AVAILABILITY AND TEACHERS' UTILIZATION OF COMMUNITY RESOURCES FOR TEACHING SENIOR SECONDARY SCHOOL CHEMISTRY

BY

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PG/M.Ed/11/59042

DEPARTMENT OF SCIENCE EDUCATION

FACULTY OF EDUCATION

UNIVERSITY OF NIGERIA, NSUKKA

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TITLE PAGE

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A PROJECT PRESENTED TO THE DEPARTMENT OF SCIENCE EDUCATION IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE AWARD OF MASTERS IN SCIENCE EDUCATION (M.ED)

SUPERVISOR: PROF. Z.C. NJOKU

NOVEMBER, 2017

APPROVAL PAGE

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Agugu Chiegeonu Valentina, a post graduate student in Department of Science Education, University of Nigeria Nsukka, with registration number PG/M.ed/11/59042 has satisfactorily completed the requirements for the award of Degree of Master of Science Education (M.ed) in Chemistry Education.

The work embodied in this project is original and has not been submitted in part or full for other diploma or degree of this or any other university.

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Student	Supervisor
Date _____	Date_____

DEDICATION

This research work is dedicated to my lovely children, Great Man Makuo and highly favoured Iruoma.

ACKNOWLEDGEMENTS

I am indeed grateful to God Almighty for his mercies and guidance throughout the period of this programme. To all those who directly or indirectly assisted me during the course of this work, I send my appreciation. Most especially, I appreciate my lovely husband Mr. George Agugu for his moral and financial support throughout this period. To my children Makuo and Iruoma, I thank you so much for your encouragements.

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The researcher acknowledges the chemistry teachers and students of various secondary schools in Nsukka Education Zone who gave valuable information that led to the credibility of this work. Finally, I thank Chika, immensely for typing this work.

Agugu Chiegeonu V.

ABSTRACT

This study aimed at identifying the available community resources and the extent of utilization of those resources for teaching senior secondary school chemistry in Nsukka Education Zone of Enugu State. The survey research design was used. One hundred and sixty (160) SSIII chemistry students and sixteen (16) chemistry teachers were drawn from sixteen schools in Nsukka Education Zone, using proportionate stratified random sampling. Six research questions and three hypotheses were formulated by the researcher to guide the study. The questionnaire was the instrument used to answer the research questions. The instrument was subjected to a reliability tests using Kuder-Richardson and Cronbach's Alpha reliability coefficients. Data collected were analyzed using frequency, percentage, mean and standard deviation. The hypotheses were tested at 0.05 level of significance using chi-square and t-test. Results showed that above 50% of the itemized community resources are available. Results also showed that majority of the available resources are not utilized. From the results, the problems associated with the use of community resources are; teachers' lack of knowledge of available community resources, teachers' high teaching loads per week, lack of interest on the part of teachers, lack of sufficient time to use available community resources among others. There is no significance difference in the responses of chemistry teachers and students on availability of community resources for chemistry instruction in secondary schools. There is no significance difference in mean responses of chemistry teachers and students on utilization of community resources for chemistry instruction in secondary schools. There is a significance difference in mean responses of chemistry teachers in rural and urban areas on problems associated with the use of community resources for chemistry instruction in secondary schools in favour of rural teachers with high mean ratings. The educational implications of the study were discussed and recommendations were made based on the results. Finally, suggestions for further studies were made by the researcher.

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CHAPTER ONE

INTRODUCTION

Background of the Study

The study of science is very important to any developing country like Nigeria. Science is described as the bedrock of development of any nation. Therefore, for Nigeria to move faster in development, priorities must be given to the study of science. The determinant factor to classify a country as being developed or underdeveloped is the level of application science and technology in the economy of that nation. Science is the systematic study of anything that can be examined, tested and verified. Technology, on the other hand is the application of scientific principle and knowledge to production. Ekemode (2000) noted that science is the "know why" while technology is the "know how". Science and technology according to Borishade (2002) form the basis of our development. Science and technology are veritable vehicles for technological advancement of any nation. There is therefore a great need for emphasis to be laid on training of scientists and technologists through teaching of science at the secondary school level.

Consequently Jegede and Brown (1998) stressed that the catalytic effects of education on national development emanate mainly from the areas of science and technology. Perhaps, it was in realization of this that most developing nations are making frantic efforts to improve on the study of science and other allied subjects in their schools. For example, in Nigeria the National Policy on Education Stipulates that admission into the nation's tertiary institutions should be based on 60:40 ratio for science and arts related subjects respectively (FME, 2004). Furthermore, the current 6-3-3-4 system of education in Nigeria which is focused on self-reliance and sustainable national development is built around science and technology. One of such

science subjects is chemistry. Chemistry is a subject which deals with the study of the nature and properties of all forms of matter (Holderness and Lambert, 2002), a lot of activities center on its study. It is therefore of immense importance to national development.

Chemistry is the study of composition of matter, the stuff things are made of and the changes that matter undergoes (Wilbraham, Staley, and Matta, 2002). Chemistry is one of the basic sciences which should be accorded priorities. This is because of the position it occupies in the world of science and in developmental processes. It serves as a gateway to other science related courses like medicine, engineering, pharmacy, radiography, bio-chemistry, agriculture, etc in our higher institutions. It is an important subject as can be seen in our everyday activities. Some of these activities include the use of pipe-borne water treated with chemicals, the use of tooth paste containing fluoride for teeth brushing, the use of paper created through chemical processes, the use of ink which is a blend of chemicals. The contributions of chemical industry to national development and the need for the industry in Nigeria are enormous. The role of chemistry in the petrol, chemical, iron and steel, pulp and paper, food processing and agro-allied industries is universally regarded as crucial. Thus, the need for effective chemistry education in Nigeria especially at the secondary school level appears very obvious and demands considerable attention.

The performance of students in Senior Secondary School Chemistry has been poor over the years as reported by some researchers. Eze (2000) reported that senior school certificate examination (SSCE) in chemistry has been very poor. Ugbachie (2004), Amu (2007) and Edenwonyi (2011) reported poor academic achievement of students in chemistry. Fasakin (2003) and Udochukwu (2008) supported this by stating that students' performance in practical chemistry has been very poor. Ezeano

(2008) recorded that for three consecutive years (1998-2000), greater percentage of candidate who sat for West African Senior School Certificate Examination (WASSCE) candidates who sat for chemistry had scores which could not give them the chances of studying chemistry and chemistry related courses in the higher institutions. Consequently, the ugly trend in students' performance in chemistry continued as contained in the WAEC Chief Examiner's reports (2002). According to these reports, students' performance was poor as compared with those of previous years. The reports showed that;

> *Candidates performed poorly in questions based on food tests; physiological processes: food contaminants and factors necessary for communicable diseases to occur. The overall performance of candidates did not show any significant improvement over those of previous years.*

It is contained in the West African Senior School Certificate Examination (WASSCE) executive summary of results and Chief Examiner's reports (2006:4) that, for the years 2004,2005 and 2006 for Nigerian candidates, the percentage of passes at credit level (Grades 1-6)in chemistry are 37.86%, 50.94% and 44.90% respectively. Performance of candidates in chemistry in 2006 dropped by about 6.04% in 2005 and fluctuated over three year period. The Chief Examiner's reports (2007:207) stated that, though the standard of the paper was good and compared favourably with those of previous years, there was still no significant improvement on candidates' performance when compared with previous years.

WAEC Chief Examiner (2009:199) further reported that "the raw mean score of 35 and standard deviation of 15.65 indicated that the performance of the candidates was poorer than that of the May/June 2008 WASSCE with a raw mean score of 38 and standard deviation of 18.28. The (2010:186) WAEC Chief Examiner's report

recorded the raw mean score of Nigeria's candidates in chemistry as 36 with standard deviation of 16.52. The performance of candidates was better than that of May/June 2009 WASSCE with raw mean score of 35 and standard deviation of 15.65. Nevertheless the performance at this level is still poor. The poor academic achievement in chemistry was due to some reasons. Ogbu (2009) reported that lack of resources and poor chemistry teachings contribute to students' poor performance in chemistry. Amuka cited in Ezeano (2008) stated that schools in developing countries, of which Nigeria is one, often lack basic facilities which are indispensable for effective teaching and learning of chemistry concepts. Neither the money required for equipping the laboratories nor chemicals are made adequately available to schools. Attama (2012) identified students' lack of interest and motivation, having anxiety towards learning of chemistry as some of the factors that contribute to their poor performance in chemistry. The researcher further noted that students absent themselves from classes due to the abstract nature of some chemistry concepts.

