COMMON LABORATORY ACCIDENTS AND CAUSES IN SECONDARY SCHOOLS OF ZARIA ENVIRON

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Abstract
Laboratories are potential dangerous work environments, often containing a wide variety of toxic, flammable, corrosive, or reactive compounds. Practical work cannot be avoided despite the fact that accidents happen in secondary schools. This paper highlights various common laboratory accidents and their causes that occurred in Secondary Schools in Zaria environs. Suggestions were made on the ways to reduce such accidents.

School laboratory is an instructional facility where the teacher helps students and guides them through the practical aspect of scientific processes and skills for the solving of some specific problems.

Laboratories are potentially dangerous work environments, often containing a wide variety of toxic, flammable, corrosive, or reactive compounds. Potentially infectious or pathogenic organisms are handled, and research often involves the use of radioactive isotopes. With the proper training, engineering controls, and administrative precautions, these risks can be effectively managed. However, accidents can and do happen.

Although accidents resulting in serious injuries rarely occur in school science laboratories, schools should be on the alert at all times and take active measures to minimize the occurrence of laboratory accidents. The causes/nature of the accidents reported in the Surveys on Laboratory Accidents and the preventive measures that can be taken are presented here for reference of schools.

According to Cla (2010), the following are some accidents that could occur in the laboratory.
1. **Cuts**: Small cuts caused by broken glass apparatus (e.g. test tubes or glass tubing), tools (e.g. dissecting instruments, corn borer or cutter) or sharp edges.

2. **Heat/Burns/Scalds**: Carelessness in handling hot objects (e.g. tripods, glassware, metal rods/plates, crucibles or combustion spoons), hot liquids, Bunsen flame or lighted matches.

3. **Others**: Accidents of various natures were reported. Over 90% of the causes under this category were mere accidental breakage of glassware or damage of equipment.
   a. Students get injured when they knocked on floor, stools, benches or cupboards.
   b. Tasting of chemicals (e.g. copper (II) sulphate) by students.
   c. Spillage of chemicals during transfer or heating of chemical liquids, washing up of apparatus containing chemical mixtures, opening the container of a chemical or breakage of glass containers.
   d. Students’ mischievous behavior of pouring chemicals on others.
   e. Concentrated sulphuric acid, phenol and sodium hydroxide were the most common harmful chemicals involved.

4. Carelessness in handling hot objects (e.g. tripods, glassware, metal rods/plates, crucibles or combustion spoons), hot liquids, Bunsen flame or lighted matches.

5. **Substances Catching Fire**
   a. Accidental ignition of flammable liquids (e.g. ethanol or ethyl ethanoate).
   b. Ignition of gas coming out from defective burner tubing or from opened gas tap not connected to Bunsen burner.
   c. Ignition of blackout curtain by focused sunlight from optical instrument.

6. **Eye Accidents**
   a. Chemical liquids or solids which splashed onto the eyes, giving rise to slight irritation or discomfort.
   b. Students unintentionally rubbed their eyes with hands contaminated with chemicals.
   c. The chemicals commonly involved were Copper (II) Sulphate, dilute acids and alkalis.
   d. Students looked at bright light through a magnifying glass.

7. **Bites by Animals**: Rats biting students and laboratory staff during experiments or when preparing for dissection experiments.
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8. **Discomfort arising from Inhalation of Gases**: Discomfort after inhaling a small amount of gas/vapour (e.g. sulphur dioxide, bromine or ammonia) from reaction mixture or town gas from leaking gas taps.

According to Nuoha (1984), science teacher handbook, accident problem occurring areas in the laboratory are identified as follows:

1. **Teacher working outside the subject discipline**: It states that it is highly probable to be an increasing problem with educational trend toward integrating the sciences and the consequences of reduction in staffing and failing school rules making single subject class less economic.

2. Newly qualified teacher and student in training even though they teach within their subject area, they still need to have some laboratory experience to be able to have successful practical work.

3. **Poor laboratory design**: Research appears to be inadequate and too small for students; the teacher can do nothing except to report the deficiencies to his/her employers through the appropriate channels until the problem is resolved.

4. **Breaking of old habits**: Sometimes the teacher knows the precautions to be taken but do not care about them.

5. **New courses**: The educational curriculum development of recent times results in variety of new experiments which unfortunately will give rise to a new hazard. Science teacher gets idea of new experiment either from textbooks or journals. Some may be hazardous, but because the publication is new, the hazard may not have been understood but teachers however fall into hazards of that experiment.

**Background of the Study**

Science curriculum requires a student to undergo practical experimentation in the laboratory with a pass of 40% of the total score. To achieve this stated goal, the laboratory must adequately be equipped and safe to use. The study is set out specifically to assess the common laboratory accidents that have occurred and their causes.

