JOURNAL OF RESEARCH IN SCIENCE AND VOCATIONAL EDUCATION (JRSVE)
Volume 5; Issue 1, 2025
Official Publication of Science and Vocational Department
Godfrey Okoye University, Ugwuomu- Nike, Enugu-Nigeria
Published by K-Injo | Kobia Data Limited

EXTENT OF SAFETY MEASURES IN SECONDARY SCHOOL SCIENCE LABORATORIES IN ABAKALIKI EDUCATION ZONE OF EBONYI STATE.

[1]Oko Kingsley Ikechukwu and [2]Dr. Veronica C. Ude
[1]Department of Science Education, Faculty of Education Ebonyi State University, Abakaliki
[2]Department of Science and Computer Education Godfrey Okoye University, Enugu
Email: *kingsmaka400@gmail.com / vude@gouni.edu.ng*
Phone: *07031561716*
DOI: *https://doi.org/* 10.5281/zenodo.15585051

Abstract: The focus of this study is to investigate the extent of safety measures, in secondary school science laboratories in Abakaliki Education Zone of Ebonyi State. Two research questions and one hypothesis guided the study. The study employed descriptive survey design. This is to enable the researcher describe the extent of safety measures and make decisions based on empirical evidence. The researcher used a total number of seventy-two (72) public secondary schools, out of 78 public secondary schools in the zone. This is because, six secondary schools out of 78 public secondary schools in the zone do not have science laboratory at the time of this research data collection. The researcher did not sample since, the number of secondary schools in the zone was not high. A four-point scale structured questionnaire developed by the researcher was used to collect data on the safety measures. The instrument is made up of fourteen (40) items. Mean and standard deviation were used in answering the research questions while, Analysis of variance (ANOVA) was used to test the hypothesis at 0.05 level of significance. The results revealed that the extent of safety measures in secondary school science laboratories in Abakaliki Education Zone of Ebonyi State was high. Based on the findings of the study, the researcher therefore, recommended that Government of Ebonyi State and school authorities should keep up the present level of laboratory safety measures in secondary school science laboratories in the state by collaborating with curriculum developers to review the existing curriculum and integrate the basic tenets of laboratory safety measures in the curriculum.

Keywords: safety, safety measures, science and science laboratory.

Introduction

Science makes life easy and improves the standard of living. For science to strive well, it requires well equipped and standard laboratories. The study of nature and natural phenomena is referred to as science. Mbajiorgu (2016) stated that the study of nature and natural phenomena deals with experimental approach of physical measurable and observable quantities. Science is a vital tool to every developing country or nation as supported by Nwana, Bajah and Obioha (2016); that professions such as agriculture, dentistry, engineering, geology, medicine, astronomy, space, exploration and pharmacy would be difficult to develop without science education. Science education subjects include physics, biology and chemistry. Instruction that is student-centered and emphasizes the role of laboratory demonstrations and experiments is the best method to ensure students develop the essential skills of science (Mbajiorgu, 2016).

Allen, Henry, Albert and Donald (2015) described laboratory as a building or room fitted up for conducting scientific experiments, analysis or similar works. Laboratory is thus a workshop for scientists. Igwe (2013) stated that, science laboratory is a facility for learning what science is and its application by scientists. It can be in-door like well-designed and equipped rooms found in most

secondary schools or out-door involving places such as riverside, work shop, field and even market. This means that laboratory experience could be attained either in-door or out-door, which implies providing opportunity for students to develop the understanding of practical and theoretical concepts through solving problems by participation in series of experimental, observational and demonstrating activities. Therefore, science laboratory is a special facility for teaching science through research evidence in secondary school science in general (Igwe, 2013). The laboratory serves as the basic practical framework for carrying out laboratory activities (that is, the study of science concepts, using the scientific method of problem definition, theorizing, testing and so on).

Nwanuma (2019) opined that laboratory activities are expected to enable students obtain the scientific methods of doing science as well as to help them develop more favorable attitudes. Nwanuma (2019), further states that such science laboratories should be relatively safe for those using it as well as the materials, chemical and tools which are stored and used in the science laboratories. Thus, a laboratory is safe if it does not in any way constitute hazard to health, life and property while being used for teaching and learning.