The poor academic achievement in chemistry suggests that chemistry education in Nigeria is largely unsatisfactory. This calls for a critical re-examination of the problems associated with the teaching and learning of chemistry. Under the condition of insufficiency of laboratory and other instructional materials, it is not easy to effectively teach and learn chemistry. The chemistry curriculum content focuses on practical activity with emphasis on locally available materials. Since the students' performance in senior secondary school chemistry is still poor, it suggests that chemistry teachers do not follow the recommended approach specified for the implementation of curriculum content. There is need to build the capacity of teachers on the implementation of the curriculum periodically. Thus, the need to stress the use of community resources for teaching and learning of chemistry.

Community is a group of people living in one locality having cultural, religious, ethnic, or other characteristic in common. (http://dictionary.reference.com/browse/community). Community can also be said to mean a setting in which the child lives, learns and develops the meaning and concepts essential to an understanding of groups living. Resources on the other hand can be defined as all persons and things capable of passing information, values, experiences and techniques that could be used to engage the learner in the learning process (Osiyale, 1998). Nwabuike (1991) state d that community resource is any place, person, object, industry or organization that a class can use in studying or improving learning which is located outside the school. Nworgu (2009) defined community based-materials as those instructional materials which can be found within the community. With regards to this work, community resources are those places, persons, or material resources found in the community which can be used for teaching chemistry. They can be found in the homes, immediate school environment or within the community. Examples of such resources include; industries like soap industries, detergent industries, vegetable oil industries, food processing industries, local gin industries, petro-chemical industries, petrol filling stations, mechanic villages factory attendants, goldsmith, petroleum engineers etc. Other examples are palm ash, palm oil, salt, snail shells, native ink, unripe and ripe fruits, ponds, stream, tap water, etc. Some topics taken from the present senior secondary school chemistry curriculum were used to guide the study. Furthermore, the process of using identified community resources involves the procedures applied in using them to explain certain concepts in chemistry. The concepts to be considered are acids, bases, salts, indicators and chromatography. The current chemistry curriculum has one of its objectives as, to show chemistry and its links with industry, everyday life activities and hazards. The

curriculum is packaged with content that leads to self actualization by students. In addition, the curriculum content focuses on practical activities with emphasis on locally available materials

Ughamadu (2005) stated that no matter how well-developed and comprehensive a curriculum is, its success is dependent on the quality of the teachers implementing it. The chemistry teacher is the most important element in the implementation of the curriculum. A teacher or school teacher is a person who provides education for pupils (children) and students (adult) (en.wikipedia.org/wiki/teacher). A chemistry teacher is therefore a person who provides chemistry education for students. To motivate students, teachers must make chemistry real and relevant by adopting those teaching strategies in which the students participate actively in lesson and using local familiar examples to illustrate scientific facts. That is why the chemistry teacher has a great role to play in the use of community resources to enhance chemistry instruction. According to Eze (2000), the consistent poor performance of students in chemistry is indicative of the quality of teaching done in the secondary school chemistry. Fasakin (2003) in line with Eze (2000) opined that students' good performance in chemistry depend on adequate preparation. Fasakin then advised that schools with inadequate facilities can prepare students for success through prudent use of what is available. In a way, what the teachers teach (concepts, skills and attitudes) and the way they are teaching them (direction and resourcefulness) are dependent upon the professional background and experience of the teachers. The chemistry teacher should therefore be resourceful and familiar with the immediate school environment and the community to find out and use available resources that could facilitate chemistry learning within their locality

The use of community resources provides meaningful interaction between the students and their world. It helps the students to apply what is learnt in the classroom to situation outside the school. It helps to motivate students and make their lesson quite interesting. Students can develop interest in certain areas of specialization based on their experiences from subject specialists. It also helps them to retain more the information acquired through this procedure (Nworgu, 2009). Community resources are considerably inexpensive. Students benefit immensely since it affords them the opportunity of interaction with the outside environment. Above all, the resources are accessible since they can be found within the community where the schools are located. The scientific concepts should be made clear to the students by giving examples and exposing them to work with materials familiar to them. For instance in topics like chemical industries, students should be taken to any industry in their locality like soap industry, vegetable oil industry, food processing industry and others depending on the location of the school.

Location is an important factor to be considered when talking about community resources. The location of the school determines the type and accessibility of community resources in that area. A location can be either rural or urban. The rural settlements are mainly agrarian in nature with few amenities and service centers. Most of the activities there are free of highly developed and complex operation. The level of use of machines in carrying out most work in rural community is low. As a result of agrarian nature of the rural community, the type of refuse generated, is biodegradable i.e. being able to be decomposed by bacteria and other micro organisms. Nature can take care of the wastes without causing pollution. That is to say that there is generally little alteration of nature and this may give the rural area the advantage of getting some of the resources in most natural forms. On the other hand,

urban settlements have relatively large and heterogeneous population with sophisticated life and activities. The level of use of machines in carrying out most economic activities in urban areas is very high. The population is made up of people of varied classes. The wastes generated are both biodegradable and non-biodegradable which generate environmental problems like pollution. Population explosion leads to over use and deterioration of the available social services (Chinedu 2008). Vandalization, lack of maintenance culture and negative attitude to environmental issues worsen the environmental problems of urban centres which may affect the resources in the urban.

Many researchers have worked on the availability and use of community and local resources in teaching and learning process. Ezugwu (1995) worked on the availability and utilization of community resources in teaching physical Education in Enugu State. Ezugwu found that resources are available and are adequately used. Omeje (1999) carried out a survey and documentation of local resources for teaching secondary school Geography in Nsukka Urban. Omeje documented quite a number of local resources for teaching geography but found that there is lack of use of the available resources. The problem could be attributed to poor quality of teachers as investigated. Similarly, Nwabuike (1991) worked on the appraisal of available community resources for teaching and learning Agricultural science in old Anambra Local Government Area. Nwabuike found that these resources are available but the teachers do not always use them for instructions and attributed this to mainly lack of finance, ignorance of the teachers and lack of resource personnel.

Some science educators have also written on the community and local resources for teaching science. Oludipe (2008) wrote on the use of community resources in teaching of primary science. Oludipe opined that resources for teaching science are

not only found in a classroom but they are also available in the immediate school environment and community. Some of these resources include; acalypha leaves, lali, kolanuts juice for teaching concepts of dyes for painting and dyeing of materials. Others are goldsmith, blacksmith, hairdryer in the saloon for teaching effects of heat on objects etc. Onwu and Okorie (1996) worked on the use of '*uke latex'* as an alternative local chemical material in teaching of some chemical concepts. The researchers found out that some bench reagents like bromine water, potassium, tetraoxomanganate (vii) $KMNO_4$, silver trioxonitrate (v) $AgNO_3$ and alcohol could be used on '*uke latex'* to test for unsaturation, presence of double bond and coagulation.

Nnamdi (2010) worked on the use of local chemicals in teaching acid- base titration in secondary schools. The author indicated the local sources of acid as lime, lemon, unripe orange etc, bases as ashes of palm kernel, plantain leaves, paw-paw leaves and indicators as juice from hibiscus flower and rose flower. The author also investigated the difference between the average titre value of locally prepared chemicals and the original chemical used for titration in the laboratory. The author found that the average titre value from the locally prepared chemical did not differ significantly from the average titre value of the original chemical.

Okorie (2014) presented a theoretical explaination of vulcanization of latex of *landolphia owariensis* (P.Beauv) using sodium sulphite(Na_2SO_3) solution under low temperature. The author found that latex of *landolphia owariensis* (P.Beauv) (a local resource) could be used to teach the concept of vulcanization in the secondary school chemistry laboratory.

Ezeudu (2000) wrote on the use of local materials in teaching of chemistry. Ezeudu opined that some concepts in chemistry would be taught using some local materials. Some of these materials include; local gin (*'kai kai')*, palmwine for

teaching alcohol; lime, lemon, orange for teaching acids; plantain and banana peels for teaching bases; *'nzu'*, chalk, sand, common salt for teaching separation techniques etc. Inspite of all these efforts made by some researchers, performance of students in chemistry is still low. There is still need to make further investigations on community resources which could be used to teach various concepts in chemistry and show the process of use of some of the resources. It is against this background that this work is built upon, hence to determine the availability, utilization and process of use of community resources for teaching some concepts in chemistry in Nsukka Education Zone.

