INVESTIGATION OF THE AVAILABILITY AND EFFECTIVE USE OF CHEMISTRY LABORATORY EQUIPMENT AMONG SENIOR SECONDARY SCHOOLS STUDENTS IN MINNA METROPOLIS, NIGER STATE

BY

JAIYEOLA, Dupe Sarah
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ABSTRACT

The topic of the study is the investigation of the Availability and Effective use of Chemistry Laboratory Equipment among Senior Secondary Schools Students in Minna metropolis Niger State, Nigeria. A total of ten (10) schools were sampled from the two local Governments in Minna metropolis. Two hundred (200) students and twenty (20) teachers were selected using random sampling technique. The instrument used for data collection was developed by the researcher. The Questionnaire on Availability of chemistry Laboratory Equipment (QACLE) and Questionnaire on Effective-use of Chemistry Laboratory Equipment (QECLE) was used. The questionnaires have twenty (20) items. The reliability coefficients of the instruments used were 0.78 for that of the teachers and 0.88 for that of the students. Descriptive survey design was used. Descriptive statistics including percentages, mean and standard deviation were used to answer research questions. It was revealed from the study that a total of nineteen out of the twenty listed items were available while water tap is not available in Minna metropolis. The study also revealed that laboratory equipment's are not adequately provided for in secondary schools. Additionally, due to inadequacy in the quantity of laboratory equipment's provided to secondary schools, students and teachers find it difficult to use the laboratory equipment's effectively. Different factors such as over enrollment of students into government secondary schools; inadequate fund; lack of supervision; inadequacy in quantity and quality of chemistry laboratory equipments; together with ignorance on the proper usage of laboratory equipment's due to lack of training were establish to work against availability and effective use of laboratory equipment's in secondary schools. Based on the above problems, it was recommended that chemistry laboratories should be effectively funded; teachers and students should be trained on proper improvisation of laboratory equipment; proper storage of laboratory equipment's: replacement/repair of damaged laboratory equipment's; supervision, monitoring and evaluation of chemistry laboratory equipment's and effective use among others were recommended as approaches for improving availability and effective use of chemistry laboratory equipment's in secondary schools in Minna metropolis.

CHAPTER ONE

1.0 INTRODUCTION

1.1.Background of the Study

Science and technology is essential instrument for development and productivity in any nation. Science is indispensible for any nation who wants to ensure rapid growth, development that has its head held high among civilized nations. This is because science and technology provide the vital instruments for industrialization and economic growth in the areas of communication, transportation, energy, information, contamination and waste control among others. In Nigeria, the study of science is of a great value that lot of emphasis has been laid on the teaching and learning of science in our schools and organizations (Neboh, 2009). Modern Science is the strong back bone which modern developments in Science and Technology depend. Several discoveries that has been recorded by man in the quest to improve his life were accomplished through the knowledge of science, it therefore became necessary that science should be taught at all stages of education (Ihejiamaizu and Ochui, 2016). At the senior secondary school science is subdivided into Biology, Geography, Chemistry and Physics.

Chemistry is an important science that cuts through all the sciences and its importance cannot be underscored. Chemistry is very vital in the world of industrial development. Today, the world is regarded as a global village; meanwhile, this view of globalization is connected to industrialization in which chemistry is the vital. Chemistry has numerous benefits for national development. It plays essential roles in manufacturing of food, clothing, housing, medicine, transportation, among others (Zudonu et al., 2018).Chemistry also offers numerous job opportunities. Chemistry education must offer learner's direction concerning impending future employment in chemistry connected jobs. The job prospects that a good instruction in chemistry

can offer are not limited to chemical industry alone. The knowledge of chemistry is essential for employment in all other sciences such as geology, biology, material sciences, archaeology, environmental sciences, engineering and medicine. Learners deciding for one of these professional fields need proper understanding of chemistry and about recent developments in chemistry. Chemistry is not just essential for occupations in the field of science and engineering, but is also essential for those in economy, trade or economy who frequently deal with the matters of chemistry and its connection to economy, ecology, or society. Those working in these fields might profit from the good knowledge of chemistry education in higher institutions (Eilks and Hofstein 2013).Chemistry is a core science subject, that deals with the composition, structure and behavior of atom and molecules that make up all forms of matter. The study of chemistry requires the learning of concept, established principles, laws and theories and also some important activities – oriented laboratory work (Musili, 2014).

Laboratories provide students with the views for them to interact openly with the physical world by using tools and data collection methods. Laboratory work is a crucial part in teaching of science. There is no hesitation that practical work in sciences at schools is widely recognized as a vital factor in teaching and learning of chemistry. It is an effective way of enhancing student's motivation and also extends the knowledge of the students in understanding the theories and ideas about their natural world. It is also an eminent fact that learners prefer practical work to any other learning activities (Zaid, 2014). Laboratory experimentations are to be demonstrated practically, some of the principles that has been thought theoretically in the classroom has no effect without practical work. It is very important that laboratory provide adequate space and also create good environment for learning. Laboratory practical's are dependent on the availability and level of equipping of the laboratory with relevant instructional materials such as

Bunsen burner, tripods stand, pipette, beakers, oven, boiling tubes, conical flasks, wash bottle, measuring cylinder, stirring rod, test tubes, spatula, litmus paper, funnels, aqueous ammonia, aqueous barium chloride, hydrochloric acid, sulphuric acid, nitric acid, universal indicator etc. and the ability of the teacher to effectively and efficiently use them during practical lesson. The following are the reasons why teachers are reluctant in using laboratory in teaching of chemistry which are protection, anxiety; lack of self-confidence, inadequate of laboratory equipment's and time deficiency (Tatli and Ayas, 2013).

Most of the chemistry teachers are afraid of conducting chemistry practical's because of the risk in handling chemicals some of these chemicals are toxic they release harmful substances into the environment, some of these laboratory do not have safety equipment, and some of these laboratory are not properly equipped and where they are available there may be shortage as a result of breakage or lost, even where they are adequate the teacher may have little or no knowledge of laboratory experience in term of setting up of the laboratory tools for practical's, selecting the laboratory apparatus that suit the practical's, as a result of these teachers skip practical's and concentrate on the theoretical aspect of chemistry. The followings are the factor to be considered when attempting to improve student's achievement in science. These include the availability of laboratory, scientific equipment and the quality of science teacher (Mulela, 2015).

Use of laboratory equipment is the regularity by which the available laboratory equipment are used in laboratory experiments. Laboratory equipment's can be available, adequate but not properly use during science teaching especially chemistry (Amba, 2015). Teachers are not

Familiar to the equipment in the laboratories and they are unable to use them. Some teachers do not have knowledge on maintenance and repair of this laboratory equipment (Gecer 2015).

Laboratory equipment use and maintenance:

i. Carefulness in management.

ii. Minimum amount of chemicals must be used to prevent it from wasting.

iii. Whichever damage must be reported and apparatus must be washed with detergent powder and dried instantly after the practical.

iv. The laboratory equipment that are made of iron e.g. spatula, retort stand and clamp, needles, scalpels, scissors, etc. must be washed, dry and lubricated after practical.

v. Cold equipment must not be heated unexpectedly and the equipment must not be cooled unexpectedly.

vi. In order to prevent adulteration of reagents, cork or stopper must not be exchanged for reagent bottles. Teachers and students must learn to return the reagent bottle immediately after the practical. (Kassim, 2014).