The use of laboratory requires extreme carefulness in order not be involved in accident or hazard. Ibam, Ibrahim and Idoko (2018) stated that the use of laboratories is liable to hazards due to the presence of chemicals and dangerous equipment not properly handled by laboratory users. Laboratory hazards and risks are many and varied as reported by Nkwegu (2019) and include exposition to poison, burns, infection, explosion and stains. Other causes of laboratory accidents he outlined include the following; distraction, poor storage of materials and equipment, failure to use protective items for safety, the use of worn out equipment. Adigun (2015) reported that laboratory accidents are in some cases inevitable; they may in most other cases be minimized or completely avoided if adequate emphasis is placed on correct laboratory safety measures.

Working with safety ensures achieving purpose without damage of any kind, injury or accident. Ali (2016) stressed that safety implies that students, teachers and other laboratory users are not injured or killed, stating that materials and equipment in the laboratory are not damaged during use. Allen, Henry, Albert and Donald (2015) posited that safety refers to the state of being protected from or unlikely to cause danger, risk or injury. Okorie (2019), opined that appropriate safety measures to prevent hazards while making use of the laboratory should be uppermost in priority. Stating that, laboratory users who are not conscious of safety in the laboratory may expose themselves to dangers, hazards or accidents. For laboratories to be safe, it must have safety measures put in place and enforced. Ikoku, Ahmed and Joju (2016) observed that lack of qualified and dedicated teachers and lack of safety facilities such as fire extinguishers, protective eye glass or goggle, safety shoes, fume cupboards among others threaten the safety of those who use the laboratory. Igwe (2016) reported that cases of accidents in Nigerian secondary schools are inevitable during laboratory activities.

To prevent continuous exposure of laboratory users to laboratory hazards, Hayble (2016), opined that laboratory safety measures must be utmost in priority. The teacher should take note of possible accidents which could occur in a given situation and appropriate action to be taken to avoid any unfortunate event, when planning practical for science laboratory work. Hayble (2016), maintained that most reagents and dangerous instruments should have hazard signs placed on them and the safety

measures or precautions of usage clearly enumerated in the manual to assist the user.

Despite the various sources of hazards in the laboratory, Steve (2015) believed that working in the laboratory is a very safe place to work. He opined that, making use of laboratory safety wears like gloves, safety glasses and laboratory coat could prevent contamination of the body with chemicals. Science teachers have the responsibility to develop safety conscious attitude in the students by creating awareness of the hazards involved in any laboratory as well as the rules and procedures guiding a particular activity. Nadino (2018), posited that science teachers must be knowledgeable on the required safety measures needed in each laboratory activity, know procedures and potential hazard associated with the use of laboratory materials. Also, Ibam, Ibrahim and Idoko (2014), advised that science students and teachers should acquire the skills for safety measures in the laboratory. Such skills include the skill of proper storage of chemicals, skill on the use of various safety instruments, skill in the disposal of laboratory wastes, skill in the management of emergency situations, personal practices in the laboratory. Ibam, Ibrahim and Idoko (2014), also pointed out that every laboratory should have safety instruments.

Safety instruments are materials and equipment used to prevent or control laboratory hazards or accident. Aniodoh (2018), Ezeliora (2001), Igwe (2016) and Nord (2018), in their separate investigations stressed that safety instruments including fire extinguishers, first aid box, hand gloves, fume cupboards, laboratory coats, disinfectants, fire blankets, gas masks and sand buckets, must be provided in science laboratories. These are to be used to prevent and control accidents and emergency situations. In order to enhance safety in the use of laboratory, Archenhold, Jekins and Robinson (2017) and Ezeliora (2016) suggested that students should know the location and proper use of these safety instruments.

Safety is the state of being protected from harm or danger. Safety can also refer to the control of known hazard in order to minimize the rate of risk. Flinn (2016) is of the view that laboratory safety deals with the development of skills and responsibility involving every laboratory user which must be integrated into science laboratory curriculum. This implies that safety measures must be integral part of each laboratory course including research with increasingly broader scope at more advanced levels.

Safety measures include the conditions or measures taken in advance to prevent something dangerous or unpleasant from occurring (Nord, 2018). Common safety measures include: detailed examination of chemicals, inspection of activities by specialists geared towards reducing physical stress and also increases productivity, geological surveys to determine the character, relations, distribution, and origin or mode of formation of its rock masses and mineral resources, rule or directive made and maintained by an authority. The development of laboratory safety measures involves total commitment from all levels of the educational sector. At the administrative level, this will include putting a decision or plan into effect such as execution of a chemical hygiene plan which must address the safe handling, storage, and disposal of chemicals. Eye wash and showers should be available and also, in good working condition. A neat and well-arranged laboratory is more conducive and enhances productivity. Hence, the need for this investigation.