Statement of the Problem

The performance of students in chemistry is still poor irrespective of the Federal Government investments in science and technology. The aim of science education is to produce men and women with scientific aptitude and personal qualities who would transform our country Nigeria into scientifically enlightened and rich nation. The Senior Secondary School (SSS) Chemistry curriculum is designed to ensure that the aims and objectives of the Federal Government for science education are realized. The performance of student in Senior Secondary School Chemistry Examination has been poor as reported by some science educators and as contained in the WAEC Chief Examiner's reports.

The use of instructional resources is very necessary in order to improve students' performance in chemistry. Unfortunately most secondary schools lack the appropriate teaching and instructional resources. Under the condition of insufficiency of fund to purchase standard resources, effective teaching and learning of chemistry is hampered. The problem of inappropriate teaching methods, lack of fund for purchase of materials for teaching chemistry and ignorance on the part of the teachers need to

be adequately addressed in order to remedy the persistent poor performance of students in the subject. Therefore, alternative sources of Chemistry teaching and learning resources need to be accessed. Community based resources can be used by teachers in implementing the current senior secondary school chemistry curriculum content in order to attain a higher academic achievement in chemistry. What are these available community resources, to what extent do chemistry teachers utilize them, and how could they be used, for teaching chemistry in Nsukka Education Zone?

Purpose of the Study

The main purpose of this study is to ascertain the availability, utilization and process of use of community resources for teaching Senior Secondary School Chemistry. The work will be specifically undertaken to:

1. Identify the available community resources for teaching senior secondary schools chemistry in Nsukka Education Zone.
2. Ascertain the frequency of utilization of community resources for teaching senior secondary school chemistry in Nsukka Education Zone.
3. Identify the problems associated with the utilization of community resources for teaching senior secondary school chemistry in Nsukka Education Zone.
4. Determine the influence of school location on the availability of community resources in Nsukka Education Zone.
5. Determine the influence of school location on the utilization of community resources by chemistry teachers in Nsukka Education Zone
6. Determine the influence of school location on chemistry teachers' rating of problems associated with the utilization of community resources in Nsukka Education Zone.

Significance of the Study

Piaget's cognitive learning theory holds that learning takes place by active interaction of the child with its environment. Students' active participation helps to make learning experience permanent. The teacher needs to employ instructional resources in the teaching process to help concretize students' learning experiences. Some chemistry concepts are abstract in nature but the use of community resources helps to make concepts real and concrete. The use of community resources stimulates the learners' interest, expands their experiences, making them active participants in the learning process.

Practically, the findings of this study will be significant to the following groups; teachers, students, school administrators and the government. The findings will serve as a guide for chemistry teachers to explore the school communities to discover and get relevant resources which could be used to explain various concepts in chemistry. The students will benefit from the results of this work as they will be exposed to interaction with environment and learning of some concepts in chemistry through the use of community resources and develop skills, potentials and interest in chemistry. The school administrators will also benefit as they will be relieved of the burden of cost all the time, in some aspects of teaching chemistry. The results of this work will enable the government realize the resources for teaching chemistry that are available in the communities and map out strategies that would sensitize the teachers on how to get and use these resources. This can be achieved through establishment of community resource centers in the zone and organizing seminars and workshops for the teachers.

Scope of the Study

This study will be limited to local/community resources available for teaching senior secondary school chemistry in Nsukka Education Zone of Enugu state.

The study is limited to senior secondary school chemistry curriculum. The topics to be used are from the present senior secondary school chemistry curriculum. They are; chemical industries, particulate nature of matter, chemical combination, standard separation techniques for mixtures, acids, bases and salts, water, carbon and its compounds and petroleum or crude oil. The study will involve the schools in post primary schools management board (PPSMB) Nsukka education zone of Enugu state.

Research Questions

The following research questions were posed by the researcher to guide the study.

1. What are the available community resources in Nsukka Education Zone for teaching senior secondary school chemistry?
2. How frequently do teachers use community resources for teaching senor secondary school chemistry in Nsukka Education Zone?
3. What are the problems associated with the use of community resources for teaching senior secondary school chemistry in Nsukka Education Zone?
4. What is the influence of school location on the availability of community resources in Nsukka Education Zone?
5. What is the influence of school location on utilization of community resources in Nsukka Education Zone?
6. What is the influence of school location on chemistry teachers' ratings of problems associated with the utilization of community resources in Nsukka Education Zone?

Hypotheses

The following null hypotheses (H_0) were formulated and will be tested at $P<0.05$ alpha level.

1. There is no significant difference in the responses of chemistry teachers and students on the availability of community resources for chemistry instruction in secondary schools.
2. There is no significant difference in the mean responses of chemistry teachers and students on the utilization of community resources for chemistry instruction.
3. There is no significant difference in the mean ratings of chemistry teachers in urban and rural areas on problems associated with the use of community resources for chemistry instructions.

CHAPTER TWO

LITERATURE REVIEW

The literature reviewed is under the following sub-headings:

Conceptual Framework

- Concept of Teaching and Learning of Chemistry
- Concept of Resources for Teaching Chemistry
- Concept of Community Resources
- Availability and Utilization of Community Resources
- Factors Militating Against the Use of Community Resources

Theoretical framework

- Jean Piaget Cognitive Learning Theory
- Jerome Brunner's Cognitive Learning Theory
- Lee Vygotsky's Social Learning Theory

Review of Empirical Studies

Summary of Literature Review

Conceptual Schema

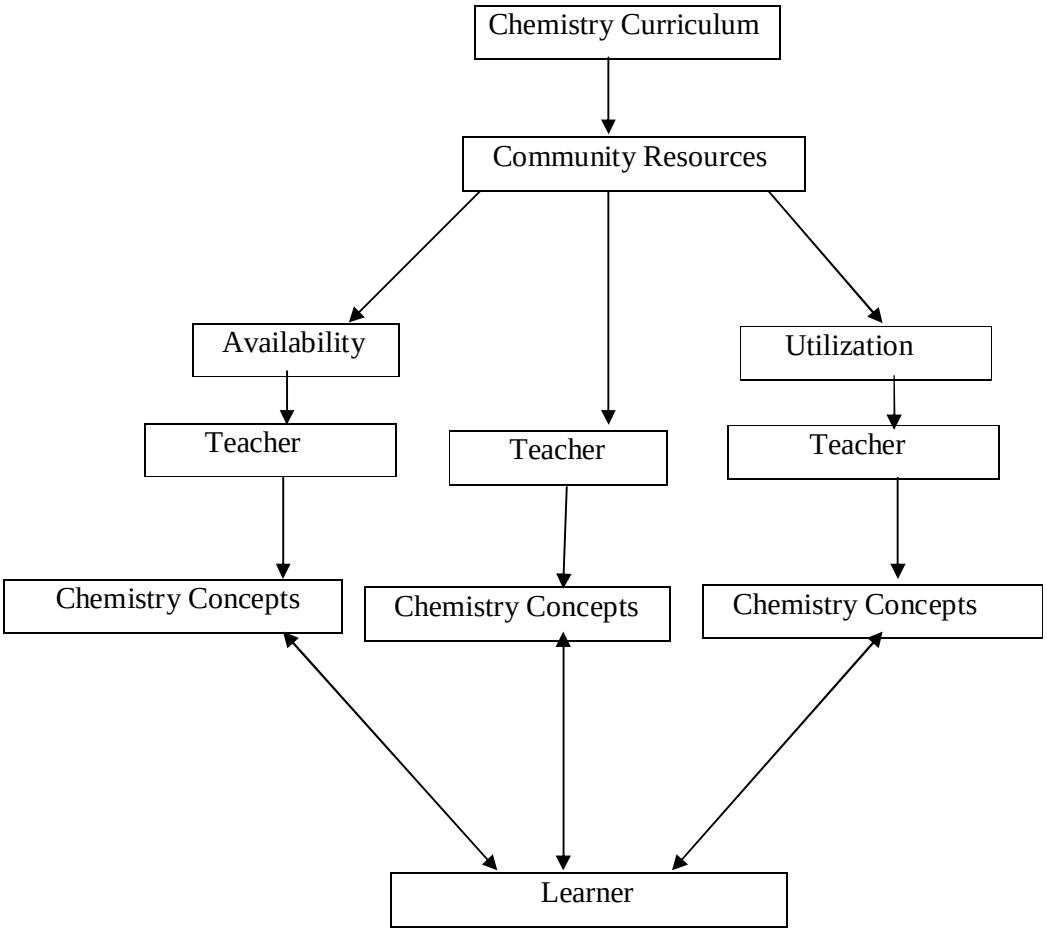

Figure 1: Teachers' utilization of available community resources for teaching Chemistry concepts.