There are some schools that do not have a chemistry laboratory at all. In some schools where laboratories were available, the laboratory were fairly equipped, it established they nonetheless lacked vital requirements such as a fume chamber, first aid kit, gas taps and running water (Njoka,2015). Some schools do not have laboratories they only have science rooms which lacked laboratory space, It was noticed that apparatus and chemicals were either insufficient and not available in such schools, instead teachers improvised those equipment using locally available resources in their surroundings (Mulela, 2015).laboratory equipment are packed away where they collect dust for many years which cause malfunctioning of such equipment. They may lay waste because the teacher are not making use of them or they don't know how to use. And when they are faulty the replacement parts are hardly available (Muhammed, 2017).

Students exposed to adequately equipped laboratory perform better than those exposed to inadequately equipped laboratory. The students that are exposed to adequately equipped laboratory exhibited a modification of attitude that was more positive than those students that are exposed to inadequately equipped laboratory (katchi and wushishi 2015). Students that are exposed to the use of available laboratory facilities performed better than those that are not exposed to the use of available laboratory facilities. Availability of laboratory anticipated the academic performance of senior secondary school student (Akanbi 2018).

It is of great important for availability and effective use of chemistry laboratory equipment in senior secondary schools especially in Minna metropolis.

1.2. Statement of the Problem

Research in science education have shown that the various instructional methods that have been used in teaching practical chemistry has not improved students' academic achievements in the subject to any significant extent despite the effort of science educators. This is due to inadequate laboratory equipment and ineffective use of the available laboratory equipment in our secondary schools. Most laboratory equipment are lost, damaged or carelessly stored. In some cases, students are not allowed to make use of chemistry laboratories due to fear of losing valuable materials through stealing in the laboratory, researchers have been researching on the laboratory equipment in secondary schools without considering the extent of availability and their effective usage . Based on this reason, the researcher is interested in finding the extent of availability and effective use of laboratory equipment in Minna metropolis and proffering possible solutions.

1.3 Aim and objective of the study

The aim of the study is to examine the availability and effective use of chemistry laboratory equipment in senior secondary schools in Minna metropolis. **The objective of the study includes to;**

- Determine the extent of availability of chemistry laboratory equipment in secondary schools.
- Determine the extent of the effective use of chemistry laboratory equipment in secondary schools.

1.4 Research Questions

In order to guide this study, the following research questions were posed:

1. What is the extent of availability of chemistry laboratory equipment in secondary schools in Minna metropolis?
2. What is the extent of the effective use of chemistry laboratory equipment in secondary schools in Minna metropolis?

1.5 Significance of the Study

The findings of this study will be of huge benefit to the government, curriculum developers and educational policy makers, school administrators, prospective and practicing chemistry teachers as it will provide vital information on the effective use of laboratory equipment and its availability in senior secondary schools.

It will also assist the curriculum developers to lay more emphasizes on the needs for availability of laboratory equipment's as main tools that enhance teaching and learning of science. It will also help the curriculum developers to lay more emphasizes on the needs for availability of

laboratory equipment's as major tools in learning science in order to enhance teaching and learning process. It will also encourage the curriculum developers and school administrators to organize seminars and workshops for the teachers in order towiden their knowledge on how to use and handle the available laboratory equipment.

1.6 Scope of the Study

This study was carried out in Minna metropolis Area of Niger State. The study was delimited to availability and effective use of chemistry laboratory equipment.

1.7 Definition of major terms

Laboratory: A building or room that is equipped with laboratory equipment for teaching practical sciences.

Laboratory equipment: Refers to all the necessary materials that are supplies required for the teaching and learning of chemistry in senior secondary school.

Availability: Having sufficient to achieve a purpose, being able to have access to something especially laboratory equipment.

Secondary school: is an education institution that offers educational experience to students for six years after primary education.

Chemistry: is a branch of science that deals with the structure and composition of matter.

Achievement: is the act of performing successfully or a successful accomplishment in chemistry.

Extent: Range of availability and effective use of laboratory equipment's.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This section deals with the review of the related literature. The study was organized under the following headings: conceptual framework, theoretical framework, empirical studies and summary of the reviewed literature.

2.1 Conceptual Framework

2.1.1 Teaching of Chemistry in Senior Secondary Schools.

Teaching of chemistry is a way of impacting knowledge of chemistry in an individual or learner in other for him/her to be useful to himself and the society. Chemistry is a very important subject for student in senior secondary school because it a passport to reading of science in higher institution, that is the reason why a professional teacher in chemistry must teach chemistry in schools. It is very vital for teachers to use a good teaching method in teaching of chemistry so has to improve the academic performance of learner, chemistry is a practical subject in which experimental or demonstration method need to be embraced by the teacher in teaching of chemistry. The tasks facing chemistry teaching and learning includes the use of teacher-centered method to teaching, absent of satisfactory and appropriate instructional materials, inadequate classroom, laboratories and laboratory facilities etc. (Katcha and Wushishi, 2015).

Inadequate qualify chemistry teachers is a critical issue in our secondary education chemistry, for chemistry education to be effective there must be adequate qualify teachers. It is discouraging to

note that in some secondary schools; due to scarcity of chemistry teachers, any available teachers are constrained to teach the subjects that are not related to their areas of specialization. E.g. a biochemist who has not yet found a greener pasture is employed to teach chemistry and integrated science at the secondary school, which is unfortunate because such a teacher is not an educationist lacks both adequate content of secondary school chemistry as well as the pedagogy (method of teaching). i wonder the type of information that is going to be conveyed to students since no teacher teaches what he does not know or gives knowledge he/she does not have (Igwe 2015).

The science laboratory instructional materials are those materials available to the science teacher for teaching and learning of science subjects. They include textbooks, computers, thermometers, fire extinguishers, first aid kits, oven, incubators, chalkboards, model/mock-ups, television, radio and Projectors etc. Before the introduction of internet in the learning of science, the only learning materials were textbooks, chemistry laboratory facilities and equipment, and the only authority figures were teachers (John, 2016).

Teaching and learning of chemistry as a subject can be enhanced through the use of information and communication technology (ICT). ICT can be seen as an important source of scientific data, theoretical information that offers a feasible means to sustenance authentic knowledge in chemistry (Awad, 2014). Earlier to Internet being accessible, the first learning tools were textbooks, chemistry laboratory apparatus and equipment, and the first authority personalities were teachers. However, there are different learning resources such as *e-book*, html documents and electronic encyclopedias in the Internet and also various means to get in touch with authority personalities such as inventors and school instructors. Students can obtain knowledge through searching the Internet (Awad, 2014).

2.1.2 Availability of Laboratory Equipment in Teaching of Chemistry.

Restriction to quality science education in Nigeria is insufficient laboratory apparatus in our secondary schools. The secondary schools are divided into community schools (owned by the government) and private schools (owned by a particular person or group of people). The financing of these secondary schools is determined by their proprietors. In our country, some of the community schools are financed by the Federal Government, while some are financed by the state government of the state. Private secondary schools are financed by specific person or group of people. At times the kind of laboratory equipment's in a school hang on the kind of schools, locality and the population of the students. Some secondary schools have general purpose laboratory to function as all science subjects laboratory while some have discrete laboratories for different science subject, (that is to say different laboratory for Chemistry, Biology, Physics, Agriculture Home economy etc.) (Ugwu2010). In some secondary schools where the establishment of chemistry laboratories is less than adequate, chemistry teaching and learning is hindered in the following ways:

i. Once students are not taught in these specialized places, the chances to investigate and engage in chemistry practical are reduced, and hence the effectiveness of teaching, and will be affected

ii. Timetabling problems make the nature and regularity of chemistry practical and learning more problematic to manage. There is a need for the improvement of the standards of accommodation to be improved and the improvement of laboratory facilities (Mwangi 2016).