Statement of the Problem

A lot of risks are involved during laboratory practical class, which need to be addressed. Otherwise there would be casualty of students and teachers in the laboratory. When laboratories are not safe, they pose danger to teachers and students and

other laboratory users. Surely, not much will be achieved if our present and future scientists are expected to work in laboratories that are not adequately planned, equipped and organized. Amber (2019), reported that research assistant died from burns sustained in a university science laboratory in California, when the plunger popped out of the syringe she was using to transfer tert-butyl lithium. This ignites spontaneously in air, causing her gloves and jumper to catch fire. He also recorded that, another research assistant, died in Yerkes Regional primate research center in Georgia due to a chance splash of primate fluids. Because he did not use safety glasses, a piece of material contaminated with herpes B virus (probably urine or feces) got into her eye and she died six weeks later. Nwanuma (2015), reported that Ikwo High School science laboratory of Ebonyi State was once partially burnt as a result of carelessness, improper lighting of the Bunsen burner and lack of fire safety equipment. For laboratory users and equipment to be free from all these hazards, safety measures must be in place and enforced.

Purpose of the Study.

The main purpose of this study is to preserve human lives and laboratory resources through promoting laboratory safety standard. Specifically, the study sought to:

1. ascertain the extent of safety measures available in Secondary school Laboratory in Abakaliki Education Zone?
2. ascertain the extent of safety measures available based on subject area in Secondary school Laboratory in Abakaliki Education Zone?

Scope of the Study

The research focused on extent of safety measures in secondary school science laboratories. Subject scope was restricted to secondary school science teachers (which include, physics chemistry and biology), in Abakaliki Education Zone of Ebonyi State. The study covered various safety measures availability in secondary school science laboratories in Abakaliki Education Zone, Ebonyi State.

Research Questions

The following research questions guided the study

1. What is the extent of safety measures available in secondary school laboratory in Abakaliki Education Zone?
2. What is the extent of safety measures available based on subject area in Secondary school Laboratory in Abakaliki Education Zone?

Hypotheses

Below is the hypothesis that guided the study;

Ho_1: The extent of safety measures available in secondary school laboratory in Abakaliki Education Zone is not significantly different based on subject areas.

Research Method

The study employed descriptive survey design. The research was carried out at Abakaliki Education Zone of Ebonyi State. The population of the study is 78 science laboratories consisting of 335 science teachers in secondary schools in Abakaliki Education Zone of Ebonyi State. Statistical data available based on 2018/2019 academic year, Biology has 153 teachers; Chemistry has 112 teachers, while Physics has 70 teachers. The researcher did not sample but, made use of 72 schools which have science laboratory. This means 6 out of the 78 secondary schools did not have science laboratory. The instrument used for the collection of data for this study is structured questionnaire and an observational schedule developed by the researcher. The instrument is titled Safety Awareness and Compliance Assessment Questionnaire (SACAQ). The Instrument has 14 items. The instrument was face validated by five experts from the department of science education, one from measurement and evaluation, one from biology education, one from chemistry education and two from physics education.

JOURNAL OF RESEARCH IN SCIENCE AND VOCATIONAL EDUCATION (JRSVE)
Volume 5; Issue 1, 2025
Official Publication of Science and Vocational Department
Godfrey Okoye University, Ugwuomu- Nike, Enugu-Nigeria
Published by K-Injo | Kobia Data Limited

The face validation scrutinized the items in terms of standard, format, clarity as well as content coverage. Cronbach Alpha statistics was used for the computation of the reliability of the instrument which yielded a coefficient of 0.71.

From the data generated, mean and standard deviation were used in answering the research questions, while the entire hypotheses were tested at an Alpha level of 0.05 using analysis of variance (ANOVA).

Results

Research Question 1: What is the level of safety measures in Secondary school Laboratory in Abakaliki Education Zone?

Table1: Mean extent of safety measures in Secondary school Laboratory in Abakaliki Education Zone. N=72

SN	Safety Measures	Mean	SD	Remarks
1	Emergency Alarm bell	1.71	0.72	LE
2	Emergency Exit Door	2.46	0.69	HE
3	Laboratory Earthen	3.08	0.99	VHE
4	Master Control Switch	2.94	0.65	HE
5	Safety Signs	2.63	0.83	HE
6	Safety Manuals	2.40	0.76	HE
7	Safety shoes	2.21	0.71	HE
8	Safety Goggle	2.86	0.78	HE
9	Hand Gloves	3.04	0.62	VHE
10	Fire Extinguisher	2.79	0.79	HE
11	Eye Wash	1.99	1.07	LE
12	Water Appliances	2.64	0.76	HE
13	Sand Bucket	2.81	0.64	HE
14	Laboratory Training	2.35	0.91	HE
	Grand Mean	2.56	0.78	HE

Summary of result presented in Table 1 indicates that item 1 is present at a low extent, items 2,4,5,6,7,8,10,12,13 and 14 are present at high extent while, items 3 and 9 are present at a very high extent. This cluster yielded a grand mean of 2.56. This implies that safety measures in Secondary school Laboratory in Abakaliki Education Zone is at high extent.

