (2006), is a design that collects data on a given population, and describes the data in a systematic manner pointing out the characteristic features or facts about that population. It was designated in such a way that their needed result will be accomplished to achieve a higher level of confidence.

#### **3.2 Population of the Study**

The population of the study is all the secondary schools teachers and students in Bosso Local Government Area of Niger State. There are fifteen (15) secondary schools with 29 biology teachers and 13,424 senior secondary students in Bosso Local Government Area of Niger State.

#### **3.3 Sample and Sampling Technique**

A simple random sampling procedure was employed to sample. Five (5) schools out of 15 secondary schools Five (5) teachers and (15) students in each of the five secondary schools were sampled from each of the schools making a total of (20) respondents from each of the five secondary schools giving a total of 100 respondents.

**Table 3.3.1:** Population distributions of sampled schools by gender

Name of schools	Male Students	Female Students	Total
Army Day Sec School	9	8	17
Hill Top Model School	8	8	16
Model Day Sec School	10	4	14
Quality Sec School	8	10	18
Fema Sec School	5	5	10
Total	40	35	75

Source: School Register 2018/19

Name of schools	Male Teachers	Female Teachers	Total
Army Day Sec School	2	2	4
Hill Top Model School	4	2	6
Model Day Sec School	2	3	5
Quality Sec School	2	3	5
Fema Sec School	4	1	5
Total	14	11	25

Source: School Register 2018/19



### **3.4 Research Instrument**

The instrument used for the data collection is questionnaire. It was used for biology teachers and students in the sampled senior secondary schools. The questionnaire is made up of two sections A and B, section A contains the biographical data of the respondent while section B contains items relating to the research study.

The response format;

Strongly Agree (SA)

Agree (A)

Disagree (D)

Strongly Disagree (SD)

The respondents are expected to express the degree of their agreements or disagreements with each of the interest statement by a tick (√) in the appropriate column. The range of the scoring skewed for positively interested statements is (4-1) for (SA-SD) while the negative skewed statement is (1-4) for (SA-SD)

### **3.5 Validity of the Instrument**

The following procedures were adopted to establish the validity of the instrument, which refers to the extent to which an instrument measured that which it is designed to measure (Nworgu, 2006).

This questionnaire was subjected to two forms of validation, face and content validation. Face and content validation was carried out by two science education lecturers. The validators examined the instruments based on clarity of questions, appropriateness of the questions to the

student's level of understanding and experience as well as agreement in addressing the purpose of the study.

The valuator's made corrections and the suggestions were incorporated into the final draft before producing it.

### **3.6 Reliability of the Instrument**

Reliability test was conducted in government day secondary school Bosso involving five teachers and fifteen students which was not among the sampled schools used for the study. The data obtained were analyzed finding the relationship of each item in the instrument using person's product moment formula and result obtained was 0.83 indicating that the instrument is reliable for the study.

### **3.7 Method of Data collection**

The instrument used in data collection was personally administered by the researcher to the teachers and students. After discussing with them the purpose of her coming and of the study, the researcher proceeded to distribute the questionnaire to the teachers and the students. The teachers and the student were requested to complete the instrument and submit on the appointed date on which the researcher collected them.

### **3.8 Method of Data Analysis**

The data were analyzed using mean and standard deviation. The mean score of 2.50 was regarded as the acceptable mean. Any item with a mean of 2.50 and above was regarded as accepted (as providing a positive answer) while any item with a mean below 2.50 was regarded as providing negative answer and hence rejected. Therefore, 2.50 are regarded as the decision point for the items in the table research questions.

## CHAPTER FOUR

### 4.0 PRESENTATION OF RESULT AND DISCUSSION

**Table 4.1:** Research Question I: Teachers response on the extent to which the following fittings and designs were appropriate in ensuring safety in the laboratories.