Real science education deeply hinge on accessibility of amenities examples are laboratory equipment and human reserve such as instructors and laboratory, (Fagbemi, 2012). The resources

available in the school will affect the quality of chemistry practical in that they determine the frequency and the amount of chemistry practical done and the nature of these practical. The available capitals will also govern the total of groups and their sizes in which students will be divided into. The quality of the chemistry practical can also be affected by the number students in a class, if too many, the apparatus and reagents may not be enough for all students or the constituted groups would be too large for effective participation in the practical activity (Mwangi 2016).

Adequate and quality school laboratory facilities are one of the vital components for attainment of quality education and to attain the proposed goal of the school program. They also support the idea by stressing that learning is a difficult action that necessitates students and teachers' motivation, sufficient school laboratory facilities such as standardized laboratory buildings and laboratory equipment, instructional materials and laboratory equipment for child's improvement (Khan and Iqbal 2012). Factors that affect chemistry achievements included lack of adequate physical facilities to enhance teaching, inadequate learning resources and facilities to the point that several schools lacked equipment totally in such important facilities as laboratories (Karue and Amukowa2013). Laboratory equipment's are lacking or inadequate in schools. It is sad to note that even where laboratory equipment's are present, they are not effectively use for instruction due to certain factors (Okoli and Osuafor, 2010).

2.1.3 Effective use of Laboratory Equipment in Teaching of Chemistry

There is no significant change in the application of laboratory amenities (instructional materials) and the learners' academic performance in chemistry. The improvement in Science and Technology demand that secondary school administrators must embrace current techniques of equipment management (Obasanya and Omosewo 2010). Modern utilization of equipment will

increase the value of instruction and knowledge of science, (Asiabaka 2010). According to her work, she resolved that there is an uninterrupted connection between the value of school equipment that is provided and the value of the standard of improvement of school. Capitals use has to do with the degree to which equipment are provided to schools, they are one or the other used effective or inefficiently or they may not be used at all. When each apparatus is extremely used such in apparatus is efficiently used. If the apparatus is not extremely used it can be describe as underuse, (Mulela, 2015).

Once there are so many pressures in using laboratory facilities this may lead to over use that can lead to failure of such facilities. Knowing how to use these laboratory equipment's is very beneficial. According to Clifton (2017), the ways laboratory equipment can be effectively use are as follows.

a) Safe handling: Laboratory equipment have dangerous effect if not properly handled, Bunsen burner can set the whole laboratory on fire if not properly handled. Chemicals are very dangerous if not handled properly, therefore laboratory apparatus and reagents must be effectively use.
b) Efficient use: Some of this laboratory equipment is complex scientific tools. Sensitive calibration should be done in order to ensure that the task is carried out exactly that of the experiment. Zero scale must be observed so that added weights are measure exactly so as to have accurate results.
c) Proper equipment: Using the right apparatus for the right experiment. Many learners in practical lessons and the related developmental difficulties, inadequate funding being entrusted to science sectors, unequipped and old modern laboratories in secondary schools. The above mention obstacles impact deeply on the nature, value and regularity

of chemistry practical. Goal accomplishment in secondary school hangs on sufficient supply and effective use of learning resources which boost appropriate teaching and learning process within favorable learning surroundings, (Mwangi 2016). There is a need to motivate chemistry teachers by all stake-holders in education by showing compassion for the teacher in terms of early payment of salaries, upgrade and paying them hazard allowances, also by providing conducive and well-furnished and equipped chemistry laboratories with consumable materials (litmus papers, reagents, filter papers and universal indicators etc.) as well as non-consumables (pipette, burettes, beakers, test tubes, funnel and weighing balance etc.). Teachers need to be sponsored to workshop, conferences and for training programs so has to effectively use this equipment and be dedicated to their duties (Nwani2011).

According to (Kassim, 2014) Stated the following procedures should be followed in order to make maximum use of the laboratory equipment.

i. Teachers must store systematically, if possible in alphabetical order. A section of plank might be used to division storing shelves into panels and it should be labeled using alphabetical order. The alphabet that the name of the chemical begins should matches the letter used to label the panel it is stored in.

ii. Little bottles must be kept in front of bigger bottles for easy site and recovery when they are needed.

iii. Chemical bottles that are frequently used in the lab should be kept on tables or open shelves that are fixed to the wall.

iv. Containers must be kept in only one row it should not be scatter.

v. ensures that reagent bottles are not completely filled. However, reagent like explosive peroxides in storage must be completely filled, as they are used up, it must be moved to smaller containers so as to displace the air.

vi. All chemical bottles must carry the full name, date of preparation and concentration; chemical risks must be visibly marked on all reagent bottles.

vii. Chemical stocks must be observed frequently; any of the chemical that shows sign of weakening must be predisposed with great care. Chemicals which are no longer useful or which the use is not known must be predisposed using the recognized techniques.

viii. Throw away any equipment that is no longer useful and breakable equipment must not be preserved with unbreakable ones.

ix. Usually a good storage arrangement must be adopted.

x. Availability the most commonly used equipment like Beakers, Test tube, Bunsen burner, Funnel, Tripods, stands, basic glassware etc. must be kept closed to working points in the laboratory

2.1.4 Important of Chemistry Practical to Secondary School Students.

Experimental work plays a vital role in teaching and learning of science. It does not only help students to increase understandings of scientific knowledge, it also assists them to attain an amount of scientific skills, which are cognitive and manipulative, as well as motivational features it generates in the students. (Mulela,2015).

According to Himanshu stated that some importance of laboratory practical's as follows.

a) Through laboratory practical teachers provide different type of learning experiences to the learners in such a way that the information gain is permanent.

b) Through laboratory practical teachers are able to put into consideration individual differences and interest of the learners, it allows the students to learn at their own pace it is student centered method.

c) It help the learners to explore different things on their own, students are able find out various scientific facts and principles which enable them to solve different types of problems that may arise in their lives on their own, which make them to have self-confidence.

d) As the learners get involved in experimental functions and handling the different kind of laboratory equipment themselves, various types of practical skills are developed in the learners, which help them to earn their livelihood in the future.

e) It helps students to improve their academic performance, when student become successful in their experimental work then they attain a sense of achievement.

f) Laboratory practical help to develop intimate relationship between the students and the teachers, as the students get necessary guide from the teachers while performing practical, while the teacher give proper attention to the students in which all of them move closer to each other.

2.1.5 Impact of Laboratory Equipment in Senior Secondary Schools

Learners taught with instructional material achieved better than those learners taught without these resources (performance). It has been noticed that poor academic achievement in sciences is affected by poor quality of Science instructors, congested classrooms and lack of appropriate and adequate science facilities (Okeke, 2012). Learners perform badly in Chemistry, because chemistry lessons are generally too large and dissimilar in terms of ability level that makes using

of chemistry laboratory difficult (Yusuf and Afolabi, 2010). Poor school performance of learners in chemistry is associated to poor condition in which science is being taught in our secondary schools. Lecture method has been the most widely used in our secondary schools in teaching science which is due to poor quality of laboratory as a result of inadequate laboratory equipment, large population of science students class and much work load on the teachers (Ihejirika 2010).

Learners that have a lot of practical experience are likely to perform academically well than those with inadequate practical skills (Usmani 2011). This means that there is a solid connection between theories and practical which means that performance of learners in one might be used to decide the performance in the other. In order for learning of chemistry to take place, students must have right to use the needed materials and resources (laboratory equipment). The students need to relate with substantial and insubstantial resources to guarantee some level of performance (Adeoye and Papoola 2011).

