

## Assessing the Laboratory Safety And Security Skills Among Science Technology And Mathematics (Stm) Teachers in Sokoto State, Nigeria

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**Abstract:** The paper, assessing the laboratory safety and security skills among science technology and mathematics (STM) teachers in Sokoto State examines STM teachers skills in the state of the art procedures and practices. Descriptive survey design was adopted for the study. A sample of ninety (90) teachers of the core science subjects was selected through stratified random sampling method from the population of science teachers in Sokoto State. Three research questions were answered. Findings of the study indicated that the science laboratories in Sokoto State lack the most essential safety devices. The study also revealed that STM teachers in Sokoto State are safety conscious but they lack the skills for good planning of laboratory activities. Based on the findings of the study, it was recommended among others that there should be effective teacher preparations and training programme that emphasizes on the acquisition of skills, and competencies as against the current system of training which is theoretically oriented.

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### I. INTRODUCTION

Science is a way of discovery through experimentation. If taught experimentally several skills could be developed in the learners. Among these skills are the science process skills. The science process skills are observable behaviors which could be acquired by manipulating tools, equipment and machines. That is through exposure to learning activities of practical nature. According to Oriafon (2003), practical's are hands-on-activities for the acquisition of practical or observable skills, knowledge and attitudes. These are the science process skills which are the generalized intellectual skills needed to learn the concepts and principles of science.

All children are enthusiastic, they want to do something, they want to construct and manipulate things, and they want to experience the richness and excitement of knowing about the natural world. However, what children learn is greatly influenced by how they are taught, if they are not taught well, they cannot learn well. Thus, it is the responsibility of the science teacher to create varied opportunities for them to engage in doing activities that will enable them make sense of the natural world, make new discoveries, solve interesting problems and develop skills. To do this, children must be made to handle objects, examine them, draw them, perform experiment with them and find out something about them. It is this that satisfy their curiosity and give them the joy of learning science. It is also this that make the science laboratory essential in the teaching and learning of science.

The science laboratory is special room where students can practice science. The laboratory contains equipment which eases the teachers work and speed up the learning process. It is a powerful aid if properly used by a craft-man who knows how to use it. The equipment could be wasted if the teacher does not possess the techniques of using them. Thus the science teacher must be resourceful and undergo training in skills and competences for teaching because teaching is a skill demanding job. He must possess dexterity in manipulating objects, in managing resources and in solving problems as they appear. He has to be very careful in carrying out his activities in the laboratory because many laboratory operations involve presence of hazardous materials which may be chemical or biological.

Doing things can be fun but accidents can also occur. Accidents are unplanned and unintentional damage to individuals and facilities. Accident may arise from thermal or chemical burns, electrical shocks etc. Among the causes of laboratory accidents are lack of good knowledge of laboratory rules and regulations, faulty equipment and facilities, usage and unguarded activities of laboratory users. This makes good

laboratory skills essential requirements of a science teacher. According to Allison (1982), in order to present science to his pupils as something interesting, innovative, stimulating and challenging, the teacher has to constantly scrutinize and review his teaching methods and attitude, his training must include subject content, safety methods and skills in the handling of materials, tools and equipment. The science teacher as a resource ager must train in the correct techniques of handling materials, tools, and equipment. He/she must take time to learn and practice scenically. He must make the working science environment safer and healthier.

Safety is part of doing any job right. Learning how to be safe is an integral part of education. Thus the science teacher needs to acquire knowledge and skills in proper location and operation of laboratory equipment, knowledge of how hazardous materials are handled, knowledge of unsafe practices and skills in prudent practices. It is the responsibility of the science teacher to prevent accidents by designing the teaching-learning situation in such a way as to safe-guard the lives of laboratory users and laboratory facilities. Thus, the science teacher must know the worst possible things that could go wrong and how he can deal with them. He must be able to provide instruction on prudent practices, appropriated precautions, potential, hazards, emergency procedures and appropriate emergency responses. However, a lot of literature reported that STM teachers lack these practical skills (Allison 1982, Ezeh 2010 and Achimugu 2012). According to Allison, most science teachers are not sufficiently exposed to proper managerial skills in the area of use, maintenance and repairs to science laboratory facilities.