**Research Questions**

Answers to the following response question were sought by the study:

1. What types of accidents occur in secondary school laboratories of Zaria with its environs?
2. What are the causes of these accidents?
3. How can these accidents be prevented.
**Research Methodology**

**Sample**

The samples of the study constitute six secondary schools (Government Secondary School Dogon Bauchi, Sabon Gari, Zaria (GSSD), Barewa college Zaria (BCZ), Government Girls Secondary School Zaria (GGSZ), Government Secondary School Tudun Wada, Zaria (GSTZ), Demonstration Secondary School Samaru, Zaria (DSSZ) and Government Science Secondary School Kufena (GSSKZ) from Zaria environ. From each school, five students and ten science teachers were selected at random.

**Instrumentation**

The data is collected through the use of two questionnaires administered on students and science teachers of sampled schools.

**Research Question 1**

What type of accidents occur in Secondary School Laboratories of Zaria environ?

The answer to this question is presented in Fig. 1

**Fig. 1 Bar Chart Showing Types of Laboratory Found in Zaria**

Fig. 1 shows, Biology laboratories in all the schools, Physics laboratory in five schools, Chemistry laboratories in 5 schools, Integrated Science laboratories in three schools, Agricultural science in two schools and none of technical workshop.
Fig. 2. Bar Chart showing types of laboratory accidents found in Zaria environs

![Bar Chart]

Fig 2 shows that, breakage due to mishandling has the highest occurrence with no explosion and fire outbreak from any of the sampled schools.

**Research Question 2:**
What are the causes of these accidents?

**Fig 3: Bar Chart Showing Distribution of causes of Science Laboratory Accidents**

![Bar Chart]

Figure 3 shows that, lack of right attitude to practicals by students constitute 25.61% and lack of seriousness by students constitute 23.17%. This shows that most laboratory
accidents that occur are due to lack of proper orientation towards practical to the student by the science teacher. This can be as a result of inexperienced teachers, such as newly qualified teachers and students in training even though they teach within their own discipline. Others include, lack of knowledge, lack of control and faulty equipment.

**Research Question 3**

**How can these accidents be prevented?**

Various suggestions on how to prevent or minimize these problems and some attitudes that the teachers have to develop to minimize the occurrence were suggested as follow:

i. Government should employ trained laboratory assistants for each and every school so as to assist teachers during practical and to help in the disposal of faulty equipment, faulty labeling and arrangement of chemicals as well as arrangement in general.

ii. Personal safety protection equipment should be provided by school or government in the labs to avoid worsening of injuries in schools.

iii. The laboratory should be spacious to allow for free movement during practical.

iv. There should be proper supervision of students during practicals by the teacher and laboratory technician.

v. Student should be well oriented on general rules and regulations in the laboratory.

vi. Laboratory should be well designed and constructed to conform to accepted norms.

vii. Small number of students should use the laboratory frequently in their lessons to avoid congestion.

viii. Enough time and pre-practical should be given to students.

To achieve these, a teacher has to develop some skills. Below are some skills suggested by various teachers.

i. Guidance towards practical and potential hazard in the laboratory.

ii. A teacher should be able to give first aid to the student in case of any emergency.

iii. Should be friendly to the student so as to make the practical interesting and controlled.

iv. Inculcate and show competency to the student.

v. A teacher should be very observant.

vi. Teachers should be courageous.

vii. Proper demonstration of procedures to the student should be done by teachers.

viii. A teacher should be creative for easy demonstration.

ix. Use of teaching aid should be emphasized.
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However, a teacher is expected to possess some attitude as suggested by some teachers Five Gourneau B. (2005) as follows:

i. Knowledge
ii. Competence
iii. Disciplined and self control
iv. Patient, tolerant and sense of humanity.
v. Subject mastery
vi. A teacher should be able to have good management of the class.
vii. Open minded in terms of academic approach.
viii. Should possess all teacher’s personalities e.g. open minded, exemplary life etc.

The analysis of this suggestion serves as the measures taken to prevent or minimize laboratory accidents.

Conclusion

Based on the popularity of the study of this research, the conclusion made valid for this research are as follows:

i. Most of the schools surveyed have inadequate science teaching resources but have adequate science laboratory.
ii. The occurrence of all types of accidents are found to be as a result of lack of seriousness by the students, lack of right attitude towards practicals, faculty equipment, lack of control and lack of knowledge on the part of all laboratory users.
iii. Most of the laboratories investigated lack safety devices and first aid box kits.
iv. There is only a little or no modern equipment in our secondary school laboratories.
v. Most schools do not have laboratory technicians/assistants.
vi. Laboratories are often over crowded during practicals and the time given to the student is not enough.

Reference


Northrup, Snorthup@intech.edu: General Chemistry Laboratory Rule and Regulation.