UNIVERSITY OF CAPE COAST

INSTITUTE OF EDUCATION

MEASURES TO MINIMIZE THE OCURRENCES OF HAZARDS IN SCIENCE LABORATORY AT ASSIN NSUTA CATHOLIC J.H.S.

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BY

FRANCIS KUMI

FOSO TRAINING COLLEGE, ASSIN FOSU.

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A PROJECT WORK SUBMITTED TO THE INSTITUTE OF EDUCATION OF THE FACULTY OF EDUCATION, UNIVERSITY OF CAPE COAST IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE AWARD OF DIPLOMA IN BASIC EDUCATION.

JULY, 2008.

DECLARATION

CANDIDATE'S DECLARATION

I hereby declare that this project work is the result of my own original research and that no part of it has been presented for another diploma in this University or elsewhere

Candidates Name: Francis Kumi

Candidates Signature…… Date…….

SUPERVISOR'S DECLARATION

I hereby declare that the preparation and presentation of the project work were Supervised in accordance with the guidelines on supervision of project work laid down by the University of Cape Coast.

Supervisor's Name:

Signature……. Date…….

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ABSTRACT

This project work came into been, when the researcher was posted into Assin Nsuta Catholic J.H.S to undertake his teaching practice. Various observations made by the researcher prompted him to research into " the frequent occurrences of hazards at the science laboratory by the pupils of Assin Nsuta Catholic J.H.S two. The researcher looks upon himself to research into the various hazards and deduced appropriate measures to minimize them.

The research instruments used for the collection of data were questionnaire, interviews and observation. The climax of this research work attest to the fact that the occurrences of hazards at science laboratories cannot be fully eradicated or uprooted but can help to minimize the hazards from occurring frequently an increasingly. The researcher suggested that further research should be carried out on the various causes of hazards in the science laboratory.

ACKNOWLEDGEMENT

Glory and honour be to the almighty God, Amen. I am full of thank to the almighty God for his protection, strength, skills and knowledge throughout my life.

I am indebted to many without whose effort prayers, support and contributions, the work wouldn't have been successful. Special mention of my parents Mr. Alex Kumi Ntow and Mrs. Comfort Mensah all of Asikuma who nurtured me through God's way and making me what I am today.

During the writing of this work, the researcher had the privilege of holding discussions with a number of personalities, including friends, tutors and colleagues. The researcher mentions in this regard and in gratitude to Mr. Christopher Acheampong who supervised this project work and to other dignitaries etc.

DEDICATION

This project work is strongly dedicated to Mr. John Essel Mensah and his wife Mrs. Agnes Mintah who have helped one so greatly. Not forgetting Agnes Kumi my beloved sister and the rest of my sister who have helped me in no small ways.

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CHAPTER ONE

INTRODUCTION

BACKGROUND TO THE STUDY

The rapid advancement in science and technology has influenced the rate of economic development of nations, improved the quality of life in most part of the would and provided solutions to some problems and need of societies.

The impact of science and technology is felt on education, health, nutrition, transport, communication and many others. Our survival depends on the mastery of the knowledge and attitude of science syllabus page six, science is a method of obtaining or acquiring knowledge through observation and experimentation. For Ghana to develop there is the need to eliminate all form or sort to superstitions and encourage the trepid development of scientific and technological literacy in various fields of study especially from the grassroots level. The Junior High School as the terminal point for the formal education of most pupils needs to be strengthened with scientific knowledge and attitudes. This has prompted the government and now much emphasis is being placed on the education of science and technology. Aside those science laboratories are being

equipped with ultra modern facilities for pupils to have enough practical work in science.

This without any doubt can help in making theoretical aspect to teaching more concrete. This concrete form of teaching is needed in all junior high schools of which Nsuta Catholic J.H.S is of no exception. Although much emphasis has been placed on the education of science and technology in this country, there is more room for improvement particularly how pupils will be interested in the study of it.

The fear that science and technology do harm than good is how most pupils pursue the subject but this is not true and for that matter the researcher has taken upon himself to go into the problems associated in the study of science especially practical lessons in the laboratory.

It came to his notice during the in-in-out programme that pupils of Assin Nsuta Catholic JHS two involved themselves in hazards noted were; shock, heat burns and scalds, chemical burns, foreign materials in the eyes, cuts and bleeding, poison in the month, poison swallowed etc. all the hazards listed above among others that occur in the laboratory hence reducing pupils interest in the study it science and technology.

It is against this background that this action research is being conducted generally to find appropriate measures to prevent or at least reduce the occurrences of hazards at the science laboratory at Assin Nsuta J.H.S.

STATEMENT OF THE PROBLEM

A close observation by the researcher at the science laboratory in Assin Nsuta Catholic J.H.S. when having science practical lessons with JHS two pupils indicated that:

1) Pupils do not know the various kinds of hazards that occur in the science laboratory.

2) They couldn't state the causes of these hazards.

3) They were unable to state the effects of the hazards on their performances in science.

4) They could not suggest ways of minimizing the hazards.

PURPOSE OF THE STUDY

The main purpose of this research is to investigate into the possible and common hazards at the science laboratory and to find appropriate measures to overcome them. This will arouse pupils' interest in the study of science and also experimenting in it. The researcher believes that it is only through this means that the country can advance in science and technology.