### Statement of the problem

The success of any teacher among other factors lies on his/her skills in managing and controlling the teaching learning environment. The teaching-learning environment must be devoid of chaos and anarchy. It must be safe and secured for the working of men and machines. However, most graduate of the Nigerian education system are not sufficiently exposed to proper managerial skills. According to Allison (1982) they lack the skills in the state of the art procedures and practices required for modern science teaching. Achimugu (2012) also reported that science teachers cannot display correct understanding of the science process as they cannot organize and conduct practical classes. It is against this background that this study is set out to find out the laboratory safety and security skills among STM teachers in Sokoto State.

### Purpose of the Study

The safety of people that work in the science laboratory is of fundamental importance. This makes it necessary for a science teacher to familiarize himself/herself with the hazards known to be associated with any given procedure, material or item equipment in the science teacher laboratory. It is thus the purpose of this study to assess the laboratory safety and security skills among STM teachers in Sokoto State.

### Research Questions

#### The following research question were raised to guide this study:

1. What are the safety measures put in place to ensure the security of laboratory users in secondary schools in Sokoto state?
2. What is the level of safety consciousness among STM measures in Sokoto State?
3. Do STM teachers in Sokoto State possess skills in managing and controlling laboratory activities?

### Methodology

The study was a survey research. All secondary school STM teachers who are teaching the core science subjects (Chemistry, physics and biology) formed the population of the study. Only secondary schools that have standard science laboratories participated in the study.

### Sample And Sampling Techniques

Stratified random sampling technique was used in selecting a sample of ninety STM teachers. There are six zonal education offices in Sokoto State. Five senior secondary schools were selected from each zone with three teachers one each of Chemistry, Physics and Biology from each school. This gave a total of fifteen teachers from each zone ( $15 \times 6 = 90$  teachers).

### Instrumentation

The instrument used in collecting data for this study was a test tagged safety and security proficiency skills performance test. The test was structured to measure teacher's proficiency in the following skills.

1. Safety consciousness skills
2. Skills in the arrangement, handling and care of laboratory equipment and facilities.
3. Skills in experimental procedures
4. Skills in the prevention of accidents in the laboratory

5. First aid and its administration skills

The instrument contained 20 items with 4 items in each stated category of skills

II. RESULTS

The data collected were descriptively analyzed using frequencies and percentages.

Research Question 1:

What are the safety measures put in place to ensure the security of laboratory users in secondary schools in Sokoto State?

Table 7 Frequency and percentage analyses on safety measures put in place to ensure safety and security in the science laboratory

Variables	Frequency	Percentage
Enough safety measures	15	16.66
Few safety measures	24	26.66
No safety measures	51	56.66
Total	90	100%

Table 1 reveals that 15(16.66%) of the science laboratories in Sokoto State have safety measures put in place to ensure safety and security of laboratory users, 24 (26.66%) have few safety devices while 51(56.66%) of the laboratories have no safety measures put in place at all.

Research Question 2

What is the level of safety consciousness among STM teachers in Sokoto State?

Table 2 Frequency and percentage analysis on safety consciousness of STM teachers in Sokoto State.

Variables	Frequency	Percentage
Awareness of Safety components of experiments	16	17.77
Awareness of hazards	34	37.77
Conscious of most likely accidents that could occur in a given procedure	13	14.44
Conscious of preventive measures	17	18.88
Knowledge of appropriate steps to be taken to deal with accidents should they occur	10	11.11
Total	90	100%

Table 2 depicts the safety consciousness level of STM teachers in Sokoto State. From the table it could be observed that 16(17.77%) of STM teachers in the State are aware of safety components of experiments, 34(27.77%) are aware that laboratory activities are associated with hazards 13(14.44%) are conscious of most likely accidents that could occur in a given laboratory procedure, 17(18.88%) are aware of preventive measures while 10(11.11%) have knowledge of appropriate steps to be taken to deal with accidents should they occur in their laboratories.

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### Research Question 3

Do STM teachers in Sokoto State possess skills in managing and controlling laboratory activities Table 3 Frequency and percentage analysis of STM teacher's skills in managing and controlling laboratory activities.