Explanation of the Schema

The conceptual schema above shows the role of the teacher in the actualization of chemistry curriculum objectives by using community based resources when teaching the learners (students) some chemistry concepts. The present trend in education is to produce individuals who will be able to put into practice what one has learnt in the school. In realization of the objectives of chemistry curriculum, instructions in the classroom are to be applicable to community needs. The teacher plays a vital role in linking the learners to the chemistry curriculum through the use of community resources. The use of community resources contribute measurably to the learning experience of the learners. When students study with relevant community resources, they develop their intellectual perspectives and improve their emotional outlook and personal skills as they observe and participate in learning processes. At the same time, they are able to discover for themselves not only the problems which face them but also the resources they can utilize in tackling those problems.

One of the roles of a teacher in teaching and learning is that of a communicator, concerned with eliciting relevant responses from the learners after their exposure to his/her teaching. The main purpose of learning is to effect change in behaviour of the learners. The purpose is achieved through effective communication of the teacher. To be able to effect the desired change in the behaviour of the learners which must be through the learners' active and meaningful participation, the teacher should use instructional resources to enhance his/her teaching. It is the duty of the teacher to find out and use resources available in the community where schools are located to enhance his/her lessons.

The use of community resources during instruction deepens the learners understanding of chemistry as a subject, and results in greater academic achievement and interest in the subject. The use of material resources depends on what the teacher

makes out of them (Onyejemezi, 2002). By implication, the instructional resources do not achieve good result on their own, rather their usefulness depends on what the teacher is doing with them. No matter how well developed and comprehensive a curriculum may be, its success is dependent on the quality of the teacher implementing it. For the teacher to be able to improve his/her teaching, he/she must be imaginative, resourceful, creative and skillful. The teacher is therefore at central position to achieve the objectives of chemistry curriculum by teaching the students using community based resources to reduce abstraction and deepen learners understanding of chemistry concepts.

Concept of Teaching and Learning of Chemistry

The concept of teaching has been defined in different ways by scholars. Izuagba (2008) defined teaching as related activities designed by the teacher for the learners that take place in and outside the class to ensure that learning take place.

According to Afe (2004), teaching is a process by which a teacher guides the learner in the acquisition of knowledge, skills and attitudes, a system of interactions involving the teacher, the learner and the learning task. However, teaching involves series of actions that are systematically designed by the teacher to facilitate learning. For learning to really take place, the teacher should take into consideration the principles of effective teaching which ranges from knowledge of the subject matter, critical thinking, problem solving skills, to communication skill.

Learning is defined as a change in behaviour which is demonstrated by people implementing knowledge, skills or practice derived from education (Birkenholz 1999). Learning is defined by Onwuka in Onyejekwe (2006) as a process which involves the acquisition of new knowledge, skills, ideas, values and experiences which enable the individual to modify or alter his action or to realize his goals.

Learning does not end with the acquisition of new knowledge, skills or ideas. The acquired knowledge or skill must be habitually utilized by the person who acquired them for learning to be said to have occurred.

Teaching and learning are inter-related. The quality of skill employed in teaching process will determine the level of behavioural change in the learner. However for effective teaching and learning to occur, the role of the teacher is very important. The teacher must come in contact with the students, understand their needs, interest, aspiration and differences so as to fashion out appropriate techniques to achieve the desired change in behaviour.

Chemistry is a branch of science which deals with how substances are formed, how they combine and react under different conditions i.e. composition and behaviour of substances as well as preparation of useful materials from matter. The real importance of chemistry is that it serves as the interface of practically all of the other science subjects as well as other areas of human endeavours. For this reason, chemistry is often said to be the central science. It aims at helping students discover as much as possible the behavhiors of different kinds of matter and find out reasons for the observed behavior and hence gain a deeper understanding of its nature and finally put the knowledge gained into practical use for a better life.

The senior school certificate chemistry curriculum was designed to help in achieving the aims and objectives of the federal government of Nigeria in the National Policy on Education (2009). Hence the senior school certificate curriculum is very practical and activity oriented. The objectives are thus, to;

(i). facilitate a transition in the use of scientific concepts and techniques acquired in the new Basic Science and Technology curriculum with Chemistry.

(ii). Provide the students with the basic knowledge in chemical concepts and principle through efficient selection of content and sequencing.

(iii). Show chemistry in its inter-relationship with other subjects.

(iv). Show chemistry in its link with industry, every day life, benefits and hazards.

(v). Provide a course which is complete for pupils not proceeding to higher education while it is at the same time a reasonably adequate foundation for post-secondary chemistry course (FME, 2009).

It is recommended that the guided discovery inquiry approach, resting on the activity of the pupil be used in teaching (FME, 2009). The approach is to use local materials or (community resources), and other examples and experiences within the environment. Unfortunately, most teachers are unwilling to use community resources not that they do not know how to use them but feel that it wastes time and inhibits them from covering the syllabus (Okpala 1991). Other chemistry teachers lack skills and techniques of using local material in teaching. This was pointed out by Offiah (1987) who noted that many chemistry teachers lack the skills and ability of putting across the chemical concepts and ideas to the students. Mkpa (1987) observed that the best way to help the students is to teach them with the local materials they are familiar with. The objectives of the chemistry curriculum could be achieved by the teachers through giving the right types of instruction to the chemistry students. No matter how well-developed and comprehensive a curriculum is, its success is dependent on the quality of the teacher implementing it (Ughamadu, 2005).The teaching of chemistry should be directed towards the use of community resources which are from the learner's environment. The study of chemistry therefore requires a combination of highly qualified and dedicated teachers and dedicated students who are willing to use community resources to produce effective learning outcome.

Concept of Resources for Teaching Chemistry

Chemistry is a science subject that requires the students to be placed in problem solving situations surrounded by suitable materials. An examination of the chemistry curriculum for activities carried out and materials for instruction shows that a lot of materials are needed. Most of the materials can be sourced locally within our environment. The local environment is rich in materials that can be used to teach chemistry in order to make students conceptualize what is being taught. The chemistry core curriculum is full of activities to be carried out by the students through enquiry and other activities. The teacher should therefore approach classroom work systematically, seek and employ relevant resources that can guarantee meaningful and lasting experience for the learner. The new materials which are being presented to the child must satisfy a conscious need. It must be meaningful to the child's own experience and be interesting to the child. Learning is an active process. According to Moneme (1986), teachers' main problem then becomes how to impart knowledge to the students.

Science is made up of knowledge and processes of acquiring it. All the means employed during the process in order to acquire knowledge is resource. The learning resources may be called instructional materials. Instructional materials are those devices and or means employed by both the teacher and the learner in order to enhance the effectiveness and teaching and learning process.

Effective science teaching/learning process demands both availability of these instructional resources as well as their proper and efficient utilization. The use of instructional resources facilitates easier understanding of the theoretical aspect of the subject matter, stimulates critical and logical thinking and development of scientific skills. The use of instructional materials involves the auditory, sight and tactile sense

organs of the body. They ensure learning science by doing. They enable the learners to be practically exposed to relevant activities and guarantee meaningful and lasting experience.

Broadly, resources are classified into human and material resources. The human resources are the teachers, the laboratory assistants, resource persons, demonstrators as well as the students. The material resources are also called the tangible resource; examples include charts, models, blackboard, chemicals etc. The intangible resources include the teacher's methods, adoption of materials and manipulation of the environment, which facilitates the learners' interaction with the materials for effective acquisition of science processes and achievement in science. In more specified terms, intangible resources refer to the resourcefulness of the teachers. Onwuka as cited by (Offorma, 1990) emphasized that the usefulness of resource materials depend on what the teachers make out of them. Teachers need the basic knowledge and skill necessary to make the fullest use of material resources so that they can guide the learners properly. One of the reasons why many teachers in schools and colleges do not use available materials is that teachers lack necessary skills to operate them.

The teacher is the greatest human resource as far as teaching of chemistry is concerned. A teacher who is creative/innovative and has some pedagogical insights knows that there are many useful resources which can be developed into instructional materials for chemistry learning and for proper achievement of results. For example, if the teacher is teaching a topic like separation techniques for mixtures, he/she can bring to class items like common salt, sand, water, oil, kerosene, sugar, sieve, and guide the students on how to use them. Therefore, teachers should as much as possible employ instructional materials in their teaching processes to concretize experience.

Concept of Community Resources

A community is a social group of any size whose members reside in a specific locality, share government and often have a common cultural and historical heritage. It is a group of people having cultural, religious, ethnic or other characteristics in common (VAJ:dictionary.references.com/browse/community). Community can also be defined as a group of organisms or populations living and interacting with one another in a particular environment.