Again, it is also designed to help the pupils in Assin Nsuta Catholic JHS two to enable them avoid involving themselves in hazards, be aware of the common hazards that can be encountered in the science laboratory the effects of such hazards on their performance the causes as well as the measures of curtailing the hazards.

RESEARCH QUESTIONS AND HYPOTHESIS

1. What are the possible hazards that often occur in the science laboratory?
2. Are pupils a contributing factor to the hazards at the science laboratory?
3. Are teachers a contributing factor to the hazards at the science laboratory?
4. Is there any negative effect of hazards on the academic performance of pupils in science?
5. What measure can be taken to prevent these hazards in the science laboratory?

SIGNIFICANCE OF THE STUDY

The investigation into the possible hazards in the science laboratory and their effects on the academic performance of pupils in science will help to:

1. Make pupils aware of the common hazards in the science laboratory.

2. Know the causes of the various hazards.
3. Determine the effects of these hazards on the academic performance of pupils in science.
4. Find the appropriate safety measures/precautions to be taken at the science laboratory are reducing the hazards.
5. Get to know/examine the need to experiment in science lessons at laboratory.
6. Be aware of the various standard hazard system symbols.

DELIMINATION OF THE STUDY

Experiment carried out in science laboratory includes, experiment is Physics, Chemistry and Biology. In each of this aspect of science, hazards occur in the process of experimenting. Due to the nature of the programme and many other factors such as time, the situation of the school where the research is being carried out, the research delimitation to only hazards that often occur during experimentation in chemistry.

The project will also cover only JHS two pupils at Assin Nsuta Catholic JHS in the Assin South District.

LIMITATION OF THE STUDY

The research work like many others faced a lot problem in the cause of the study. They include library a lot of problems in the causes of the study. They include library with well equipped materials where references can be made for the study, the situation of the school where the research is carried out also made it difficult for the research is carried out also made it difficult for the researcher to access the internet for information.

Financial constraints and time allocated for the study also posed a big carried out effectively.

ORGANIZATION OF THE STUDY

They study of the measures to minimize the occurrences of hazards of JHS two pupils at science laboratory in practical lessons have been captioned into five chapters, references and appendix.

The first chapter is the introduction of the project. This chapter puts the study into perspective. It describes the background of the study, the statement of the problem, states clearly the purpose of the study. It further describes the specific hypothesis of the research questions to be tested or answered. The first chapter again talks about the distributions of the study limitations of the study and finally the organization of the study which describes how the whole project has been structured.

The second chapter which is the review of related literature talks about what other researchers have discovered in this same area of study.It has been treated under major and minor reviews. The major review deals with the common hazards in the science laboratory safety rules and symbols. The minor review also consists of the general rules of laboratory conduct, then the summary and conclusion of the chapter.

The research methodology section of the project makes up the chapter three of this research work. It entails the research design which is the specific strategies the researcher will employ in collecting, analyzing and reporting the research intends to generalize the result of the study.

The sample and sampling procedures are also described under the population of the study. Again it consists of the instrumentation and their relevant to the study. Procedures used in collecting data, thus the pre-interventions, interventions and post-interventions made in collecting the data as well as how the data collected will be analyzed is also treated under the research methodology in chapter three.

The chapter four is the results, findings and discussion. This chapter talks about the presentations of the results and findings obtained during the research and their discussion as well as the comprehension of the results. It describes the data obtained from the various instrument used. It discusses pertinent issues that were obtained in the data collected. It also discussion how the instrument and interventions help to arrive at findings. The problems addressed and those which were not as well as the general outcome of the intervention are also treated under this chapter.

Summary, conclusion and recommendations is treated under the last chapter which is the chapter five of the report. The chapter five consist of the overview of the research problem and methodology as well as the summary of key findings, recommendations, suggestions of area for further research as the interventions should be modified in subsequent research are all treated under the chapter five which eventually is the last chapter of the project.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

This research topic was discovered when the researcher was posted to Assin Nsuta Catholic JHS to undertake his teaching practice, His choice of this topic became necessary because a lot of things were observed when he had the opportunity to teach science in Assin Nsuta Catholic JHS two. A whole lot of practical lessons at the science laboratory, they encountered some problems there. Pupils involvement in different kinds of hazards when experimenting in science implies that the safety of the pupils at the laboratory were at risk and this puts fear on them and for that matter their interest in the study of science and technology is hindered. This research work is carried out in order to identify the common hazards, their causes, and effects on pupils' performance in

science and safety precaution and rules to be followed to make the science laboratory safe to work.

Safety precaution at science laboratory had been on area of interest by many researchers in science because this field of study threatens many pupils due to the dangers that are encountered in the science of which Assin Nsuta Catholic JHS two (2) is of no exception. Enough had been said by many researchers in this perspective. This chapter (Review of related literature) talks about what others researchers have said about this research topic.

MAJOR REVIEW

Any chemistry laboratory is potentially dangerous because it contains flammable liquids, fragile glassware and poisonous chemicals. Many also are equipped with high pressure gas cylinders whiles some of these gases, for instance nitrogen and helium are high pressure poses potential dangers.