Students exposed to adequately equipped chemistry laboratory equipment perform better than those exposed to inadequately equipped chemistry laboratory equipment. The difference was in favor of those exposed to adequately equipped laboratory which affect their achievement positively in chemistry (Katcha et al, 2015). Practical Method ensue students' higher achievements in chemistry, which lead to enhancement of learners' attitude towards chemistry and resulted in high student admission in chemistry in schools. This method also brings about improvement in students' achievement of science process skills. The study resolved that, practical Instructional method to chemistry is a very effective teaching method every chemistry teachers must be stimulated to use to improve students' achievements in chemistry. The study suggested acceptance of the teaching approach in all schools in order to enhance students'

achievements, therefore acquisition of science process skills, increase students' attitude to chemistry subject and rise the enrolment (Muchai 2016). The academic achievement of schools with adequate laboratory equipment has been improving over the years progressively while academic achievement in schools that have inadequate laboratory equipment have not improve over the years (Bakari et al 2014). Positive relationship occurs between availability of physical amenities such as laboratories, libraries, classrooms, desks, chairs, and students' academic achievement in chemistry (Vandiver 2011).

Ihejirika, (2010); and Yusuf and Afolabi,(2010) identified the following factors for the poor performance of students in science as-

i. Students with or without ability is enrolled for the subject.
ii. Employment of unqualified Science teachers.
iii. Overcrowded classroom.
iv. Lack of appropriate and sufficient Science equipment's.
v. Over-loaded curriculum.

Eya and Elechi (2011) in her study on the availability and utilization of Basic Science laboratory facilities in Junior Secondary Schools; a panacea for reform in Science Technology and Mathematics Education. Three research questions were impersonated to monitor the study. Data were collected using a checklist and a teacher questionnaire. The data collected were analyzed using frequencies and percentages. The result of the study revealed that most of the Junior Secondary Schools lack laboratory equipment's and Resources that is needed for teaching Basic Science moreover; there were no current Basic Science laboratories. It was also found out that some Basic Science teachers do not use the few available facilities in teaching. Some of the

teachers ‘said the reasons why they are not using the equipment’s and resources include lack of adequate laboratory amenities, lack of teachers guide and practical materials.

2.2 Theoretical Framework

The theoretical framework for this study is based on Jean Piaget theory of cognitive development and Jerome Bruner theory of Cognitive Development. Jean Piaget (1896-1980) considered the development of children understanding and mainly the part play by development in children increasing ability in understanding the world around them. According to him, children cannot carry out certain responsibilities till they are psychologically mature to do so. This theory is center on the school of cognitive theory called cognitive constructivism. The most important aspect of Piaget’s theory to this study is that a child learning by doing things by himself. It is not easy for the child to learn from the teacher just giving him information, the child can only learn by doing and the teacher only guild the child, a child’s significant knowledge is through handling of the environment. Children are able to construct their own knowledge by manipulating the objects in the environment. Students are able to learn easily and remember what they have learned in chemistry by making use of laboratory equipment availability and effective use of laboratory equipment on secondary school students will increase their achievement (Muchai 2016). Piaget‟s theories pay attention on how students relate with their surroundings to improve difficult thinking and knowledge. As learners relate with their surroundings and new objects, the learners learn and improve their ideas. Piaget argues that information is the communication among the individual and the surroundings. He added that experimenting and manipulation of physical objects especially laboratory equipment’s is the main way by which students learn(okpe 2018).

The researcher embraced Jerome Bruner's constructivism theoretical arguments that learning is an active process in which learners construct new ideas or concepts based upon their current or past knowledge, (Bruner, J. 1996). He also argues that humans generate knowledge and meaning from interaction between their experiences and their ideas. The theory is associated with pedagogic approaches that promote active learning and discovery processes. Hands on experiences are therefore necessary for effective learning as the learner is required to do something in the process of learning. The teacher should try and encourage students to discover principles by themselves. Chemistry teachers can achieve this by giving practical's in the laboratory. The various laboratory experiences expose the learners to hands on activities thus actively participating in the learning process. If well planned in a properly set laboratory, laboratory experiences can develop scientific thinking and also develop practical abilities (Njoka 2015).

Constructivists‟ instruction adopts critical thinking, and generates motivation and self-determining students. Constructivists recommend that education is more real when students are involved in the learning method instead of struggling to obtain information passively. Students learn fast when they are permitted to build a personal understanding grounded on things experience and imitating on those experiences (okpe 2018).

Constructivism changes the learner from a passive receiver of information to an active member in the learning process. Events such as presentation of experimentations (class experiments) and conversation about the experimental results with peers help learners to develop understandings. The nature, quality and frequency of using laboratory to teach chemistry practical's are important in building new knowledge and concepts by the learners. During these laboratory activities,

learners have chances to learn the process and skills that can facilitate conceptual changes that can lead to increased academic performance of students in chemistry (Mwangi 2016).

2.3 Empirical Studies

(Musah, *et al*, 2017) investigated and work on the impacts of Availability and Utilization of Biology/Chemistry Laboratory Facilities and Students Academic Achievements in Secondary Schools in Yobe State, Nigeria. In their study the effects of availability and utilization of biology/chemistry laboratory facilities and students' academic achievement in secondary schools in Yobe state of Nigeria was investigated. A Correlational survey research design was adopted in their study and guided by two research questions and one null hypothesis tested at 0.05 level of significance. The population of the study comprises of all the 42 biology teachers and 370 biology students across all the senior secondary schools in Yobe state. Stratified random sampling technique was used to select the student sample (370). A questionnaire containing a checklist (Biology/Chemistry Laboratory Facility) and a Preform were used for data collection. Data for research questions were analyzed using Mean and Standard Deviation while Pearson Product Moment Correlation Coefficient and Multiple Correlation analysis were used for the null hypotheses. The reliability coefficient of the instrument was obtained to be 0.84 using Cronbach Alpha. The findings of their study reviews that biology/chemistry laboratory facilities are either not available entirely, or where they are available they are inadequate and therefore they are not utilized by the high number of students population. It was therefore discovered that there was a significant relationship between biology/chemistry laboratory facility availability and utilization, and student's academic achievement $r=.614$, $n=42$, $p<0.05$, $r=.572$ and $r=.590$, $n=370$, $p<0.05$. To this end, it was then recommended that Government at state level through Ministry of

Education and Science and Technical schools Board should as a matter of priority provide and equip the laboratories with relevant, enough and usable facilities to improve student's performance in biology/chemistry in external examinations and beyond.

(Zudonu, *et al*, 2018) Investigated and work on the effect of laboratory instructional methods on students' attitudes in some chemistry concepts at senior secondary school level The study investigated the effects of guided discovery and demonstration methods against lecture method on students' attitudes, A total of 230 senior secondary one (SS1) chemistry students were involved in the study. The number was made up of 100 males and 130 females from five secondary schools in Ahoada West Local Government Area of Rivers State of Nigeria. A non-randomized pretest- posttest control group was used for the study. Cronbach Alpha was used to establish the reliability of the Chemistry Students' Attitude Scale (CAS). The reliability coefficient of CAS was 0.75. Research questions were answered using mean and standard deviation scores to analyze the data of the study. Hypotheses were tested using analysis of covariance (ANCOVA). From the findings, it was observed that guided discovery was the most effective in facilitating students' attitudes. This was followed by demonstration while lecture was found to be the least facilitative method. It was therefore discovered that attitude is dependent on teaching methods. The study recommended among others that guided discovery and demonstration methods should be used by teachers in teaching practical chemistry contents (acids and bases) to guarantee effective instructional delivery.