Research Question 2

What is the level of safety measures based on subject areas in Secondary school Laboratory in Abakaliki Education Zone?

Data collected with respect to this section A (items 1-14) of the instrument were used to answer this research question. Summary of data analysis is presented in table 3.

Table2: Mean extent of safety measures based on subject areas in Secondary school Laboratory in Abakaliki Education Zone

SN	Safety Measures	Subject Areas	N	Mean	SD	Remarks
1	Emergency Alarm bell	Biology	30	1.63	0.67	LE
		Chemistry	20	1.65	0.67	LE
		Physics	22	1.86	0.83	LE
2	Emergency Exit Door	Biology	30	2.50	0.68	HE
		Chemistry	20	2.60	0.75	HE
		Physics	22	2.27	0.63	HE
3	Laboratory Earthen	Biology	30	3.06	0.74	VHE
		Chemistry	20	3.05	0.65	VHE
		Physics	22	3.14	0.35	VHE
4	Master Control Switch	Biology	30	2.93	0.78	HE
		Chemistry	20	2.95	0.69	HE
		Physics	22	2.95	0.38	HE
5	Safety Signs	Biology	30	2.67	0.84	HE
		Chemistry	20	2.65	0.88	HE
		Physics	22	2.55	0.80	HE
6	Safety Manuals	Biology	30	2.33	0.88	HE
		Chemistry	20	2.35	0.67	HE
		Physics	22	2.55	0.67	HE
7	Safety shoes	Biology	30	2.20	0.76	HE
		Chemistry	20	2.25	0.72	HE
		Physics	22	2.18	0.66	HE
8	Safety Goggle	Biology	30	2.77	0.68	HE
		Chemistry	20	3.05	0.76	VHE
		Physics	22	2.82	0.59	HE
9	Hand Gloves	Biology	30	2.97	0.41	HE
		Chemistry	20	3.20	0.83	VHE
		Physics	22	3.00	0.62	VHE
10	Fire Extinguisher	Biology	30	2.73	0.69	HE
		Chemistry	20	2.95	0.89	HE

		Physics	22	2.73	0.83	HE
11	Eye Wash	Biology	30	1.83	1.02	LE
		Chemistry	20	2.30	1.17	HE
		Physics	22	1.91	1.02	LE
12	Water Appliances	Biology	30	2.57	0.73	HE
		Chemistry	20	2.85	0.81	HE
		Physics	22	2.55	0.74	HE
13	Sand Bucket	Biology	30	2.87	0.51	HE
		Chemistry	20	2.80	0.83	HE
		Physics	22	2.73	0.63	HE
14	Laboratory Training	Biology	30	2.47	0.10	HE
		Chemistry	20	2.50	1.05	HE
		Physics	22	2.05	0.72	HE
	Grand Mean			2.54	0.70	HE

Summary of result presented in table 2 indicates that in item1 Biology, Chemistry and Physics are all present at low extent. In item 2 Biology, Chemistry and Physics are all present at high extent. In item 3 Biology, Chemistry and Physics are all present at very high extent. In item 4 Biology, Chemistry and Physics are all present at high extent. In item 5 Biology, Chemistry and Physics are all present at high extent. In item 6 Biology, Chemistry and Physics are all present at high extent. In item 7 Biology, Chemistry and Physics are all present at high extent. In item 8 Biology and physics are present at high extent while chemistry is present at very high extent. In item 9 Biology is present at high extent while Chemistry and physics are present at very high extent. In item 10 Biology, Chemistry and Physics are all present at high extent. In item 11 Biology and physics are present at low extent while Chemistry is at high extent. In item 12 Biology, Chemistry and Physics are all present at high extent. In item 13 Biology, Chemistry and Physics are all present at high extent. In item 14 Biology, Chemistry and Physics are all

also present at high extent. This cluster yielded a grand mean of 2.54 and SD of 0.7. This implies that the safety measures based on subject areas in Secondary school Laboratory in Abakaliki Education Zone is at high extent.