Resources, according to Osiyale (1998) is defined as all persons and things capable of passing information, values, experiences and techniques that could be used to engage the learner in the learning process. According to Maduabum (1989), resources are the instructional equipment and materials which the teacher can use to help students to achieve lesson objectives. Nworgu (2009) defined community based materials as those instructional materials which can be found within the community. Nwabuike (1991) defined community resources as any place, person, object, industry or organization that a class can use in studying or improving learning which is located outside the school. In relation to this work, community resources can be defined as places, material and human resources found in the community which can be used for teaching and learning chemistry. They can be gotten from the immediate school environment, in the homes or the community where the schools are located. Examples are soap industries, petro-chemical industries, local gin, shells, palm-ash, oil, salty water, streams, unripe and ripe fruits, native ink e.t.c.

Materials resources help to provide learners with opportunities, skills and attitudes needed for future work in science and to practice investigation and inquiry activities. It enables children to be actively involved in learning. According to Azeke (1987), inadequate instructional materials and equipment in secondary schools

remove the activity component of the science lesson which makes science real and experimental. In the absence of using material resources, science teaching and learning becomes expository and dictatic in secondary schools. Ani (2001) observed that materials and equipment encourage creative instinct which is fundamental to academic achievement. Ugwuanyi (1998) reported that many students perceive science as a difficult subject because it involves imagination of objects and concept when laboratory materials and equipment are lacking. Oyedeji (1986) recognized the role of equipment in teaching and learning of science; Ezeliora (1999) conducted a study aimed at empirically determining which of the learning materials will influence retention of chemistry concepts more among senior secondary school students and to what extent they influence the attitude and achievement of students. Ezeliora reported that locally improvised learning materials proved superior to the standard learning material in engendering retention of chemical concepts. One begins to wonder whether lack of science equipment is not one of the factors responsible for the continuous poor performance of science students when compared to arts students. The researcher therefore concluded that science materials and equipment must be effectively managed in order to achieve better result in science education particularly in chemistry.

According to Bomide (1985) community resources are materials that are obtained from the environment by either science teacher or with the help of local personnel to enhance instruction. This is the only way to provide the learner with a clear understanding of chemistry and then expose them to the basic principles and applications of science. In education, it is generally agreed that instructional materials are some of the most important devices, which both teachers and learners can use to enhance the quality of an instruction. Various research studies have shown that the

use of instructional materials facilitates teaching and learning processes when properly used. Nkechi (1999) observed that availability of suitable instructional resources in good supply and in rich variety range is therefore essential in education and crucial for the achievement of curriculum objectives.

The list of instructional materials that teachers can use to improve the quality of instruction is inexhaustible. The teacher's level of resourcefulness, creativity and imagination is in fact the limit. Instructional resources according to Erickson and Curl (1972) make teaching and learning activity interesting, significant and increase learning. When instructional resources are used in teaching, they provide direct sensory experiences of seeing, touching and smelling which are necessary for understanding and learning. Instructional resources are usually designed, provided and used for the achievement of specific curriculum objectives.

Availability and Utilization of Community Resources

Many teachers do not recognize the potential of simple instructional resources at very little cost or how to use them. It is necessary to find out the available community resources for teaching and learning chemistry. It is the duty of the chemistry teachers to find out and use resources available in the school community to enhance chemistry instruction. A good science teacher should posses the skill of designing, developing and utilizing instructional resources to bring meaningful learning to the door post of the learners. When the learner comes face to face with the teachers through the proper use of instructional resources, the lesson is always effective. Most of the community resources are available in schools, homes, markets, industrial sites and even on the roads. For a school to conduct an effective teaching and learning of chemistry, instructional resources must be made available for the

chemistry teachers who must be professionally and pedagogically competent in coordinating the functions of these materials.

The value of community resources cannot be over emphasized. They make lessons clear and more strongly stamped on the learner's mind. Students can be motivated to learn more when resources are used. Bello (1984) identified the following for the usefulness of teaching materials:

i. Make teaching more real
ii. Makes students remember facts more easily
iii. Make chemistry realistic and environment based.
iv. Reduces abstraction and learning difficult.
v. Improves students' ability to apply knowledge to solve community problems.
vi. Arouses student's curiosity and sustain their interest and attention.

Due to insufficient training, many teachers do not recognize the potential of many simple teaching materials available in their locality at very little cost or how to use them. For this reason, it is very necessary to find out the available community resources for teaching chemistry and how they are being used.

The limit of relevant instructional materials to be used depends on how resourceful and creative the teacher concerned is. It is pertinent to note that the type and quality of materials which may be available for chemistry teaching and learning processes may vary from one geographical area to another. Most of the instructional materials are available and can easily be assessed within the community. There is therefore need for the chemistry teachers to be professionally trained and competent in co-coordinating the functions of these materials.

Utilization is the act of using methods and resources for learning (Echendu 2006). Advanced learner's oxford dictionary defined utilization as making use;

finding a use for something. During utilization the teacher applies the principles of selection and use of materials to choose instructional materials that are relevant and appropriate for the learners and the topic. The designer needs to take into consideration the make up of the audience, the objectives of the course and the cost of materials. Offorma (1994) noted that the learners' characteristics (age, maturity, intellectual ability, psychological readiness etc) should be considered when selecting and using instructional materials to avoid creating confusion and frustration among the learner.

It is one thing to provide materials and another thing to use the materials provided for effective teaching and learning. It is very pertinent to look at the extent of the use of local material in teaching and learning of chemistry in Senior Secondary Schools. This will help us appreciate the inherent effect of those materials on students' learning experience. The value of instructional resources to the educational process depends on its availability, safety and its utilization. To provide a conducive environment for effective learning, the instructional resources should be well maintained and well used.

Achimugu (1998) observed that there is wastage of human and material resources for teaching and learning. This he claimed has its root in inefficiency, mis-use, under utilization, non-utilization, lack of maintenance and lack of appreciation of these resources. The chemistry teacher is therefore faced with the task of how to use the available resources to teach the students in such a way as to avoid boredom and wastage. The teacher needs to plan how to use resources.

During the planning, he needs to ask himself some pertinent questions which include;

Will the resources (i) stimulate curiosity?

(ii). Give opportunity for developing skills?

(iii). Give opportunity for developing curiosity and co-operative working (Wuyep and Agbo, 1998). If the answers are in the affirmative,

i. He will determine the best point to introduce the material in the lesson.

ii. Group work should be used occasionally not just when the materials are enough. This will enable students to interact and learn from each other.

iii. To make the lesson more interesting and related to real life situations, students can be taken out on field trips just within the locality like a battery charger's workshop, black smith's workshop, etc.

iv. Teachers can liaise with colleagues for exchange of ideas and materials especially for schools that are near each other. (Wuyep and Agbo, 1998).

Onwuka (1984) observed that:

> *Resource materials do not achieve any of the attributed values on their own, their usefulness depend on what the teacher makes out of them. Intelligent handling of these materials in the classroom is necessary. Teachers need the basic knowledge and skills necessary to make the fullest use of local resource materials. One of the reasons why available materials are not used by many teachers in schools and colleges is that they lack the necessary skills to operate them.*

It is a well known observation that some teachers though vast in their subject areas fail to get their message across to their students. To solve such a problem, teaching materials should be used to clarify teacher's instruction and put the use of verbalization to a minimum.

Every teacher is expected to be resourceful, this is the quality that will enable him/her to improve his/her materials in order to make the teaching more effective. Our local environment is rich in materials that can be used to teach chemistry in order to drive home some points and make students conceptualize what is being taught. This goes to

imply that the most wide-spread cause of lack of instructional materials is the teacher. In other words, if the teacher is dynamic and creative, he can always make available and use materials to make the lesson more interesting and rewarding.

Research carried out by Nwosu (1991) indicated that there is little utilization of instructional materials by teachers during the process of teaching and the improvised local substitutes are rarely used in teaching. The utilization of resources by teacher should therefore be highly encouraged for effective teaching and learning process.

A teacher is a person whose occupation is teaching. Teacher or school teacher is a person who provides education for pupils (children) and students (adults). Teaching according to Offorma (1994) is defined as a systematic activity deliberately engaged in by somebody to facilitate the learning of the intended worthwhile knowledge, skills and values by another person and getting the necessary feedback.

A teacher must be academically sound and professionally qualified for him/her to be competent. The tone of any school and indeed the performance of its students depend largely on the quality of its teachers. There is therefore the likelihood that students taught by highly qualified and resourceful teachers will do better in examination than those taught by unqualified teachers.

According to Okpara (1989) the teacher, more than any other factor, plays a very significant role in enabling pupils to attain the objectives of instructions.