(Katcha, M.A. and Wushishi, D.I., 2015) Research on the Effects of laboratory equipment on secondary school students' performance and attitude change to biology learning in federal capital territory, Abuja, Nigeria.in their study the effects of laboratory equipment on performance and

attitude change to biology learning among Senior Secondary School Students in Federal Capital Territory (FCT) Abuja was inspected. The study adopted a quasi-experimental pre-test and posttest matched group design. The sample comprised of 136 Senior Secondary School class II (SSSII) biology students. They were drawn from two (2) co – educational Secondary Schools using criterion sampling techniques. Four null hypotheses were tested at 0.05 alpha levels. Three gadgets were used. They include: Biology Laboratory Equipment Check List (BLCL), Biology Practical's Achievement Test (BIOPAT) and Biology Students' Attitude Change Questionnaire (BSACQ). The reliability indices of BIOPAT and BSACQ were determined using split-half methods and 0.78 and 0.82 indices respectively were established and considered adequate for the study. The reliability index of BLCL was determined using split-half method and reliability indexes of 0.75 were established, which was considered adequate for the study. The discoveries indicated a significant difference between the performance of biology students exposed to adequately equipped laboratory and those exposed to inadequately equipped laboratory. The difference was in favor of those exposed to adequately equipped laboratory. Also, that, the attitude change of biology students exposed to adequately equipped laboratory is not gender-related. They recommended that school authorities and stakeholders should ensure that Science laboratories are adequately equipped in Senior Secondary Schools so that they could remain centers of excellence where future scientists, engineers etc. are prepared for University education in order to meet the goals of MDGS, EFA and vision 20-2020.

Summary of Literature reviewed

The availabilities and effective use of laboratory equipment in teaching chemistry in secondary school is one of the most important instructional materials which can aid teaching and learning activities to be very effective and efficient. In any school where equipment and effective use of those available instructional material or learning tools are put in place it will be observed that teaching become easy and learning ability or learning experience become effective in learning environment, as instructional material such as laboratory apparatus is used frequently and students are able to make use of those equipment, there level of performance will be improved and practical skills, reasoning and the ability to handle the equipment or apparatus in a proper or safety manner will equally be of benefit to their learning experience.

Having the ability to work with scientific tool start from proper handling of laboratory equipment, as a matter of fact, for a student to active, will develop in cognitive reason, laboratory practical help to improve the learner skills from domain of learning. Student studying chemistry must be actively involved in practical work to enable there ability in reasoning, handling and caution with what they are studying.

Chemistry become very interesting when is done or carry out with practical activities, this is quite noted that student who engage with practical work in conjunction with theoretical work perform well than student with theoretical explanation. The place of practical activity in student learning can't be over looked, due to the fact that it enhances the learning ability of students and their teachers.

The important of chemistry to the secondary school student in our modern time play an important role in student learning or studying chemistry, chemistry display the real life reaction of chemical seeing and observing of those reaction enhance student learning, chemistry in

secondary school form the basis of what constitute the reaction of what we see in real life, it help to improve learning experiences of the learners in such a way that the information gain is permanent, it help us to be able to explain some fact behind action of substance, the result give, the observation deduced, the rule and theory to implement are learned from secondary schools.

In addition, chemistry is very important as it show how reaction of drugs and treatment of patent response. Teaching chemistry in secondary school is very vital since students learning abilities goes along with the activities carried out in schools.

The literature reviewed showed that some of the senior secondary school chemistry laboratories in many state are not properly equipped with necessary equipment and some chemistry teachers are not capable of handling the equipment. These have led to the poor academic achievement of students in chemistry. So many secondary schools are springing up, students' enrolments in chemistry are increasing and more equipped laboratories should be built. From the literatures reviewed so far, no research has been conducted on the availability and effective use of laboratory equipment on secondary schools student's achievements in Minna metropolis. Therefore, there is the need to investigate the availability and effective use of chemistry laboratory equipment in secondary schools in Minna metropolis and how laboratory can improve students' learning, thus bringing about good achievement in chemistry.

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This study investigated the Availability and Effective use of Chemistry Laboratory Equipment in Senior Secondary School in Minna Metropolis. In this chapter the research methodology that is use for this study is described under the following sub- headings: Research Design, Population of the Study, Sample and Sampling Technique, Instrumentation, Pilot Study, Validation of the Instrument, Reliability of the Instrument, Procedure for Data Collection and Procedure for Data Analysis.

3.2 Research Design.

The design for this study is descriptive survey aimed at Investigating Availability and Effective use of laboratory equipment in secondary school in Minna metropolis. Minna metropolis presently has twenty three (23) public senior secondary schools. Orodho (2012) opinion that, descriptive design is used in preliminary and investigative studies which allow researcher to collect data summarizes, present and interpret the data collected for the purpose of clarification. The descriptive survey is able to ascertain the Availability and Effective use of Chemistry Laboratory Equipment in Minna metropolis.

3.3 Population of the Study.

The population of the study consists of all Senior Secondary Schools (SSIII) Students and their chemistry teachers in the public secondary schools in Minna metropolis Niger state. Minna metropolis consist of two local Government namely Bosso and Chanchaga Local Government areas Bosso local government consist of thirteen(13) public schools while chanchaga consist of ten(9) public schools making it a total of twenty two public schools that has up to SS(III) level.

The total population was a total of three thousand and eighty (3080) students while that of the teachers was a total of forty four (44)

3.4 Sample and Sampling Technique.

For the purpose of this study Ten (10) public schools were sampled from the two local governments. A total of two hundred (200) Students and their teachers which was about 20 teachers were used the students were sampled using random sampling method.

S/N	Name of school	No of students	No of teachers
1	Bosso Secondary school Minna	20	2
2	Maryam Babagida Girls Science College	20	2
3	Sir Ahmadu Bello Model Secondary school	20	2
4	AhmaduBahago Secondary school	20	2
5	Day Secondary school Limawa	20	2
6	FR.O Connel science College	20	2
7	Government Day secondary School Bosso	20	2
8	Government Girls Science College Bosso	20	2
9	Zarumai Model School	20	2
10	Government Girls Secondary School	20	2
	TOTAL	**200**	**20**

3.5. Instrumentation.

The study investigated Availability and effective use of chemistry Laboratory equipment on Senior Secondary Schools in Minna metropolis, Niger state. The instruments used in the collection of data are: questionnaire on availability of laboratory equipment for Teachers (QALE) (Appendix A) and Effective use of chemistry Laboratory equipment for the students (EUCLE) (Appendix B). The availability of chemistry laboratory facilities for teachers and effective use of laboratory equipment for the students is a likert scale type of instrument. Each consists of twenty items (20) with four options that of the teacher is level of availability from 20 -above rated 4 points, Level of Availability 11-20 rated 3 points, Level of Available 1-10 rated 2 point and not available is rated 1 point. It was to determine the extent of availability of chemistry Laboratory equipment in the senior secondary schools in Minna metropolis.

The second instrument is to determine the extent of effective use of chemistry laboratory equipment which is for the student's level of effectively use very often rated 4 point, the level of often rated 3 point, level of seldom rated 2 point and never rated 1 point.

3.5.1. Validity of the Instrument.

The two instruments used for data collection from both the teachers and the students

Where: Questionnaire on Availability of Chemistry laboratory equipment (QACLE) and Questionnaire on Effective use of Chemistry Laboratory equipment (QECLE) respectively and predictive validity method was used to validate them.

The instrument was constructed by the researcher and validated by the researcher major supervisor, and two Lecturers both from School of Science Education, Federal university of technology, Minna Niger State. The terms of reference for the validation are to (a) assess whether the instruments were in line with the subject matters they were supposed to test. (b)

Assess whether the language of expression was simple and clear. The instrument was found capable of measuring the two variables.