Hypothesis

Ho_1: The level of safety measures available in secondary school Laboratory in Abakaliki Education Zone is not significantly different based on subject areas

JOURNAL OF RESEARCH IN SCIENCE AND VOCATIONAL EDUCATION (JRSVE)
Volume 5; Issue 1, 2025
Official Publication of Science and Vocational Department
Godfrey Okoye University, Ugwuomu- Nike, Enugu-Nigeria
Published by K-Injo | Kobia Data Limited

Table 3: test of significance of difference of levels of safety measures based on subject areas in Secondary school Laboratory in Abakaliki Education Zone

SN	Safety Measures	Source	DF	Sum of Squares	Mean Squares	F.ratio	F.prob	Decision
1	Emergency Alarm bell	Between Group	2	0.77	0.38	0.73	0.48	Not Sig.
		Within Group	69	36.11	0.52			
		Total	71	36.88				
2	Emergency Exit Door	Between Group	2	1.21	0.61	1.28	0.85	Not Sig.
		Within Group	69	32.66	0.47			
		Total	71	33.88				
3	Laboratory Earthen	Between Group	2	0.92	0.46	0.13	0.88	Not Sig.
		Within Group	69	25.41	0.37			
		Total	71	25.50				
4	Master Control Switch	Between Group	2	0.07	0.00	0.08	0.10	Not Sig.
		Within Group	69	29.77	0.43			
		Total	71	29.78				
5	Safety Signs	Between Group	2	0.20	0.10	0.14	0.87	Not Sig.
		Within Group	69	48.67	0.71			
		Total	71	48.88				
6	Safety Manuals	Between Group	2	0.65	0.32	0.55	0.58	Not Sig.
		Within Group	69	40.67	0.59			
		Total	71	41.32				
7	Safety shoes	Between Group	2	0.05	0.03	0.50	0.10	Not Sig.
		Within Group	69	35.82	0.52			

		Total	71	35.88				
8	Safety Goggle	Between Group	2	1.02	0.51	1.12	0.33	Not Sig.
		Within Group	69	31.59	0.46			
		Total	71	32.61				
9	Hand Gloves	Between Group	2	0.71	0.35	0.93	0.40	Not Sig.
		Within Group	69	26.17	0.38			
		Total	71	26.88				
10	Fire Extinguisher	Between Group	2	0.69	0.35	0.56	0.58	Not Sig.
		Within Group	69	43.18	0.63			
		Total	71	43.88				
11	Eye Wash	Between Group	2	2.80	1.40	1.24	0.10	Not Sig.
		Within Group	69	78.18	1.13			
		Total	71	80.99				
12	Water Appliances	Between Group	2	1.24	0.62	1.09	0.34	Not Sig.
		Within Group	69	39.37	0.57			
		Total	71	40.61				
13	Sand Bucket	Between Group	2	0.25	0.12	0.29	0.75	Not Sig.
		Within Group	69	29.03	0.42			
		Total	71	29.28				
14	Laboratory Training	Between Group	2	2.90	1.45	1.80	0.17	Not Sig.
		Within Group	69	55.42	0.80			
		Total	71	58.32				
	ANOVA Value					0.74	0.46	Not Sig.

Based on the result of the data analysis as shown in Table 3 above the result of all the items (1-14) were not significant because their F. Probability value is greater than Alpha level 0.05. The grand AVOVA value calculated is 0.46. This implies that levels of safety measures based on subject areas in Secondary

school Laboratory in Abakaliki Education Zone is significant.

Discussion of findings

The findings of this study indicate that the extent of laboratory safety measures in secondary school science laboratories in Abakaliki Education Zone is at high extent. This is in line with the findings of Ibam, Ibrahim and Idoko (2018) that, organization of science laboratory is not proper and remains unsafe without adequate emergency doors and eye wash in Nsukka Local Government Area of Enugu State. The results of the data also indicated other safety measures are in high extent such as warning sings, manuals, shoes, goggles and hand gloves including emergency exit doors, master control switch, fire extinguisher and sand bucket. This is in line with the recommendations of Nord (2018) that each laboratory should have at least two exit doors and also Aniodoh (2001) that every laboratory should have a master control switch for gasses, water and electricity which must be easily accessible.