S/N	STATEMENT	VAP	JAP	NAP	AP	MEAN	Total	Dec
1.	Quantity and Fitting of the laboratory doors and windows.	5	10	5	5	2.60	25	A
2.	Position of the demonstration table.	16	5	2	2	3.40	25	A
3.	Displaying shelves	3	13	4	5	2.60	25	A
4.	Storage Facilities	14	4	4	3	3.12	25	A
5.	Water pipings	4	2	16	3	1.60	25	R
6.	Electrical wiring and fitting	3	2	15	5	1.72	25	R
	Total Mean							

Table 4.1.1 shows the respondents responses (teachers response) on the type of designs and fittings in the biology laboratory appropriate to ensure safety. It shows the mean scores of 2.6,3.4,2.6,3.12,1.6 and 1.72 therefore total mean for table 4.1.1 is 2.63 which is above the

acceptable mean this means that the type of design and fitting in the biology laboratory do not ensure safety.

**Table 4.1.2:** Research Question II: Teachers response on the availability of safety equipment in the biology laboratories.

S/N	STATEMENT	VA	JA	NA	BA	Mean	Total	Dec
7.	Fire Extinguishers	10	5	5	5	2.80	25	A
8.	First aid kits	12	5	3	5	3.04	25	A
9.	Displayed safety rules and regulation	8	5	7	5	2.56	25	A
10.	Sand buckets	5	9	4	7	2.60	25	A
11.	Hand gloves	9	7	5	4	2.80	25	A
12.	Safety goggles	3	4	13	5	1.88	25	R
13.	Trash bins	4	2	15	4	1.80	25	R

Table 4.1.2 shows respondent responses on the availability of safety equipment in biology laboratory. It shows the mean scores of 2.8, 3.04, 2.56, 2.60, 2.80, 1.88 and 1.80. Therefore, the total mean for table 2 is 2.7 which is above the acceptable mean, this means that there is availability of safety equipment in biology laboratory.

**Table 4.1.3:** Research Question III: Student response on the extent of implementing safety practices in the biology laboratories.

S/N	STATEMENT	VGE	GE	LE	VLE	Mean	Total	Dec
14.	Avoidance of eating and drinking in the laboratory	25	20	15	10	2.67	75	A
15.	Wearing of laboratory coats	16	14	25	20	2.35	75	R
16.	Using only properly labeled materials	23	27	10	15	2.21	75	R
17.	Taking precautions to avoid spills	20	10	35	15	2.20	75	R
18.	Washing of hands before and after practical's.	15	30	10	20	2.53	75	A
19.	Wearing of hand gloves	14	15	26	20	2.31	75	R
20.	Tying back long hair in the laboratory	21	25	13	16	2.33	75	R

Table 4 shows respondent responses (teachers responses) on the extent to which the following safety practices is applied during practical section in the biology laboratory. It shoes the mean scores of 2.67,2.35,2.21,2.53, 2.31 and 2.33. Therefore the total mean for table 4 is 2.23 which is

below the acceptable mean, this means that safety practices is not applied by the student during practical section in biology laboratory.

#### **4.1 Discussion of the study**

The three research questions that guided this study were the themes around which the major findings of the study were organized and discussed.

In table 4.1.1: it reveals that the respondent agree that item 2, 4 and 5, the designs and fittings in the laboratory ensures safety while item 1 and 3 disagree that the designs and fittings in the laboratory ensures safety This result is based on the laboratory assistant and biology teachers response.

With this, it means that more effort should be applied through using good, modern and reliable materials on the designs and fittings in the biology laboratory to ensure safety.

In table4.1.2, it was observed that item 6, 7, 8, 11and 12 do agree on the use and availability of safety equipment in the biology laboratory while item 9 and 10 disagree on the use and availability of safety equipment in the biology laboratory. This result is based on the senior student response.

With these there is availability of safety equipment in the biology laboratory. In table 4.1.2:it was observed that item 13 and 14 do agree on the laboratory assistant and personal ensures safety in biology laboratory while item 15 disagree on the laboratory assistant and personal ensures safety in biology laboratory. This result is based on the senior student response. With these the school authorities need to send the biology teachers and technicians on yearly educator training on how to manage materials and guide inquiry-based learning during laboratory experiment.

In table 4.1.3: it was observed that item 18 do agree on the application of safety practices in the biology laboratory while item 16 and 17 disagree on the application of safety practices in the biology laboratory. This result is based on the teacher's response.