3.5.2 Pilot Study.

The questionnaire on Availability of Chemistry Laboratory Equipment (QACLE) and Questionnaire on Effective use of Chemistry Laboratory Equipment (QECLE) was pilot tested for its reliability using ten (10) students from New Gate Comprehensive Academic and their teachers that was not part of the sampled schools. The reliability coefficient of the instrument was 0.78 for that of the teachers and 0.88 for that of the students.

3.6.1 Method for Data Collection.

The researcher went to the sampled schools with an introductory letter collected from the HOD of the department seeking the permission of the principals of the sample schools in order to collect data on the research work. The administration and the collection of the instrument were carried out by the researcher with the assistance of the chemistry teachers of the school's. The availability of chemistry Laboratory equipment was distributed to the chemistry teachers while the Students questionnaire on effective use of laboratory equipment was administered to sampled students in the selected schools. After sorting out the questionnaire, the data were analyzed.

3.6.2 Method for Data Analysis.

The data collected for this study were analyzed using mean and percentage statistics for availability of chemistry laboratory equipment. The data collected for effective use of laboratory equipment was analyzed using mean and standard deviation.

3.6.3 Decision Rule

The Likert scale has four levels or categories namely: not available; available 1-10; available 11-20; available 21 and above for that of the teachers while that of the students is categories namely

very often: often; seldom; never. Each level is assigned a number ranging from 4-1. The researcher computed the mean as thus: 4+3+2+1/4= 2.5

With 2.5 as the computed mean, it means that any item or variable with a mean 2.5 or above is regarded as available or effectively use while all others with a mean below 2.5 are regarded as not available or not effectively use. This was used to answer all the questions.

CHAPTER FOUR

4.0 DATA PRESENTATION AND ANALYSIS

4.1 Introduction:

This chapter deals with the analysis of data collected. The main focus of this study is to investigate the Availability and Effective use of Chemistry Laboratory Equipment among Senior Secondary School Students in Minna metropolis. The data collected were analyzed using Statistical Package.

4.2 Data Analysis.

The instruments used for the data collection were Questionnaire on Availability of Chemistry Laboratory Equipment for Teachers (QACLE) containing twenty items (20) that investigated the extent of availability of chemistry laboratories equipment in Minna metropolis secondary Schools and Questionnaire on Effective use of Chemistry Laboratory Equipment (QECLE) that contain twenty (20) items for the students. The data collected were analyzed and used to draw tables 4.1, 4.2, and 4.3. The data collected in the

Course of the study were.

ii. Mean and Percentage for the extent of availability of chemistry laboratory equipment.

ii. Mean and standard deviation for the extent of effective use of chemistry laboratory equipment.

Research Question 1

What is the extent of availability of chemistry laboratory equipment in secondary schools in Minna metropolis?

Table 4.1 shows the analysis of the data from the QACLE used to investigate the extent of availability of chemistry laboratory equipment in secondary schools Minna metropolis.

S/N	Laboratory facilities/equipment	Not A	A 1-10	A 11-20	A 21 & above	Mean	Remark
1	Beakers	1	7	2	10	3.05	Available
2	Test tubes	1	7	2	10	3.05	Available
3	Pipettes	1	7	2	10	3.05	Available
4	Burettes	1	7	2	10	3.05	Available
5	Funnels	1	7	2	10	3.05	Available
6	Spatulas	1	7	2	10	3.05	Available
7	Stirring rod	2	5	3	10	3.05	Available
8	Wire gauge	1	5	5	9	3.10	Available
9	Bunsen burner	3	5	4	8	2.85	Available
10	Tripod stand	3	4	1	8	2.90	Available
11	Thermometer	6	3	1	10	2.80	Available
12	Droppers	2	8	1	9	2.85	Available
13	Brushes	4	4	1	11	2.95	Available
14	Volumetric flask	1	5	2	13	3.30	Available
15	Conical flask	1	5	2	12	3.25	Available
16	Measuring cylinder	1	5	5	9	3.10	Available
17	Test tube racket	2	5	2	11	3.10	Available
18	Weigh balance	6	5	1	8	2.55	Available
19	Water tap	12	1	3	4	1.95	Not available
20	Wash bottle	4	5	1	10	2.85	Available
	GRAND MEAN					3.08	

Decision rule = 2.5

According to the decision rule table 4.1 shows that equipment's 1-18 and 20 are available having a mean score greater than 2.5 while equipment 19 is not available in Minna metropolis.

4.2. Percentage of Availability of Laboratory Equipment in Minna metropolis.

Availability Range	Percentages (%)
Nill (Not Available)	13.5
1-10	26.02
11-20	11.69
21 & Above	47.76
Total	100

Table shows the percentage (extent) of availability of laboratory equipment in Minna Metropolis from the table 47.76% of the schools have 20 and above number of laboratory equipment, 26.02% of the schools have 1-10 number of laboratory equipment, 13.5% of the schools lack some basic laboratory equipment, 11.69% of the schools have 11-20 number of laboratory equipment.

Research Question 2

What is the extent of effective use of chemistry laboratory equipment in secondary schools in Minna metropolis?

Table 4.3 shows the analysis of the data from QECLE used to investigate the extent of Effective use of Chemistry Laboratory Equipment in Secondary Schools in Minna Metropolis.

S/N	Laboratory facilities/equipment	Very often	often	Seldom	Never	Mean	Standard deviation	Remark
1	Beakers	74	41	36	49	2.70	1.20	Effectively use
2	Test tubes	88	38	55	19	2.96	1.00	Effectively use
3	Pipettes	63	87	50	0	3.07	0.75	Effectively use
4	Burettes	108	63	24	5	3.37	0.79	Effectively

								use
5	Funnels	92	53	39	16	3.11	0.98	Effectively use
6	Spatulas	33	50	67	50	2.33	1.03	Not effectively use
7	Stirring rod	53	47	50	50	2.52	1.13	Effectively use
8	Wire gauge	21	22	123	34	2.15	0.83	Not effectively use
9	Bunsen burner	22	21	115	42	2.12	0.86	Not effectively use
10	Tripod stand	81	58	42	19	3.01	1.00	Effectively used
11	Thermometer	35	41	65	59	2.26	1.07	Not effectively used
12	Droppers	33	50	66	51	2.33	1.03	Not effectively use
13	Brushes	34	50	50	66	2.09	1.11	Not effectively use
14	Volumetric flask	11	23	66	100	1.73	0.87	Not effectively use
15	Conical flasks	96	64	32	8	3.24	0.87	Effectively use
16	Measuring cylinder	84	38	58	20	2.03	1.39	Not effectively use
17	Test tube racket	60	59	64	17	2.81	0.96	Effectively use
18	Weigh balance	0	10	23	167	1.22	0.52	Not effectively use
19	Water tap	12	11	27	150	1.43	0.85	Not effectively use
20	Wash bottle	68	40	52	40	2.68	1.14	Effectively used
	GRAND MEAN					2.30		

Decision rule = 2.5

From table 4.3 from the result obtained on the extent of effective use of chemistry laboratory equipment in minna metropolis, it was observed that some items such as items 1-5,7,10,15,17 and 20 are effectively used while items 6,8,9,11,12,13,14,16,18 and19 are not effectively used.

Summary of the Finding

Findings from table 4.1it was observed that all the laboratory equipment were available except water tap. This implies that most secondary schools in Minna metropolis have the basic chemistry laboratory equipment mention in table 4.1.

Findings from table 4.2 shows the availability range of these equipment, it was review that most of these equipment need to be increase in numbers because the number of schools that have 21 and above number of equipment in Minna metropolis are not up to 50% . There is a need to increase the numbers of the laboratory equipment for effective use and also some of these equipment are not available in some schools.