Some of these chemicals easily turn (flammable) and cause fire. Others have various harmful effects on human beings or on the environment.

Ameyiber k. et'al (1990), pieces of apparatus like broken glassware can harm the body by causing deep cuts processes taking place in the laboratory can create a situation harmful to a person's health or surroundings. A person working at the laboratory is exposed to many hazards and must be aware of these hazards and try as much as possible to avert hazards occurring. It hazards do occur then it is important that ways should be found to stop them or minimize their effects. "While no human activity is completely risk free, if you use common sense and a bit of chemical sense, you will encounter no problem."

Keith M. Shea (1988), Awareness and observation of safety rules removes a lot

of the dangers of hazards and makes the laboratory safer place to work. According to Robert et'al (1985), proper precautions must always be followed; it this is done the laboratory is no more dangerous than a kitchen or bathroom keeping the laboratory safe is the responsibility of all persons who were in it. Everybody count!

COMMON HAZARDS IN SCIENCE LABORATORY

Common hazards identified hazards identified at science laboratories according to Nartey L. T. and Menyah C. K (2003) includes the following

1. Shock
2. Heat burns and Scalds
3. Chemical burns
4. Foreign materials in the eye.
5. Cuts and Bleeding
6. Poison in the mouth
7. Poison swallowed.

POSSIBLE CAUSES OF HAZARDS IN SCIENCE LABORATORIES

The following are some of the possible causes of hazards in science laboratories identified by Nartey L. T. and Menyah C. K (2003):

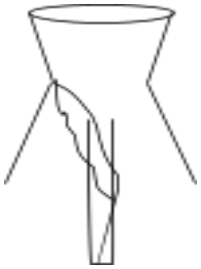
1. Water on floor (especially a polished floor).
2. Spilled acid on a bench on a position where clothing might mop it up.
3. Liquids being poured above eye-level.
4. A flammable solvent being heated with a naked flame.
5. A dangerous liquid being pipette by mouth from a vessel in which the tip of the pipette is only just-below the surface of the liquid.

6. Use of sharp instruments for example broken glass.
7. Overcrowding likely to causes pupils to knock apparatus off the bench.
8. A jar near the eye of a cupboard where it could easily fall off.
9. Unsupported apparatus.
10. Ignorant of laboratory safety rules.
11. Over-groom finger nails.

LABORATORY SAFETY RULES AND SYMBOLS

Laboratory safety rules and symbols identified by Boston (1971) are described as follows.

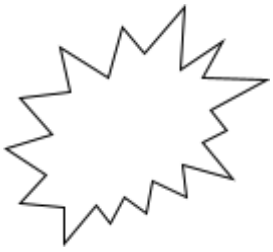
Glassware



GLASSWARE SAFETY

1. where you see this symbol, you will notice that you are working with glassware that can easily be broken.
2. Take particular care to handle such glassware safety and never use broken or chipped glassware.

Fire



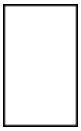
FIRE SAFETY

1. Whenever you see this symbol, you notice that you are working with fire. Never use any source of fire without wearing safety goggles.

2. Never heat anything particularly chemicals unless instructed to do so.
3. Never reach across a flame.
4. Never heat anything in a closed container.
5. Always use a clamp, tongs or heat-resistant gloves to handle hot objects.

Always maintain a clean work place or area particularly when using a flame.

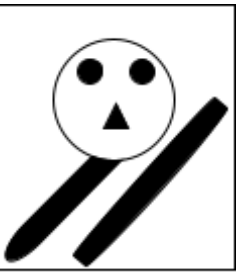
Heat



HEAT SAFETY

Whenever you see this symbol, it tells you that you should put on heat resistant gloves to avoid t burning your hands.

Chemical

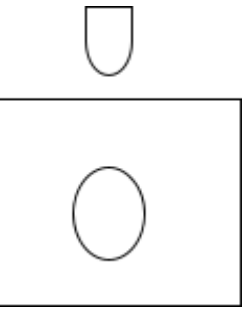


CHEMICAL SAFETY

1. This symbol indicates chemicals that can be very hazardous.
2. Never smell any chemical directly from container. Always use your hands to watt some of the odors from the top of the container towards your nose and only instructed is do so.

3. Never touch or taste any chemical unless instructed to do so.
4. Keep all lids close when chemicals are not in used. Dispose of all chemicals as instructed by your teacher.
4. Immediately rinse with water if any chemical particularly acid get contact on your skin and clothes, then inform your teacher.

Sharp Instrument

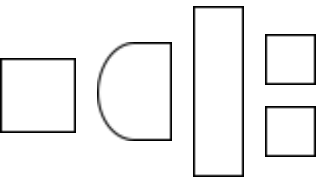


SHARP INSTRUMENT SAFETY

1. whenever you see this symbol, it tells you that you are working with a sharp instrument.

2. Always use simple edged razors, double edge razor are two dangerous.
3. Handle any sharp instrument with extreme care. Never cut any material towards you, always cut away from you.
4. Immediately notify teachers if your skin is cut.