A good chemistry teacher should posses the skill of designing, developing, and utilization of community resources to bring meaning to some concepts in chemistry. When the learners come face to face with the teacher through the proper use of community resources, the lesson is always effective. The chemistry teacher should make chemistry concepts real and relevant by using locally sourced materials

in teaching the students. The chemistry teacher is therefore the key factor in the utilization of community resources for the actualization of objectives of chemistry curriculum.

Factors Militating Against the Use of Community Resources

Several factors have been identified to militate against the use of available community resources. One of them is lack of professional teachers. If the teacher is skillful and creative, he can always use available materials to make the lesson interesting. Lack of qualified and experienced chemistry teachers and laboratory personnel are most likely to be the situation in our secondary schools. Asiegbu as cited in Ugwu (2005) stated that, in our present education system, untrained teachers are employed to teach in our Secondary Schools and Colleges. Due to insufficient training, many of the teachers do not recognize the potential of many simple teaching aids available at very little cost and how to use them. Abubakar (2010) stated that most thickly populated schools are having large number of chemistry students with one or two professionally qualified chemistry teachers and to fill the gap, engineers, pharmacists, geologists and Higher National Diploma (HND) holders are employed to teach chemistry in secondary schools. Therefore lack of qualified and professionally trained chemistry teachers is a problem that affects the use of community resources in teaching and learning of chemistry.

Another factor that militates against the use of community resources in teaching chemistry is laziness and poor knowledge on the part of teachers. Some elements of reluctance according to Mkpa (1987) stem from laziness on the part of the teachers, ignorance of the dividends of effective utilization of aids or unwillingness to put in extra-effort to enhance their professional competence. Bassey (1987) discovered that some teachers find it difficult to use instructional materials because of

lack of interest, resourcefulness, inadequate or no training at all on how to use the materials.

Another factor that hinders effective use of community resources is the teacher's workload. It is important to note that in order to enhance utilization of instructional materials, there is need to limit the workload of teacher. According to Owolabi (1990), under utilization of instructional materials can be reduced by;

(i). Reducing the workload of the teachers for effective and thorough teaching by using the requisite instructional materials to enhance learning process.

(ii). Proper monitoring by the educational agencies to ascertain whether teachers comply with the use of available resources.

(iii). Increasing preparatory periods

(iv). Accommodating community activities.

When all these identified factors are adequately tackled, there will be high level of utilization of community resources in the secondary schools.

Theoretical Framework

The theoretical framework is discussed under the following:

- Jean Piaget Cognitive Learning Theory.
- Jerome Brunner's Cognitive Learning Theory
- Lee Vygotsky Social Learning Theory

Jean Piaget Cognitive Learning Theory

Piaget's theory of cognitive learning holds that learning takes place from active interaction of the child with his environment. He maintained that a person does not grow in knowledge by passively coping with objects in the external world, but by acting on them to know them. The action by the child may be through direct manipulations, visual observations or through mental or internal transformation or

changes such as comprehending an idea after combining new and old information (Piaget 1970). Piaget went further to believe that cognitive learning is a gradual and developmental process. Teachers should be conscious of the developmental level of the learners to adapt instruction to the learner's capability. The cognitive achievement is influenced by several factors such as maturation, past experience, genetic inheritance and quality of the environment. The theory highlights a great importance of the child's social environment (ecological and cultural) to influence what the child learns and his pace of learning it. The implication is that the chemistry teacher should ensure students' active participation, considering their developmental stage in the use of community resources for chemistry instruction.

Some of the concepts taught in secondary school chemistry are abstract but the use of community resources helps to make concepts real and concrete. When students are made to work on their own, they seem to understand the concepts better than when work is done for them. The use of community resources will give room for student's active participation and involve more than one student's sense organs and so, serves as an effective strategy of teaching chemistry. It brings about systematic and logical reasoning, which helps to make some abstract concepts real and understood better.

Jerome Brunner's Cognitive Learning Theory

Brunner is another cognitive developmental psychologist who in his theory introduced the concept of learning by discovery. He stresses on cognitive effectiveness and believes that learning by discovery starts when a science teacher intentionally creates problem by introducing inconsistencies. To the teacher, the inconsistencies lead to intellectual discomfort which stimulates the learners to initiate individual discoveries through cognitive restructuring or internal re-organization.

As a result, students may be more likely to remember concepts and knowledge discovered on their own. The advantage of discovery learning is that it encourages active engagement, promotes motivation, autonomy, responsibility, independence and development of creativity and problem solving. The theory advocates problem solving approach and discovery method in teaching science. The implication of Brunner theory is that teachers should deliberately create problems for the students by giving them suitable projects considering their cognitive level and the concept to be learned. Experience gotten from the use of community resources will enable the students to make some discoveries, be creative, make generalization and broaden their knowledge in general chemistry.

Lee Vygotsky Social Learning Theory

Lee Vygotsky is a social learning theorist who argues that social interaction precedes development. The zone of proximal development (ZPD) is relevant to instructional technologist since instruction precedes development. The discrepancy between children actual age and the level they reach in solving problem with assistance is the zone of proximal development (ZPD). In other words, learning takes place in the (ZPD). This zone is the difference between what a child can do alone and what he/she can do with others' assistance. The ZPD varies with culture, society and experience. Vigotsky believes that the larger the zone, the better students will learn in school. He believes that partners should jointly solve problem to bring about cognitive development. Thus, a child does not learn in isolation. Teachers should therefore create room for cooperation among students for effective cross-fertilization of ideas and knowledge. The implication is that teachers should organize group work, group discussion and debate among students to encourage, guesswork and interactive thinking in the learners. The teacher should give students projects that will require

them to get the resources from their community. This will make them to explore the environment and get acquainted with resources that could be used to learn chemistry.

Review of Empirical Studies

Many researchers have worked on the use of community resources in teaching various subjects. Ezugwu (1995) worked on the availability and utilization of community resources in teaching physical Education in secondary schools in Enugu State. The purpose of the study was to evaluate the availability and utilization of community resources in teaching physical education in secondary schools in Enugu state. The survey research design was employed using the chi-square test to analyze the data. Thirty (30) schools each from the three education zones of the state were selected using stratified random sampling method. The researcher distributed and collected three hundred and twenty (320) copies of close ended questionnaires which were used to collect data. The researcher found that more than 60% of physical Education teachers in Enugu State identify the community resources like soccer field and village square and utilize them often. The researcher also revealed that most of the teachers in procuring community resources encounter problems like high fee charges, lack of cooperation by the members of the community and lack of knowledge of their existence. The researcher recommended that the Government should be paying special allowance to teachers who use community resources in teaching their subjects and that there should be in-service training for the teachers on the importance and use of community resources. The work of Ezugwu is related to this study since both centered on availability and utilization of community resources for learning but in different subject areas. The present work will however, include the process of using some of the identified community resources for teaching chemistry.

Nwabuike (1991) carried out a study of appraisal of available community resources for teaching and learning Agricultural science in secondary schools in old Anambra local government area of Anambra state. The main purpose was to appraise the community available resource for teaching and learning Agricultural Science. The survey research design was used. Two forms of questionnaires were used to collect data from both teachers and students. The mean, frequency tables and percentages were used to analyze the data. Fifteen (15) secondary schools were randomly sampled from twenty-six (26) schools in the study area. One hundred and fifty (150) agricultural science students were randomly selected out of seven hundred and eighty (780) (SS 111) Agricultural science students. All the Agricultural science teachers from the selected schools numbering twenty (20) were used. The researcher found that, there are many community resources which could be used for teaching and learning of Agricultural science in old Anambra Local Government Area of Anambra State but teachers do not always use them for instructions. The researcher also found out that the major factors that limit the effective use of community resources for teaching Agricultural science include; lack of finance, teachers' ignorance of the resources, their heavy teaching loads per week and lack of personnel resources. The researcher recommended that teachers should endeavour to explore their environment to discover the relevant resources which could be useful for instruction in agricultural science. The Government and school authorities should endeavour to give teachers necessary supports and incentives to encourage them to use community resources in their instruction. Nwabuike carried out an appraisal of the available resources for teaching agricultural science which is related to determination of the availability and utilization of community resources for teaching chemistry though in different subject areas. The present work benefited from this reviewed work by using the questionnaire

as the instrument to elicit information from both the teachers and students on the availability and utilization of community resources for teaching chemistry. The present work will also show the process of utilization of some identified community resources for teaching certain concepts in chemistry.