The result of the study as revealed in table 2 indicates that, laboratory

Equipment's are not adequately provided for in secondary schools in Minna metropolis.

Some of the laboratory equipment's are observed to be provided for although material like water tap is not provided for. This report is in agreement with the findings of (Njoka, 2015) who opined that there are some schools that do not have a chemistry laboratory at all. In some schools where laboratories were available, the laboratory were fairly equipped, it established they nonetheless lacked vital requirements such as a fume chamber, first aid kit, running water. Judging from the reports of this research finding, most equipment's are only provided to secondary schools but the quantity of the resources provided to secondary schools are inadequate. The findings affirm with the work of Mwangi (2016) The quality of the chemistry practical can also be affected by the number students in a class, if too many, the equipment's and

reagents may not be enough for all students or the constituted groups would be too large for effective participation in the practical activity. The findings equally agree with the observations of Karue and Amukowa (2013) Factors that affect chemistry achievements included lack of adequate physical facilities to enhance teaching, inadequate learning resources and facilities to the point that several schools lacked equipment totally in such important facilities as laboratories.

Findings from table 4.3 show the extent of effective use of chemistry laboratory equipment in secondary schools. It was observed that most of these equipment were effectively use while some are not effectively use, this may be due to the fact that there is increase in students enrolment without increase in the laboratory equipment or ignorant on the proper use of these equipment due to lack of training of the teacher on how to use these equipment. This affirm the findings of Nwani (2011) Teachers need to be sponsored to workshop, conferences and for training programs so has to effectively use this equipment and be dedicated to their duties.. It is worthy to note that the extent of effective use of laboratory equipment's depends on their level of availability. The inadequacy in the quantity and quality of laboratory equipment's has affected their effective use.

From the findings of the result utilization of laboratory resources in teaching and learning chemistry in secondary schools by the students indicates that not all the listed items are being use by the students. This is because students' enrolment into science courses in secondary schools is always on the increase. Muhammed, (2017) laboratory equipment's are packed away where they collect dust for many years which cause malfunctioning of such equipment. They may lie waste because the teacher are not making use of them or they don't know how to use. And when they are faulty the replacement parts are hardly available.

CHAPTER FIVE

5.0 DISCUSSION, CONCLUSION AND SUMMARY

The research findings based on the data presented in chapter four are interpreted and discussed in this chapter. The outline of the chapter is as follows:

1. Summary of the study

2 Conclusion Reached from the Findings of the Study

3. Educational implications of the findings of the study.

4. Recommendations.

5. Limitations of the study.

6. Suggestions for further research.

5.1 Summary

Chemistry is a branch of science that needs effective use of laboratory equipment in order to develop scientific skills and increase academic achievement of students in chemistry. The non-availability of laboratory equipment and inability to effectively use the existing ones has affected the academic performance and the interest of senior secondary school students in chemistry. This study therefore Availability and Effective use of Chemistry Laboratory Equipment's in secondary schools in Minna metropolis Niger state.

In the course of this study, two research questions were developed. The study has some significance such as providing information on the importance of effective use of laboratory equipment's and it availability in teaching and learning of chemistry, Encouraging regular

supervision on the schools etc. The study is delimited to senior secondary schools three (SSIII) because it is at this stage students are being exposed to practical activities that require the use of laboratory equipment's. Chapter two reviewed the work of other researchers related to this study. Descriptive survey design was used while the population of study is all senior secondary schools students in SS (III) class and their teachers. Two hundred students (200) and twenty (20) teachers were selected. The instrument use for the collection of data was constructed by the researcher. Ten (10) senior secondary schools were sampled from the two local Governments in Minna metropolis. Questionnaire on availability of Chemistry Laboratory Equipment (QACLE) for the teachers and 'Questionnaire on Effective use of Chemistry Laboratory Equipment's (QECLE) for the students consists of twenty items with four options of likert scale type. The data collected were scored and analyzed using mean, percentage and standard deviation. The results and discussion are reported in chapter Four

5.2 Conclusion Reached from the Findings of the Study

The purpose of the study is to find out the availability and effective use of Chemistry laboratory equipment among Senior Secondary School Students in Minna metropolis Niger state. The findings made from this study showed that: most laboratory equipment is available. Among the twenty (20) listed items, only one (1) is not available. Based on the findings of the study, the following conclusions were made:

Most chemistry laboratory equipment is available in secondary schools in Minna metropolis, Niger state. Among the 20 laboratory equipment considered in this study, only water tap among the equipment is not available.

The extent to which the equipment is provided for in secondary schools is not satisfactory because most of this equipment need to be increase in number. The present states of the provided equipment in secondary schools consistently affect its effective use in chemistry laboratories. Hence, the extent of effective use of this equipment in secondary schools is affected because only equipment that are common and large in number are effectively use.

Effective use of this laboratory equipment's was affected by progressive increase in students' enrolment without proportional increase in equipment's, ignorance of the teacher on the proper use of this equipment's due to lack of training, which could be controlled by adopting some strategies such as constant training of the chemistry teachers on the use of these equipment's, funding in order to increase the number of laboratory equipment's which will motivate the teachers to make use of them in Minna metropolis.

5.3 Educational Implications of the Findings of the Study

Availability and Effective use of laboratory equipment's in teaching and learning of chemistry is very important in the actualization of chemistry educational objectives. The findings of this study have the following implications to the chemistry teachers and chemistry students, education administrators, policy makers, researchers, curriculum planners and text book writers. The following recommendations were made in line with the results of the study:

The government, non-governmental organizations and policy makers should pay attention to the unavailable laboratory equipment's and make sure it is provided for, and also increase the number of the available once in order to suit the number of students this will motivate teachers and students to put in their best in the teaching learning process this will boost students' performance in examinations.

Adequate provision of laboratory equipment's in secondary schools will reduce avoidable accidents which have affected the quantity of equipment's provided to chemistry laboratory in secondary schools through breakages, stealing, neglect of laboratory rules and regulations but this will improve the quality of equipment's available to secondary schools. This will motivate the students and increase their interest in leaning of chemistry which will improve academic achievement of students.

5.4 Recommendations

The following recommendations are made from the findings of the study.

1 Chemistry teachers should ensure that the basic equipment's that are available in chemistry laboratory are effectively used in order to enhance teaching and learning of chemistry. This is done by ensuring that students acquire the basic knowledge of chemistry practical's and how to handle this equipment's in order to avoid breakage.

2 Secondary schools should be provided with adequate chemistry laboratory equipment's in order to enhance teaching and learning of chemistry.

3 Unavailable laboratory equipment's should be improvised. This will boost students' active participation during and after chemistry practical's.

5.5 Limitations of the Study

The researcher faced the following problems while carrying out the research work.

The day the researcher administered the instrument, some of the teachers were not present in the school the researcher have to wait for some of them. Some teachers were not willing to respond to the questionnaire. The researcher however has to persuade them. For that of the students when

the researcher get to the class lesson was going on the researcher have to wait for the teacher to finish the lesson before administering the questionnaire to the student.