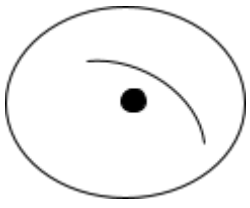
Electric



ELECTRIC SAFETY

1. Whenever you see this symbol, you will know that you are using electricity in the laboratory.
2. Never use long extension cord to plug in any electric device. Do not plug too many applications into one socket or you may overload the socket and cause fire.
3. Never touch an electrical appliances or outlet with wet hands.

Eye and Face



EYE AND FACE SAFETY

1. this symbol indicates that you are performing an experiment in which you must take precautions to protect your eyes and face by wearing safety goggles.

2. When you are heating a test tube or bottle, always point it away from you and others, chemicals can splash or boil out of a heated test tube.

STANDARD HAZARD SYMBOLS

Symbols and signs have been developed to show the dangers associated with

chemicals and apparatus in the science laboratory. "Symbols and signs are used to advise students or pupils and teachers of the dangers involved in the use of some chemicals and apparatus."

K. Ameyiber (1990), safety signs may be those in the vicinity. They are subject to regulations which differ from those requiring hazard warning symbols on bottles or equipment, although in some cases the same may be used.

MINOR REVIEW

1. Perform laboratory work only when your teacher is present or around. Unauthorized or unsupervised laboratory experiment is prohibited.
2. Your concern for safety should begin even before the first activity. Always read and think about each laboratory assignment before starting.
3. Know the location and use of all safety equipment in your laboratory. These include the safety shower, eye wash, first aid kit, fire extinguisher and blanket.
4. Wear laboratory coat or apron and protective glass or goggles for all laboratory works. Wear shoes rather than sandals and back the loose hair.
5. Clean your bench top of all unnecessary materials such as books, clothing before starting your work.
6. Check all chemical labels twice to make sure you have the correct substance. Some chemical formulas and names may differ by only a letter or a number.
7. You may be asked to transfer some laboratory chemicals from a common bottle or jar to your own test tube or beaker. Do not return any excess material is it original container unless authorized by your teacher.
8. Avoid unnecessary movement and walk in the laboratory.

9. Never taste laboratory chemicals, gum, food or drinks should not be taught into the laboratory.
10. If you are instructed to smell something, do so by fanning some of the vapour towards your nose. Do not place your nose near the opening of the container. Ask your teacher to show you the correct technique.
11. Never look directly down into a test tube, view the container from the side. Never point the opening end of a test tube towards yourself or neighbour.
12. Any laboratory hazard however small, should be reported immediately to your teacher.
13. In case of chemical spill on your skin or clothing, rinse the affected area with plenty of water, If the eye are affected, water-washing must begin immediately and continue for (10 – 15 minutes) or until proper assistance is seek or obtained.
14. Minor skin burns should be placed under cold running water.
15. When discharging, use materials carefully follow the instructions provided.
16. Return equipment, chemicals, aprons and protective glasses to their usual and designed locations.
17. Be familiar with the layout of the laboratory room, know the location of fire extinguisher, fire blankets, safety shower and eye wash faintains.
18. Learn the location of the nearest exit from the laboratory to the outside of the building. In case of fire out-break in the building due the stairs to exit, never use the elevator.
19. Before leaving the laboratory, make sure that gas lines and water faucets are shut off.

20. Never work in the laboratory alone.

21. If in doubt ask!

SUMMARY

This chapter talks about what others have said about the safety precautions to be taken in the science laboratory. In the first place, consideration was given to the common hazards in the science laboratory which includes; shock, heat burns and scalds, chemical burns, eye hazards, cuts and poisoning. Possible causes of hazard in the science laboratory as well as laboratory rules and symbols associated with them are also dealt with in this same chapter.

Finally, it also consists of the general rules of laboratory conduct.

CONCLUSION

The most important safety rules are to follow your teacher's directions or the directions in your textbook exactly as stated. Safety signs and symbols should be posted on appropriate doors, walls, boards, benches, cupboards and chemical containers in the laboratory. This would help put pupils alert about safety in the science laboratory. It is also very essential for pupils to be reminded of the laboratory safety rules and symbols before entering the science laboratory.

CHAPTER THREE

METHODOLOGY

INTRODUCTION

This section of the study describes the population of the study, the design, research instrument and procedures followed. It also describes how the researcher collected and analyzed the collected data as a way of finding solutions to the problems of the study.

RESEARCH DESGN

At the research design of the methodology section, one would read about the specific strategy the researcher employed in collecting, analyzing and reporting the research. The researcher decided to use the descriptive survey to investigate into the problem and also enable him to collect relevant data to test his hypothesis or the research questions. The purpose of the research design is to observe, describe and document aspect of a situation as it naturally occurs.

POPULATION AND SAMPLE SELECTION

The population of the study or the target population to whom the research intended to generalize the results of the research is all pupils at Assin Nsuta Catholic JHS two. The school has a population size of about one hundred and twenty (120) pupils at which the majorities are girls. Out of this number, the focus was on forty (40) pupils which constitute the form two class. This class was chosen due to the fact that most of the practical works in form two. Thus taking the population of JHS two pupils was relevant for the study. It has been said earlier that out of 120 pupils in the school, only 40 were selected for the study which represernts 33.3%. this happened as a result of the nature of the course, time available for the study, financial constraints and many others. These challenges were the factor that inhibited the researcher from choosing more than the given figure discussed already. The above figure indicates that the sample size was 40 out of 120 pupils. The method used for the sampling was random sampling.