Omeje (1999) worked on survey and documentation of local resources for teaching secondary school Geography. The purpose of the study was to survey and document the local resources used in teaching geography with relations to environmental education. Seventeen (17) geography teachers and 10% of final year geography students were selected through systematic sampling. Twenty five (25) resource persons from the school communities were also used. Focused Group Discuss Technique, visitation photographing and manual recording were used for data collection. The data were analyzed using frequencies, percentages and documented photographs. The researcher found that numerous local resources were not being used by the teachers. The problems identified to inhibit the use of local resources included; lack of qualified Geography teachers, lack of time or enough periods for Geography lesson on the school time table. The recommendations were appointment of more qualified Geography teachers and provision of more time and period for Geography lesson in the school time table. Omeje worked on survey and documentation of local resources for teaching geography. The local resources are those resources that can be found in the community. This reviewed work is related to the present one in terms of finding out the available local/community resources for teaching, but in different subject areas. The work guided the present one on the method of data analysis to be employed. The present work will further show how to use some of the available community resources for teaching certain concepts in chemistry.

Nlewedim, Ngwu and Ugwoke (2005) worked on the use of local resources in teaching biology in secondary schools in Nsukka Local Government Area of Enugu State. The purpose was to find out the extent of use of local resources for teaching biology. The descriptive survey research design was used and the instrument for data collection was questionnaire. The data was analyzed using frequency and percentages. Five (5) schools were randomly sampled out of the twenty five (25) secondary schools in the area. One hundred (100) biology students and three (3) biology teachers were randomly selected from each of the sampled schools. A total five hundred (500) biology students and fifteen (15) biology teachers were used for the study. The findings showed that some of the available local resources were adequately used while some were not used. The researchers recommended that workshops and seminars should be organized for the teachers by the government.

This reviewed work is related to the present one since both deals with local/community resources for teaching, but in different subject areas. The present work benefited from this reviewed work in terms of study area, research design and method of analyzing data. This work will in addition show the process of utilization of some of the available community resources for teaching chemistry.

Aba and Adisa (2003) worked on the use of local resources in teaching of Biology in Senior Secondary School in Apa Local Government Area of Benue State. The purpose of the study was to find out the extent of availability and utilization of local resources in the teaching of Biology. The survey research design was employed. Two forms of questionnaires were used to collect data from students and teachers. The mean standard deviation and chi-square were used to analyze the data. Four (4) schools were randomly sampled from the fourteen (14) schools in the study area. Forty (40) students each were randomly selected from the four sampled school giving

a total of one hundred and sixty (160) SSI Biology students. All the Biology teachers numbering eight (8) in the four sampled schools were used. The researchers found that some local resources were available while others were not available. They also revealed that some available ones were adequately used while others were not adequately used. They recommended that teachers should be encouraged to use local resources by sending them to workshops and seminars by the government. The work of Aba and Adisa is related to this work since both deals with availability and utilization of local/community resources for teaching, though in different subject areas. The reviewed work served as a guide to the present one on the development of instrument for both teachers and students. The present work will further show how to use some of the identified community resources for teaching certain concepts in chemistry.

Ukoha and Chukwudobe (2001) worked on the extent of teachers' use of local resources in teaching chemistry on Ohafia Local Government Area of Abia state. The purpose was to find out the extent of teachers' use of Local Resources in teaching chemistry. The study was carried out using survey research design. The questionnaire was the instrument used for collection of data. The data collected were analyzed using frequency, mean scores and percentages. Ten (10) schools were randomly sampled out the seventeen (17) schools in the study area. Four hundred and fifty (450) chemistry students were randomly selected from the sampled schools. All the chemistry teachers numbering twenty (20) were used. The findings showed that teachers rarely use the local resources. Based on the findings, the researcher emphasized that awareness should be created to ensure that teachers realize and integrate local resource as part of their chemistry lesson. The work of Ukoha and Chukwudobe is related to this study since both seek information on utilization of

resources for teaching chemistry but in different geographical areas. The present work benefited from the reviewed one in terms of appropriate method of data analysis and research design employed. The present work will further show how to use some of the identified community resources for teaching certain concepts in chemistry.

Mba (2011) worked on the availability and utilization of instructional materials in teaching of physics in secondary schools in Isoko North Local Government Area of Delta state. The purpose was to investigate the availability and utilization of instructional materials in teaching physics. The descriptive survey research design was employed and the questionnaire was the instrument used to collect data. Analysis of data was carried out with frequency counts and percentages. Six (6) schools were randomly sampled from the twenty (21) secondary schools in the area. Two hundred and eighty eight (288) physics students forty eight (48) from each school were randomly selected from the sampled schools. Twelve (12) physics teachers two (2) from each school were also drawn from the sampled schools. The findings of the study revealed that instructional materials for teaching physics are available but they are inadequately used by teachers. The researcher recommended that the available instructional materials should be properly preserved. The work of Mba (2011) has a direct relationship with this study as both seek information on availability and utilization of resources for teaching, but in different subject areas. This reviewed work served as a guide to the present work in areas of research design, instruments and method of data analysis. The present work further shows how to use some of the available community resources in teaching some concepts in chemistry.

Arokoyu and Ugonwa (2012) worked on the assessment of resource availability for chemistry instruction in secondary schools in Rivers state. The purpose of the study was to investigate the extent of availability and utilization of

non-human resources for chemistry instruction. The descriptive survey research design was used. Data analysis was carried out using mean and standard deviation. Sixty (60) chemistry teachers from twenty (20) schools were selected from four (4) Local Government Areas in Rivers State. The results obtained revealed that most secondary schools do not have adequate resources for chemistry instruction and that the few available resources are not properly utilized for chemistry instructions, in schools. They recommended that the government and school heads should endeavour to procure adequate material resources for teaching and learning of chemistry. Also, the chemistry teachers should ensure proper utilization of the available ones. The work of Arokoyo is related to this study since both are seeking information on availability and utilization of resources for teaching chemistry but in different geographical areas. This reviewed work centered on the conventional reagents and apparatus used in the chemistry laboratory to perform experiments but this work intend to investigate the community resources which could be used to teach certain concepts in chemistry.

Onwu and Okorie (1996) worked on the use of '*uke latex*'/ Landolphia Owariensis(P.Beauv) as alternative local chemical material in the teaching of some chemical concepts. The purpose was to devise some classroom based experiements in which a naturally occurring local substance (*uke latex*) Landolphia owariensis (P.Beauv) could be used as an alternative laboratory chemical for teaching chemical concepts like unsaturation, saturation, cyclization, decolourization, vulcanization and polymerization. The survey research design was used and observations were made to draw some conclusions. Thirty (30) secondary school (SS)11 chemistry students in Owerri Local Government Area of Imo State were used for the study. The researchers found that '*uke latex*' can be used to demonstrate chemical concepts like unsaturation,

presence of double bond and coagulation. The researchers recommended that chemistry teachers should be encouraged as part of their professional development, to be adopting or devising school based practical activities in which locally available resources would be effectively utilized. The work of Onwu and Okorie demonstrated how to use '*uke*' (a local resource) to teach some chemical concepts which is related to utilization of community resources for teaching chemistry. The reviewed study will also serve as a guide to the present one on how to show the process of use of some identified community resources for teaching some concepts in chemistry.

Summary of Literature Review

The literature review looked at the conceptual schema, some concepts like teaching and learning of chemistry, resources for teaching chemistry, community resources, availability and utilization of community resources and factors militating against the use of community resources. The literature review also looked at some theories of learning that relate to teaching and learning of science subjects. These include; Piaget, Bruner and Lev Vigotsky theories respectively.

Studies have shown that teacher's qualification and experience are very important in the utilization of community resources. They have also revealed that resources which could be used in teaching and learning different subjects are available within the school community. The problem is that teachers do not make adequate use of these resources due to certain reasons like ignorance, lack of dedication, too much work load, insufficient number of periods in the school time table, lack of motivation from school authorities and government among others.

Previous researchers centered their work on community/local resources for teaching other subjects like physical Education, Agricultural Science, Geography, Biology etc. Some science educators have written opinion papers on local resources

for teaching chemistry. Others have written on the instructional materials for teaching chemistry which include equipment, apparatus, chemicals and reagents that could be used to teach chemistry. Other researchers have also worked on the use of local resources for teaching chemistry but in different geographical locations. One of the identified problems why teachers do not make adequate use of these resources is ignorance, the present work identified the available community resources, investigate the extent of utilization of these resources and show how to use some of the identified resources for teaching certain concepts in chemistry.