5.6 Suggestions for Further Research

1. The effect of availability and effective use of laboratory equipment's on chemistry students' achievement.

2. The effect of effective use of laboratory equipment's on secondary school student's achievement.

3. Availability and maintenance of laboratory equipment's in teaching of chemistry.

4. The study can be carried out in our higher institutions such as collage of education, polytechnics and universities.

REFERENCES

Adeoye O.M and Popoola S.O (2011) Teaching effectiveness, Availability and use of library information resources among teaching of nursing in Osun and Oyo State Nigeria

Alanbi O. A, Omosewo O.E and Nese O.B (2018) Teachers characteristic and availability of laboratory as predictors of secondary students performance in Physics in Ilorin, Nigeria journal of teacher education and educators Vol 7, NO 1

Asiabaka I. P (2010) The need for effective facility management in schools in Nigeria. New York science journal 1(2): 10-20

Awad B. (2014) Empowerment of teaching and learning chemistry through information and communication technologies AJCE, 2014, 4 (3)

Bakari J, Likoko S, Ndinyo F (2012). Effect of physical facilities on performance in Kenya certificate of secondary examination in public schools in Bungoma South.NairobI: international journals science and research. (IJSR)

Clifton Watson (2017) Why is it important to be familiar with laboratory apparatus and their uses: - 8401290.html

Eya, N.M and Elechi, C.N (2011). Availability and Utilization of Basic Science

HimansuMallick: What are the merits and demerit of laboratory method of teaching science [2779] www.preserverarticles.com/education/what is the merit and demerit of laboratory method of teaching science [2779]

IgweI.O(2015) Secondary education chemistry curriculum implementation in Nigeria. Contending issues and innovative approaches for the future. Journal of life and applied sciences((1)SAR)ISSN2408-7610Vol3(1)PG(24-33)

IhejiaMaizu C. C and Ochui I. O (2016) Utilization of biology laboratory equipment and student academic performance in Cross River State Nigeria British journal of education.Vol 4 NO 9.PP.55_63 (www.eajournal.org)

Ihejirika N.C (2010) The impact of global economic crisis on student performance in biology in secondary schools certificate examination (2005-2009) in some selected schools in Kano State. 5th Annual conference proceedings of STAN 148-152

in Science Technology, Engineering and Mathematics.*52nd Science*

Jonny Ringo (2017) A list of chemistry laboratory apparatus and their use

Karue N, Amukowa W (2013). Analysis of factor that lead to poor performance in Kenya certificate of secondary examination Embu district in Kenya. In the int. J. social sci 13(1);92-108

Kassim A.G (2014) How to use the laboratory and conduct practical for skills and acquisition for secondary school students in Kaduna State. International journal of academic research in education and review, Vol 2(7), PG. 160-164

Katcha,M.A and Wushishi D.I (2015) Effect of laboratory equipment on secondary school students performance and attitude change to biology learning in federal capital territory Abuja, Nigeria. Journal of education research and behavioral science Vol 4(9), PG. 250-256 ISSN 2315-8735 ©2015 Apex journal intermediate

Khan P Iqbal M (2012) Interdisciplinary journal of contemporary reseach in business 4. (3).

Laboratory Facilities in Junior Secondary Schools: A panacea for Reform

Muhammed R (2017) A survey of availability utilization and maintenance of biology laboratory equipment and facilities in secondary school in SokotoState , Nigeria international journal of science and technology Vol 6 NO 1

Mulangi J.T (2016) Effect of chemistry practical's on students' performance in chemistry in the public secondary school of Machakods and Nairobi countries in Kenya

MulelaM.M(2015) Effect of availability and use of laboratory on students' performance in science subject in community secondary school in KINONDON MUNICIPATION. TANZANA

Neboh, O. I(2009) Effect of learning activities package (LAP) on students achievement and retention in senior secondary school biology NSUKKA Nigeria

Njoka E.M (2015) Extent of utilization of laboratory in teaching and learning chemistry in public secondary school in Meru South district, Kenya PG. 1-76

Nwani A (2011) Fundamentals of curriculum development and planning.Abakaliki salt coast printing and publishing ltd

Obasanya S.A and Omosewo E.O (2010) Effect of improvised and instruction material to secondary school students. Singapore journal of scientific research .1.68-76.

Okeke, D.C (2012) Impart of material resource in facilitating students' interest and academic achievement in agriculture science annual 53rd conference proceeding of science teachers association Nigeria. 163.168

Okpe V.O (2018) Effect of instruction material on academic achievement of Physics students in secondary school in Udi local government area of Enugu State Nigeria

Tagbemi S.K (2012) Survey of the level of awareness of laboratory safety measure of science teachers and students in senior secondary school in Guseu metropolis. Unpublished M.Ed science thesis.Ahmadu Bello University Zaria

Teachers Association of Nigeria Annual Conference Proceedings.

Usmani (2011) Teaching A2 Physic practical skills (http:/www.scrib.com/doc/64683921) Teaching Physics practical skills site visited on 4/6/2013

Vandiverb (2011) The impact of school facilities on the learning environment. Unpublished doctoral dissertation Capella University.

Yusuf M. O and Afolabi, A.O (2010) Effect of computer assisted instruction (CAI) on secondary school student performance in biology. The Turkish online journal of education technology (TOJET) 9 (1) 62

Zudonu O.C and Njoku Z.C (2018) effect of laboratory instructional method on students attitudes in some chemistry concepts at senior secondary school level. Vol 6 www.journal.com online: ISSN 2320-9186

FEDERAL UNIVERSITY OF TECNOLOGY, MINNA
SCHOOL OF SCIENCE AND TECHNOLOGY EDUCATION
DEPARTMENT OF SCIENCE EDUCATION

QUESTIONNAIRE ON AVAILABILITY OF CHEMISTRY LABORATORY EQUIPMENT. (QACLE)

Dear Respondent,

I am a student of Federal University of Technology, Minna undergoing a research on; Availability and Effective use of Chemistry Laboratory Equipment on Senior Secondary School Students' Achievement in Minna metropolis. The data to be collected is to find out whether the following chemistry equipment are available in the teaching and learning of chemistry in your school. The data will be strictly used for the purpose of this research.

Please, kindly tick appropriately and filled in the perspective of your view to ensure that the research purpose is attained.

Name of School:……

Section A

Tick from the following options the appropriate position of under listed facilities in the school.
What is the extent of availability of chemistry laboratory equipment in secondary schools in minna metropolis?

S/N	Laboratory facilities/equipment	Not Available	Availability 1-10	Availability 11-20	Availability 20 & above
1	Beakers				
2	Test tubes				
3	Pipettes				
4	Burettes				
5	Funnels				
6	Spatulas				
7	Stirring rod				
8	Wire gauge				
9	Bunsen burner				
10	Tripod stand				
11	Thermometer				
12	Droppers				
13	Brushes				
14	Volumetric flask				
15	Conical flask				
16	Measuring cylinder				
17	Test tube racket				
18	Weigh balance				
19	Water tap				
20	Wash bottle				

SECTION B

QUESTIONNAIRE ON EFFECTIVE USE OF CHEMISTRY LABORATORY EQUIPMENT (QECLE).

Dear respondents,

I am a student Federal University of Technology, Minna undergoing a research on: Investigating on Availability and Effective use of Chemistry Laboratory Equipment on Senior Secondary Students Achievement in Minna metropolis. The data to be collected is to find out whether the following chemistry equipment are effectively use in secondary schools. The data will be strictly used for the purpose of this research.

Name of School: …….

Sex of the Student: …….

Please, kindly tick appropriately and filled in the perspective of your view to ensure that the research purpose is attained

LABORATORY USAGE

What is the extent of the effective use of chemistry laboratory equipment in secondary school in minna metropolis?

S/N	Laboratory facilities/equipment	Very often	often	Seldom	Never
1	Beakers				
2	Test tubes				
3	Pipettes				
4	Burettes				
5	Funnels				
6	Spatulas				
7	Stirring rod				
8	Wire gauge				
9	Bunsen burner				
10	Tripod stand				
11	Thermometer				
12	Droppers				
13	Brushes				

14	Volumetric flask				
15	Conical flask				
16	Measuring cylinder				
17	Test tube racket				
18	Weigh balance				
19	Water tap				
20	Wash bottle				