In the random sampling, the lottery method was used. This method ensures that each pupil has an equal chance of being selected or picket. The procedures are described below;

1. A sample frame was constructed by preparing a list of students or pupils records which includes names and addresses of sample unit in alphabetical order and numbered accordingly.
2. The names listed in sample frame and their numbers were written on slips of paper and were put in a container.
3. It was well mixed and a slip of paper was removed at a time from the container without working into it.
4. The name and number on the slip selected was recorded and was thrown back into the container before the next picking was done.

RESEARCH INSTRUMENTS

The instruments simply imply the tools the researcher employed in collecting data. In this research work, the tools the researcher used include questionnaire, interview schedule and observation. The questionnaire was administered by the non-mail (personal delivery) and was to find out those responsible for the causes of hazards at science laboratory. Whether teachers, pupils or both. It was used to find out the effects of hazards at science laboratories on the performance of pupils in the study of science.

The interview was used to collect data on the common hazards at the science laboratory. Information on the possible causes of hazards identified was collected using observation as well as common standard hazards symbols often seen at the science laboratory.

DATA COLLECTION PROCEDURES

The questionnaire was administered by the non-mail that is personal delivery. Set of printed questions were designed to gather specific data from respondents through the answers the gave. The questionnaire was handed over to the prospective respondents to be taken home and provided the answers themselves.

At the intervention, the interview guide was prepared which included the questions to be asked and spaces to record the answers the respondents gave. The interview was conducted both at school and at home.

Teachers especially science teachers were also interviewed to find those things responsible for the causes of hazards at the science laboratory. The researcher also engages himself in the observation of pupils at the science laboratory during practical lessons. Findings from the observation were recorded during the process. The researcher employed the passive observation technique. This implies that the assessor did not take active part but just did strict recording data. The assessor or the researcher was made to through the questionnaire so that validity could be assured as well as the interview guide.

INTERVENTION PROCESSES

INTERVENTION;

This simply refers to a set of strategies planned and implemented to solve a specific problem or improve of reform an educational practice located in an immediate situation. The intervention processes have been put into three categories. That is pre-intervention, intervention and post-intervention.

THE PRE-INTERVENTION

This is the procedure that the researcher adopts in trying to define or diagnose

the perceived problem before the actual intervention. In this research work, the researcher at the pre-intervention stage, observed the following that;

1. pupils were not aware to the causes of hazards at the science laboratory.
2. they were ignorant about common hazards at the science laboratory.
3. do not know much about safety rules and laboratory conduct.
4. could not identify standard hazards symbols and its implications.
5. it should be stated that this observation was done in accordance with some of the lessons taught and the outcome of its was recorded down. This record of the observation enabled the researcher to device a suitable means of solving the problems at hand during the intervention.

INTERVENTION

This is a series of concrete measures or approaches put in place to solve a specific problems. Based on the observation done by the researcher at the pre-intervention, he put the following measures during the intervention stage;

1. the pupils were made aware of the causes of hazards at the science laboratory. With this, the researcher identified the causes of hazards as follows; liquids on floor (especially polish floor), spilled acid on a bench in a position where clothing might mop it up, liquid being poured above the eye level, ignorant of laboratory safety rules, over-grown finger nails among others were identified. These causes were listed down at the science laboratory. Again common hazards that occur in the laboratory as well as laboratory safety rules and conduct were also listed, printed and pasted at the doors, walls, columms etc of the laboratory to keep the rules in the minds of the pupils before and at the laboratory. These were made after the pupils have been taught. Moreover, teachers were made to

be in the science laboratory during experiment and never left the pupils alone in the laboratory.

Standard hazards symbols and signs associated with chemical were also made known to the pupils and teachers as well as also warned them to be extra careful when working with those chemicals and apparatus. The symbols were also drawn on cards and pasted at the science laboratory. A sample of the listed of the standard hazard symbols are shown below.

DAIGRAMES

A critical examination of all the diagrams above will indicated that they are meant for some purpose almost all the diagrams seen above carry one message. That is to warn pupils on dangers associated with laboratory apparatus and chemical as well. This implies that the science laboratory is potentially dangerous and extra care must be taken when working at the laboratory. The researcher during the pre-intervention stage saw or observed that, pupils do not know much about standard hazard symbols and signs as well as its interpretation and sue to that pupils confused with the usage of some apparatus and chemicals at the laboratory. As result of this, they involved themselves in number of hazards anytime practical lesson is taught. This prompted the researcher to institute some measures in a way of solving the problem.

The researcher thus introduced the pupils to these symbols by way of printing

them on cards and papers and pasted them at the vantage point at the science laboratory. When pupils mastered the symbols and sign as well as their meaning, the frequent and increasing occurrences of hazards reduced gradually. The result of this could be seen at the post-intervention observation made by the researcher.