Students need to be enrolled with orientation on how to use the equipment in the Biology laboratory.

## **CHAPTER FIVE**

### **5.0 CONCLUSION AND RECOMMENDATIONS**

#### **5.1 Conclusion**

From the result obtained from the data analysis, the researcher has concluded that there is need to apply more effort on safety practices during practical session in biology laboratory.

Properly designed laboratory investigations should have a definite purpose that is communicated clearly to students, focus on the process of science as a way to convey content and there should be incorporate ongoing student reflection and discussion to enable students to develop safe and conscientious laboratory habits and procedures.

The teacher should not be faced with a Hobson's choice in teaching in an unsafe environment which can lead to harm, injury and loss of lives, in the result of accident which tends to make learners lose interest in biology science, particularly laboratory activities. The student develops fear instead of love and interest in biology and science subjects.

#### **5.2 Recommendations**

1. The school authority should send some personal for seminar and workshop in order to implement good attitude and safe practice to other students
2. Student should observe the rules and regulation guiding the biology laboratory which leads to safety practices.
3. The government should provide funds to equip scanty laboratories building for practical's that can accommodates both student and their teacher to make teaching easier and leaning faster.



4. The laboratory building should be set aside at the school environment in order to avoid distractions.

### **5.3 Implications of the study**

The educational implications from the findings are in the part of the teachers, they should implement safety practices with good attitude to an extent in order for student to adhere to safety practices without being careless during the laboratory activities in Bosso Local Government Area of Niger State. This study implies that safety practices should be employed from the teacher and adhered by the students in order to improve safety practices in the Biology laboratory.

On the part of the students who have phobia for practical in science laboratories due to the occurrence of the hazards and accidents in the science laboratory will find this work reliable in order to develop good attitudes, safe conscientious laboratory habits in any practical field.

The teachers and the laboratory staff should also see the need of keeping the rules, develop slogans about them, writing some of them on the cardboard sheets hung on the laboratory. With these, Practical work will be conducive through the safety measures in the science laboratories.

The school administrators will find this work relevant by providing an adequate facility such good modern and reliable building with necessary equipment where laboratory investigations can be conducted with ease. The national science teachers' association will find the best means to administer the groups of objectives that may be achieved through the use of laboratory in science classes such as attitude, understanding the nature of science, cognitive abilities, acquisition of knowledge concept and skills.

#### **5.4 Limitation of the study**

The researcher in his minimum financially capacity managed to cope with transportation within Bosso local government area during the distribution and collection of the questionnaire and getting information from the ministry of education Niger state on the number of teachers and student in Enugu south local government area for her research work in order to meet up with the supervisor. During the course of typesetting she had trouble with her lap top system which affected her work which lead in the delay of typing, editing and printing of the research work.

#### **5.5 Suggestion for Further study**

A further investigation need to be carried out to find out

1. The problems relating to lack of qualified laboratory personnel
2. The need to investigate on the size and location of a science laboratory.
3. The challenges effecting student in phobia for science courses

#### **Summary**

Practical activities are fragile, if is not properly organized it can lead to frustration, harm, injury and lose of life, that is why it is important to enroll science teachers on training and seminar yearly for them to impact what they have learnt to their student according to Brunner's theory of instruction, it holds that management should be knowledgeable in scientific management principles through training and should be able to apply them accordingly through which they can produce future scientist. In this view, the researcher embarked on this study in order to highlight the extent of implementation and adherence to safety practices in biology laboratory among staffs and senior secondary school student in Bosso Local Government Area of Niger State.

To address this issue the researcher formulated four specific purpose of the study which seeks to:

- 1.The general designs and fittings of biology laboratory relevant to safety.
- 2 The availability of safety equipment and materials in biology laboratories.
- 3 The services of laboratory assistant that are employed to ensure safety.
- 4 The extent of implementing safety rules in biology laboratory.