Findings also revealed that, levels of safety measures based on Subject Areas in Secondary School Laboratory in Abakaliki Education Zone is at high extent. Findings reveal that emergency exit doors, master control switches, fire extinguisher, eye wash, water appliances, sand bucket, safety signs, manuals and shoes were provided at high extent in all the three subject areas (science labs.) while, safety goggle and hand glove were at very high extent in Chemistry but, at high extent in both Biology and Physics laboratories.

Summary of Findings

1. The extent of laboratory safety measures in secondary school science laboratories in Abakaliki Education is at high extent.
2. The extent of laboratory safety measures based on subject areas in secondary school science laboratories in Abakaliki Education is at high extent.

Conclusion

Safety is very necessary in all human activities to safeguard lives and property. Therefore laboratory safety measures are essential for the safety of both teachers and students during laboratory activities. Though, the study showed high laboratory safety measures, but not same with other schools in different areas. Since, laboratory safety measures deals with the safety of lives and property, it should be a must in all science laboratories.

Recommendations

Based on the findings of this study, the researcher made the following recommendations:

The state government in collaboration with curriculum developers and science teachers should review the existing curriculum and integrate the basic tenets of laboratory safety measures in the curriculum. Science teachers and administrators should ensure laboratory safety procedures and precautionary measures are followed during laboratory activities. Both teachers and students should be encourage and sponsored for in-service science laboratory safety training.

REFERENCES

Adigun, A.O. (2020), evaluating adequacy of safety facilities in Conducting Secondary School Technology and science Practicals. 40th Annual Conference Proceeding of Science Teachers Association of Nigeria.262-265.

Ali, A. (2021). Strategic issues and trends in science education in Africa. Onitsha: Cape publishers International Ltd.

Allen, W.B., Henry A.M., Albert, C.B. and Donald C.B. (2021).The new international Webster comprehensive dictionary of English language. Columbia: Typhoon international corps.

Aniodoh, H.C.A. (2020). Modern aspects of integrated science education. Enugu: Hacotam Educational books.

Archenhold, W.F., Jenkins E. & Wood, R. C. (2021). School science laboratories .A handbook on design management and organization. London: John Murray Publishers Ltd.

Ezeliora, B. (2021).A guide to practical approach to laboratory management and safety precautions. --Enugu: Snaap Press Ltd.

Flinn, C.M. (2020). A manual/catalogue of flinn scientific inc.Batavia, Illinois USA.

Hayble, T.S.M. (2021). Laboratory Resources Utilization, Funding and Management of Public Institution in Nigeria. African Journal of Education 1(1),24-30

Ibam, J.M., Ibrahim M. and idoko, E.A. (2021). A survey of laboratory safety practices in secondary schools in Nssuka Local Government Area: Unpublished B.Sc (Ed) Project of the Department of Science Education UNN.

Igwe, I.O. (2021). Principles methods, science teaching in Nigeria. Enugu: Jones Communications Publishers.

Igwe, I.O. (2019). Principles of science and science teaching in Nigeria, (An introduction).Enugu: Jones Communication Publishers.

Ikoku, C., Ahmed, M. & Joju, E. (2019). Laboratory exercises in chemistry. Enugu: Fourth Dimension Publishers.

Mbajiorgu, N.M. (2021). Science: The teachers' perspective, an introduction to science education. Enugu: Institute of Development Studies UNN.

Nadino, O. (2019). General guideline for science safety. Wikipedia online encyclopedia. Retrieved March 5, 2018, from www.sciencebyjones.com/ safetyrules.

Nkwegu, V.N. (2019). Adequacy of safety measures in chemistry laboratories in senior secondary schools in Ikwo Local Government Area of Ebonyi State. An Unpublished NCE Project of the Department of Chemistry, Ebonyi State College of Education, Ikwo.

Nord, A.N. (2021). Laboratory safety.Wekipedia, online encyclopedia, retrieved June 5th,2017 from http://www.scs/12.org/scs/curriculumgates.

Nord, A.N. (2021). Laboratory safety. Wikipedia online encyclopedia. Retrieved March 23, 2008, from htt://www.SCSK/12.org/SCS/curriculumgates.

Nwana, O.C. Bajah, T. and Obioha, E. (2020). NCE/DLS course book on integrated science cycle 3. Kaduna: National Teachers Institute.

Nwanuma, T.N. (2019). Laboratory safety awareness of senior secondary chemistry students in Ikwo East Development Center of Ebonyi State. An Unpublished NCE Project of the Department of Chemistry, Ebonyi State College of Education, Ikwo.

Okorie, J.U. (2019). Science education. Bauchi: League of Researchers Publishers.