POST-INTERVENTION

This refers to the last category of the intervention processes. This evaluates the outcome of the action taken. This ascertains whether the problem at hand has been solved. At this stage of the intervention process of this research work, the researcher gave out questionnaire was used to identify those factors responsible for the causes of hazards at the science laboratory. It was also used to find out the effects of hazards at science laboratory on the performance of pupils in the study of science. Observation as well as interview were also conducted or employed to collect data for the post-intervention.

DATA ANALYSIS PLAN

This explains how the data collected was analyses. In this research work, descriptive statistics was used to analyze the data. The descriptive statistics employed included only measures of central tendency such as mean, percentages etc were used in the analysis of the data collected. Representation of data on pie chart as well as bar graphs was also catered for.

Respondents were made to submit the questionnaire is the researcher at the school premises. Pupils were motivated in the answering of the questionnaire and interviews try awarding them pens, pencils and exercise books.

CHAPTER FOUR

RESULTS / FINDINGS AND DISCUSSION

This chapter would analyse the data collected from the respondents. Figure and percentages are used to make explanation of the issue at hand clearer. Also pie chart and bar graphs are used for graphical explanation.

The purpose of the study as noted from the previous chapter is to deduce some measures to minimize the occurrences at hazards in science laboratory at Assin Nsuta Catholic JHS two. The data collected were also shown on various tables in this chapter. The discussion that had been held earlier mentioned that tables were used to show the result of the observations, interviews and questionnaire prepared by the researcher. These are shown as follows:

Table 1. This shows the observation made by the researcher on some lesson taught at the pre-intervention stage.

Umber of lesson taught	number of hazards occurred	number of pupils involved
1	6	7
2	5	6
3	4	5
Total	15	18

The table 1. above illustrated the record of the observation made by the researcher himself at the pre-intervention stage. It shows the number of lessons observed, the number of hazards occurred in each lesson as well as the number of pupils

involved in each case. From the table the total number of hazards per lesson (mean) can be shown as summation of hazards per lesson/number of lesson observed number of hazards/lessons observed.

Mean $\frac{6+5+4}{3} = \frac{15}{3} = 5$

It implies that in each lesson five (5) hazards occurred. Also the total number of pupils involved in hazards per lesson can be calculated as number of pupils involved in hazards in each lesson/number it lessons observed

$$\frac{\text{Number of pupils involved in hazards per lesson}}{\text{Number of lesson observed}}$$

$\frac{7+6+5}{3} = \frac{18}{3} = 6$

It also shows that in each lesson six (6) pupils involved in the hazards occur and the number of pupils involved in the hazards is six per lesson representing 12.5% and 15% respectively.

This has also been shown on a bar chart as shown below number of hazards occurred is represented on the y-axis that is frequency and number of lessons observed (marks) on the x-axis respectively.

Graph diagram

B. Also the number of pupil in hazards per lesson is shown below

Graph diagram

Table 2. Responses to the common hazards in the science laboratory.

Hazards	number of respondents	Percentage (%)
Shocks	1	2.5
Heat burns	3	7.5
Chemical burns	16	40
Foreign material in the eye	3	7.5
Cut and bleeding	9	22.5
Poison swallowed	3	7.5
Poison in the mouth	2	5
Others	2	5
No response	1	2.5
Total	40	100

The table above shows the response of the questionnaire that was given to the pupils to fill with the aim of finding the common hazards in the science laboratory. It was clear from the table that the most occurring hazards in the science laboratory are chemical burns and cuts and bleeding which are represented 40% and 22.5% respectively. Considering the population under study, it can be said 25 out of the 40 pupils responded that chemical burns and cuts and bleeding are the major hazards that

confront pupils when having science practical lessons at the laboratory. This also implies that much is to be done about these hazards to help curb it as well as the minor ones.

Table 3. Response of these considered as the contributing factor to the causes of hazards in the science laboratory.

Factors	number of respondents	Percentage (%)
Teachers	7	17.5
Pupils	30	75
None of them	3	7.5
Total	40	100

The table 3 above shows the response of the questionnaire filled by the pupils to find out those responsible for the causes of hazards in the science laboratory. As many as thirty pupils representing 75% were of the view that pupils are the major contributing factor to the causes of hazards. Seven respondents representing 17.5 also said that teachers are the contributing factor to the causes of hazards in the science laboratory. Three (3) pupils responded neither neigther teachers nor pupils being the contributing factor. The above data is represented on a pie chart below it has been converted into degree (360^0).

Factor (items)	number of respondents	Age of sector
Teachers	7	$7/40 \times 360 = 63^0$

Pupils	30	$30/40 \times 360 = 270^0$
None of them	3	$3/40 \times 360 = 27^0$
Total	40	360

Pie Chart

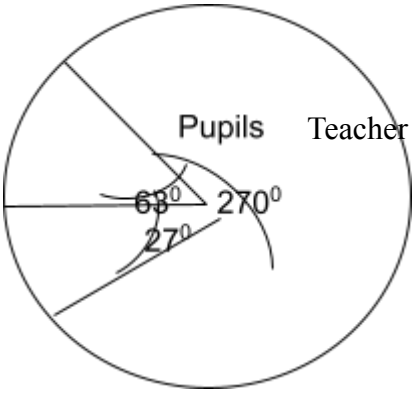


Table 4. Response to the causes of hazards in the science laboratory.