Variables	Frequency	Percentage
Skills in good planning of laboratory activities	11	12.22
Skills in proper organization of work space	13	14.44
Skills in proper arrangement of equipment and tools	20	22.22
Skills in regular checking and servicing of laboratory equipment and facilities	17	18.88
Skills in proper ventilation which prevents suffocation and enhance visibility in work place	29	32.22
Total	90	100%

Table 3 reveals that 11(12.22%) possess skills in good planning of laboratory activities. 13(14.44%) possess skills in proper organization of laboratory work space. 20(22.22%) have skills in proper arrangements of laboratory equipment and tools. 17(18.88%) possess skills in regular checking and servicing of laboratory equipment and 29(32.22%) have skills in proper ventilation of laboratories to prevent suffocation and enhance visibility in laboratory work spaces.

### Findings of the study indicated that:

1. There is inadequacy of safety measures and safety devices in science laboratories in Sokoto State. In most schools no safety measures at all
2. Most STM teachers (37.77%) are aware that laboratory work is associated with a lot of hazards but only few of them (11.11%) have adequate knowledge of appropriate steps to be taken to deal with accidents should they occur.
3. STM teachers in Sokoto State lack skills in good planning of laboratory activities.

### Discussion of Findings

From the findings of the study, science laboratories in Sokoto State are not safe and secured for the successful operation of men and machines. This is because they lack the most essential security devices like first aid boxes, fire extinguishers, fire buckets, fire blankets, emergency exits, emergency action plan and fixed safety rules and regulations. This finding is in line with the findings of Raymond and Maigida (2007) which reported that materials for student's practical work are not always provided in most schools, school workshops and facilities are not properly taken care of and all the safety devices needed are not there. Finding of this study as presented in table 2 indicated that STM teachers in Sokoto State are aware that laboratory work is associated with a lot of hazards as a result of which they need to be extra careful in conducting practicals. This finding supported an earlier study by Situ (2006) which discovered that home economics teachers in Niger State are safety conscious in food and clothing laboratories.

However, it is important for an STM teacher to be fully aware that an emergency like an accident is unexpected and it cannot be predicted. Even if your safety skills are beyond reproach, it does not necessarily mean that you will never be faced with having to respond to danger and need to make a quick decision. It is how you respond to the danger that will ultimately make all the differences to the outcome in the long run. If you go to pieces at the first sign of danger you risk putting the learners under your care in more danger. To successfully deal with an emergency situation you need to access the situation carefully and respond appropriately. Findings of the study also indicated that STM teachers in Sokoto State lack skills in good planning of laboratory activities. Since the teachers lack this skill it is obvious that STM teachers in Sokoto State cannot develop in the learners the psychological security needed to be able to develop interest in the study of science. This is in line with the observation of Allison (1982) that part of the problem of science teaching in Nigeria today is that the teacher is called upon to make the learners grasp things or concept which he himself has not fully grasped and is ill-equipped to handle. Teaching-learning activities must be designed in such a way as to minimize all safety hazards. The laboratory as a special classroom for social interaction, for trying out new roles and for developing trust, confidence and a sense of personal identity must be made sufficiently safe and secured. Safety is ensured by taking safety precautions using safety devices and maintaining safety rules and regulations. According to Okala (2008) proper attitudes, safety habits, manipulative skills, general knowledge, appreciation, understanding and the like are the essential skills required of a competent STM teacher.

### III. CONCLUSION

The findings of this study indicated that the science laboratories in Sokoto State lack the most essential safety devices which make the laboratories unsafe. The study also revealed that STM teachers in Sokoto State are safety conscious but they lack the skills for good planning of laboratory activities.

### IV. RECOMMENDATIONS

**Based On The Findings Of This Study The Following Recommendations Were Made:**

1. STM education should be properly funded: This is because science education is capital intensive. A lot of funds are needed to build laboratories, to procure laboratory equipment and facilities, to maintain existing ones and to supply latest laboratory and security devices.
2. Effective teacher preparation and training with emphasis on the acquisition of skills, attitudes and competencies as against the current system of training that is theoretically oriented.
3. Fit and competent STM teachers must be properly trained on safety matters. They must acquire knowledge of all reasonable safeguards against working order of equipment and facilities, emergency action plan and first aid treatment. Also they must have good knowledge of class management, of laboratory organization and of maintaining class discipline.

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