The study used descriptive survey research design questionnaire was used as an instrument to collect data. Four research questions and eighteen questionnaire item was used to gather information from 20 respondent made up of 5 teachers and 15 students from the 5 schools sampled which gives a total of 100 respondent drawn from the study area. The questionnaire was validated by three validators and its reliability was established using coefficient of correlation Pearson's product moment formula and the result obtained was 0.83 which shows that the study is reliable.

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**APPENDIX**

**FEDERAL UNIVERSITY OF TECHNOLOGY MINNA, NIGER STATE**

**DEPARTMENT OF SCIENCE EDUCATION**

**TEACHERS' AND STUDENTS' QUESTIONNAIRE ON THE IMPLEMENTATION OF SAFETY** Dear sir/ma

This questionnaire is a research instrument designed to obtain information on the implementation of safety practices in the laboratory among secondary schools in minna metropolis in partial fulfillment for the award of degree of bachelor of technology (B.TECH) in Biology Education.

Kindly assist in filling this questionnaire by indicating appropriate response with respect to each statement and your response will be treated with utmost confidentiality.

Thank for your cooperation.

**PRACTICES IN BIOLOGY LABORATORY AMONG SECONDARY SCHOOLS IN MINNA METROPOLIS**

**SECTION A: PERSONAL DATA/BIODATA**

Please tick (\*) as appropriate on the space provided;

Teacher ( )                  Student ( )

Sex: Male ( )                  Female ( )

Class: SS1 ( )                  SS11 ( )                  SS111 ( )

Number of years in teaching 5-10 ( )                  11-15 ( )                  16-20 ( )                  21 and above ( )

## SECTION B: INSTRUCTION AND KEY RATING (FIVE LIKERT SCALING)

Instruction: Tick (\*) appropriate in the column provided against the option of your choice

**For Research Question I:** Teachers response on the extent to which the following fittings and designs were appropriate in ensuring safety in the laboratories.

Very Appropriate (VAP) - 4 -Fittings are appropriate over 60% and above

Just Appropriate (JAP) - 3 -Fittings are appropriate between 59% - 40%

Appropriate (AP) - 2 -Fittings are appropriate between 39% - 1%

Not Appropriate (NAP) -1 -Not appropriate at all (0%)

S/N	STATEMENT	VAP	JAP	NAP	AP
1.	Quantity and Fitting of the laboratory doors and windows.				
2.	Position of the demonstration table.				
3.	Displaying shelves				
4.	Storage Facilities				
5.	Water pipings				
6.	Electrical wiring and fitting				

**For Research Question II:** Teachers response on the availability of safety equipment in the Biology laboratories.

Very Available (VA) – 4 -Safety equipment are available over 60% and above

Just Available (JA) – 3 - Safety equipment are available between 59% -40%

Barely Available (BA) – 2 -Safety equipment are available between 39% -1%

Not Available (NA) – 1 - Not available at all (0%)

S/N	STATEMENT	VA	JA	NA	BA
7.	Fire Extinguishers				
8.	First aid kits				
9.	Displayed safety rules and regulation				
10.	Sand buckets				
11.	Hand gloves				
12.	Safety goggles				
13.	Trash bins				

**For Research Question III:** Student response on the extent of implementing safety practices in the biology laboratories.

Very Great Extent (VGE) -4, Great Extent (GE) – 3, Little Extent (LE) – 2, and Very Little Extent (VLE) – 1.

S/N	STATEMENT	VGE	GE	LE	VLE
14.	Avoidance of eating and drinking in the laboratory				
15.	Wearing of laboratory coats				
16.	Using only properly labeled materials				
17.	Taking precautions to avoid spills				
18.	Washing of hands before and after practicals.				
19.	Wearing of hand gloves				
20.	Tying back long hair in the laboratory				



**EXTENT OF IMPLEMENTATION OF SAFETY PRACTICES IN BIOLOGY  
LABORATORIES AMONG SENIOR SECONDARY SCHOOLS IN MINNA  
METROPOLIS**

**BY**

**ELUWA CHIBUZO**

**2013/1/49214BE**

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FEDERAL UNIVERSITY OF TECHNOLOGY MINNA**

**NOVEMBER, 2019**