Causes	number of respondents	Percentage (%)
Water on the floor.	23	57.5
Spilled acid on the bench.	16	40
Liquid poured above the eye level.	10	25
Flammable solvent heated with naked flame.	13	32.5
Pipetting below the surface of the liquid by mouth.	11	27.5
Overcrowding	14	35
A jar near the edge of cupboard.	8	20

Unsupported apparatus.	12	30
Overgrown finger nails.	17	42
Ignorance of the laboratory rules and symbols.	20	50
Pouring liquid from a large bottle.	9	22

The table four above shows the data obtained from the questionnaire that were given to pupils to tick [ ] as many as they think are the causes of hazards in the science laboratory. The questionnaire was given to a total number of forty (40) pupils to fill. It can be seen from the table that majority of the pupils ticked water on the floor , ignorance of the laboratory safety rules, overgrown finger nails and spilled acid on bench as the major causes such as liquid being poured above the eye level, a flammable solvent being heated with naked flame among others, though were not ticked more as compared to those discussed earlier but can also not be left out. In short, the table shows that the various causes of hazards listed contribute greatly to the hazards in the science laboratory.

Teachers as well as pupils were interview to know whether the hazards at the science laboratory have negative influence on the academic performance of pupils in the study of science especially practical lessons.

This is shown on the table below.

Table 5. Results of the interview conducted.

RESPONDENTS	YES	NO	TOTAL
Teachers	3	1	4
Pupils	32	8	40
Total	35	9	44

From the table five, out of the forty (40) pupils and four (4) teachers interviewed, three (3) teachers said that the hazards occur in the science laboratory have negative influence on the pupils because this has led to a drastic reduction of the pupils who avail themselves for experiments at the science laboratory. Again thirty-two (32) out of the forty pupils interviewed also said 'YES'. That is pupils have been influence negatively on the study of science practical lessons due to the hazards that occur.

The responses of the pupils indicate that they feel unhappy as well as unsafe in going for practical lessons at the laboratory due to the frequent occurrences of hazards. The outcome of this is reduction of pupils' interest in studying science in general let alone practical lessons. Teachers also complain about the hatred that pupils develop for science which makes them absent themselves from science lessons.

Table 6.

Lessons	Number of hazards	number of pupils involved
1	3	3
2	2	3
3	2	2
4	1	1
5	-	-
Total	8	9

The table six above illustrate the final and post-intervention, observations made by the researcher which were recorded down. From the table, five lessons were observed on different days or occasions which the result was written down. In each of the lessons observed hazards occurred and some pupils became victims, except lesson five in which no hazard occurred and as such no one was a victim of it.

Lesson one for example; three (3) different hazards occurred which three pupils were victims of it. The fourth lesson for instance also recorded no hazards as against one pupil, but lesson five recorded no hazard. In all, the summation of the hazards occurred is eight (8) and that of pupils affected is also nine (9). By comparing the observation done at pre-intervention stage to that of post-intervention, it can be said that the number of hazards occurred and the pupils who became victims has reduce drastically. This is so because lesson five of the post-intervention stage for instance recorded no hazard. This implies that some measures have been put in place and also pupils have really been oriented.

From the table, a statistical conclusion that can be drawn is, the average number of hazards per lesson/the average (mean) number of pupils involved in each lesson which is shown below. The total number of hazards/lessons observed.

$$\text{Mean} = \frac{3+2+2+1}{5} = 8/5 = 1.6 \text{ approximately} = 2.$$

It implies 2 hazards occur per lesson.

Again, the total number of pupils involved in each lesson Summation of pupils who were victims / lessons observed.

$$\text{Mean} = \frac{3+3+2+1}{5} = 9/5 = 1.8 \text{ approximately} = 2.$$

That 2 pupils were victims per lesson.

In this chapter, a discussion has been made on the results and findings from the questionnaire answered by the pupils and the interviews as well as the observations made by the researcher. It was clear that in almost every practical lesson, hazards occur which pupils also becomes victims of it. It was also seen that the common hazards such

as chemical burns, cut and bleeding etc at the science laboratory are caused mostly by pupils. That is pupils form the major part as the contributing factor to the causes.

Finally, it has also been seen that the occurrences of hazards in the science laboratory affect or influence pupils negatively in the study of science specifically practical lessons. It can also be deduced from the discussions held above. The mechanisms put in place by the researcher has helped reduced the occurrences of hazards in the science laboratory at Assin Nsuta Catholic JHS.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

SUMMARY

As earlier stated, the purpose of this study is to find out the appropriate measures to help reduce or minimize the occurrences of hazards associated with science practical lessons at the laboratory as well as the effects of these hazards on the academic performance of pupils in science. In order to collect enough data for the study, questionnaire was given to pupils to fill. Interviews as well as observations were put in place or conducted.

The results and finding as discussed earlier indicated that in each lesson a total number of two (2) hazards occurred in which two pupils became victims. The common

hazards at science laboratory according to the results included; chemical burns, cuts and bleeding, heat burns, foreign materials in the eye and many others.

It also came to notice that pupils were the major factor contributing practical lessons. Again, it was also seen that, the various hazards at the science laboratory have negative effective on pupils' performance in science and technology at large.

CONCLUSION

This study has revealed so many things that militate against pupils high performances in science practical lesson. It has then put in place the necessary measures of mechanism to help reduce the occurrences of these hazards in the laboratories. It has also awakened pupils to know more about hazards and how to ensure prevention as well. By this various hazards symbols and signs are shown to pupils. In all, the study has created awareness to both pupils and teachers who engage in science practical lessons the various causes of hazards, its effects and how minimize or control them to ensure safety in the science laboratory.

RECOMMENDATIONS

The researcher, after carefully conducted the study has the following recommendations:

1. That refresher courses should be organized for science teachers at JHS level from time to time on how to handle pupils at science laboratory during practical lessons.
2. Pupils should be made aware of the common hazards they are likely to encounter at the science laboratory before going there, and this would make them be extra careful.

3. teachers particularly science teachers should be in the science laboratory every time an experiment is being undertaking and never leave the pupils alone.
4. Laboratory safety rules and symbols should be printed boldly and clearly and pasted at vantage points such as the walls of the laboratory, door an column etc. This will help keep the rules in minds of the pupils or even they may remember the rules when they see them.
5. Standard hazards symbols and signs associated with chemicals and apparatus in he science laboratory should be made known to the pupils and teachers as well in order to be extra careful when working with those chemicals and apparatus.
6. Highly poisonous chemicals and fragile apparatus should be properly kept at the laboratory.

AREAS FOR FURTHR RESEARCH

The researcher after this study, suggest that further studies should be carried out on the various causes of the common hazards identified in this research work.

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APPENDIX A.

A sample of questionnaire given to pupils to fill

Foso Training College (FOSCO), Science Department.

QUESTIONNAIRE

INTRODUCTION

The object of this questionnaire is to enable the researcher gather information on "measures to minimize the occurrences of hazards at the science laboratory." Please give

vivid answer to the questions because your answers will be treated will all confidentiality. Do not disclose your identity as an individual, Thank you. Where alternative answers are provided, please tick [ ] denoting your choice of answer. where there are no alternative answers, please provide your answers in the spaces provided.

QUESTIONNAIRE SERIES NO. 001 (For researcher)

1. How many times do you visit the science laboratory for pracitical work in science in a week? a) one b) two c) three d) four

2. Have you ever encountered hazards at the science laboratory?

YES [ ] NO [ ]

3. How many times, specify if any……?

4. Tick [ ] from the list below the one your hazard can be classified under:

Electric shock [ ] Heat burns [ ] Cuts and bleeding [ ]

Chemical burn [ ] Foreign materials in the eye [ ]

Poison in the mouth [ ] Poison swallowed [ ]

5. What was the cause of your hazard …….?
6. Tick [ ] from the list below, those likely to cause hazards at science laboratory.

a) Water on the floor [ ] b) Spilled acid on bench [ ]

c) Liquid poured above the eye level [ ]

d) Flammable solvent heated with naked flame [ ]

e) Pipetting below the surface of liquid by mouth [ ]

f) Overcrowding likely to cause pupils to knock apparatus [ ]

g) A jar near the edge of cupboard [ ]

h) Unsupport apparatus [ ]

i) Over-grown finger nails [ ]

j) Ignorant of laboratory safety rules [ ]

k) Pouring liquid from large bottles [ ]

l) Others [……]

7. Who do you blame as the cause of your hazards?

a) Teacher [ ] b) Pupils [ ] c) Headmaster/Mistress [ ]

8. What is your attitude to experiment at the science laboratory?

a) Like [ ] b) Not sure c) Dislike [ ]

9. Has your hazards gotten a negative influence on your academic performance?

YES [ ] NO [ ]

10. What suggestions would your make as a measure of making science laboratory safe

…….?

Thank you for your co-operation.

APPENDIX B.

A sample of interview guide prepared for teachers ;

1. How many periods on the timetable are allocated for the teaching of science in form two?

2. What number of periods do you use for experiment at the science laboratory?

3. When do you experiment at the science laboratory?

a) morning b) after break c) afternoon

4. Do your pupils encounter hazards at the laboratory during practical lessons

……?

5. If Yes, What kind of hazards and why…….?

6. How was the attitude of the pupils towards experimenting at the laboratory and how is it now.

7. What can you say is the cause of this ……?

8. Who do you blame for the cause…….?

APPENDIX C

Sample of Interview Guide for Pupils

1. How do you like your teacher handling science?

   a) very much b) not much c) not at all

2. Have you ever had experiment at the science laboratory…….?

3. Have you had hazards at the science laboratory before ……?

4. How many times do you go for experiments at the science laboratory?

   a) often b) very often c) not at all

5. Who do you blame is the cause of your hazards at the science laboratory

   …….?

7. How do you feel when it is time for experiment at the science laboratory

   ……?

7. Has the hazards at the science laboratory influenced you negatively in your performance in science? a) YES b) NO c) Not Much