CHAPTER THREE

RESEARCH METHOD

This chapter describes the method and procedure adopted in collecting and analyzing data. It covers a detailed description of the following: design of the study, area of study, population of the study, sample and sampling techniques, instrument for data collection, validation of instrument, reliability of instrument, method of data collection and method of data analysis.

Design of the Study

The design of the study is survey, specifically descriptive survey. Nworgu (2006) defined descriptive survey as those studies which aim at collecting data on, and describing in a systematic manner, the characteristic features or facts about a given population. The researcher will use survey research design to investigate and document information on availability and utilization of community resources for teaching chemistry in Nsukka Educational Zone.

Area of Study

The area of the study was Nsukka Education Zone of Enugu state. Nsukka Education Zone is one of the six education zones in Enugu state. Nsukka Education Zone is made up of three (3) local government areas; Nsukka, Igbo-Etiti and Uzo-uwani. There are fifty-seven (57) schools under the zone. The list of all the schools is shown in appendix A (57).

(Source: Post Primary Schools Management Board (PPSMB) Nsukka Zone).

The choice of Nsukka Education Zone is borne out of the fact that students performance in senior secondary school chemistry has been poor over the years as reported by some researchers.

Population of the Study

The population of the study comprised one thousand two hundred and fifty eight (1258) Senior Secondary three (SS III) chemistry students of 2015/2016 session and sixty nine (69) chemistry teachers in post primary schools management board Nsukka Education Zone. Senior Secondary three (SS III) chemistry students are the most experienced students at the secondary school level to give appropriate responses to the information required for this study. The list of all the schools, total number of the senior secondary three (SS III) chemistry students and number of chemistry teachers in the zone are also shown in appendix A (57).

(Source: Post Primary Schools Management Board (PPSMB) Nsukka Zone).

Sample and Sampling Techniques

The sample of the study was one hundred and seventy six (176) respondents comprising one hundred and sixty (160) SS III chemistry students and 16 chemistry teachers drawn from 16 secondary schools in Nsukka Education Zone. Proportionate stratified random sampling was used to draw one hundred and five (105), forty five (45) and ten (10) chemistry students; eight (8), five (5) and three (3) chemistry teachers from Nsukka, Igbo Etiti and Uzo-uwani local government areas respectively. Twenty eight percent (28%) of the schools in the study area was drawn by stratified random sampling. Eight (8) schools were selected from the twenty nine schools that make up Nsukka local government. Five (5) schools were selected from the sixteen (16) schools in Igbo-Etiti and three (3) were selected from the twelve (12) schools that are in Uzo-uwani local government. The eight (8) schools drawn from Nsukka local government area were grouped as urban while the eight (8) schools drawn from Igbo-Etiti and Uzo-uwani were grouped as rural schools. The indices for grouping these schools into urban and rural was based on population density of students and teachers, availability of functional electricity and agrarian nature of communities where the schools are located.

The list of sampled schools, total number of chemistry students and teachers are shown in Appendix B (60).

Instrument for Data Collection

The instrument for data collection was questionnaire developed by the researcher to elicit information on the availability, utilization and problems associated with the utilization of community resources for teaching chemistry. The instrument was designed for both chemistry students and teachers. The questionnaire comprised three sections. Section A, dealt with the demographic characteristics of the respondents. Section B comprised clusters A and B, which required information on extent of availability and utilization of itemized resources for teaching certain topics in chemistry. Section C comprised cluster C which sought information on factors that constitute problems to effective utilization of community resources for teaching chemistry (to be answered by teachers only).

The checklist was used to ascertain the availability of community resources. Rating scale was used to determine the extent of utilization of the resources and the problems associated with the utilization of the resources

Validation of the Instrument

To ensure the face validity of the instrument, it was given to three experts in the field. Two lecturers in Department of Science Education and one in the Department of Measurement and evaluation, all from University of Nigeria, Nsukka. The experts were required to determine the suitability of instruments in achieving the objectives of the study from which the items were drawn. The validates examined the questionnaire items generated and made their contributions. The two separate questionnaires for teachers and students respectively were merged as one. The initial seventy-five (75) items on availability and utilization of community Resources for teaching chemistry were reduced to sixty-four (64) items. The initial seventeen (17)

items on factors militating against utilization of community resources for teaching chemistry were increased to twenty-two (22) items. The comments and suggestions made by the validates were used for the modification and final draft of the instrument.

Reliability of the Instrument

Twenty students and twenty teachers were used for trial testing of instrument on availability and utilization of community resources for teaching chemistry. The students and teachers used were selected from Schools in Science Technical and Vocational Schools Management Board (STVSMB), a different board in Nsukka Education Zone. The students' and teachers' responses on availability were subjected to reliability test using Kudder-Richardson reliability coefficient with reliability index of 0.959 and 0.96 respectively. Their responses on utilization part of the instrument were subjected to Cronbach's Alpha reliability coefficient with reliability index of 0.967 for students and 0.730 for teachers. Twenty chemistry teachers rated the instrument on factors that constitute problems for effective utilization of community resources for teaching chemistry. Teachers' responses were subjected to Cronbach's Alpha reliability coefficient with reliability index of 0.820. The reliability indices gotten showed that the instrument has a high reliability.

Method of Data Collection

The researcher, personally visited the schools in Nsukka Local Government and administered the questionnaire to chemistry students and teachers. The researcher through the help of research assistants also visited and administered the questionnaire to chemistry students and teachers in Igbo-Etiti and Uzo-uwani local government areas. The copies of the questionnaire were collected the same day.

Method of Data Analysis

Data were analyzed using frequency, percentage, mean and standard deviation. The frequency was used to determine the community resources that are available or

not available. A standard criterion mean of 2.50 was adopted for the purpose of determining the degree of acceptance on teachers' utilization of community resources for teaching chemistry and problems associated with utilization of the resources. The chi-square was used to test the hypotheses at 0.05 level of significance on the availability of resources while the t-test was used to test the hypothesis at 0.05 level of significance on utilization and problems associated with utilization of resources. The choice of t-test and chi-square was to establish the equity of variance of the two groups under study.

CHAPTER FOUR

PRESENTATION OF RESULTS

This chapter presents the results of the study in line with research questions and hypotheses in tabular form.

Research question one: What are the available community resources for teaching chemistry in Nsukka Education Zone?

Table 1: Frequency and percentage of available community resources for teaching chemistry in Nsukka Education Zone

S/N	Topics	Resources	Teachers (N=16)					Students (N=160)				
			Available		Not Available			Available		Not Available		
			Freq.	%	Freq	%	Rem.	Freq.	%	Freq.	%	Rem.
1	Chemical industries	Soap	11	68.8	5	31.3	A	110	68.8	50	31.3	A
		Vegetable oil (P.K.O)	11	68.8	5	31.3	A	110	68.8	50	31.3	A
		Cassava	10	62.5	6	37.5	A	100	62.5	60	37.5	A
		'Kaikai'	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Pap	16	100.o	0	00.0	A	160	100.0	0	00.0	A
		Detergent	12	75.o	4	25.0	A	120	75.0	40	25.0	A
		Bread	12	75.o	4	25.0	A	120	75.0	40	25.0	A
		Palm oil	10	62.5	6	37.5	A	100	62.5	60	37.5	A
		Ogiri	11	68.8	5	31.3	A	110	68.8	50	31.3	A
		Okpa	16	100.0	0	00.0	A	160	100.0	0	00.0	A
2	Chemical combination	Camphor balls (Iodine)	16	100.0	0	00.0	A	50	37.5	110	68.8	A
		Coloured beads for models	16	100.0	0	00.0	A	160	100.0	0	00.0	A
3	Standard separation techniques for mixtures	Sand	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Common salt	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Cubes of sugar	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Leaf (as funnel)	11	68.8	5	31.3	A	160	100.0	0	00.0	A
		A piece of cloth (as filter paper)	11	68.8	5	31.3	A	160	100.0	0	00.0	A
		Native dye ('uri')	11	68.8	5	31.3	A	160	100.0	0	00.0	A
		('odo')	16	100.0	0	00.0	A	110	68.8	50	31.3	A
		Camwood ('ufie')	16	100.0	0	00.0	A	110	68.8	50	31.3	A
		Clay tray	16	100.0	0	00.0	A	110	68.8	50	31.3	A

		pot (evaporating dish)									
		Palm oil	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		A piece of magnet	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Iron fillings	16	100.0	0	00.0	A	160	100.0	0	00.0	A
4	Acids bases and salts	lime	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Grape	8	50.0	8	50.0	A	160	100.0	0	00.0	A
		Orange	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Lemon	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Pawpaw leaves	16	100.0	0	00.0	A	80	60.0	80	40.0	A
		Soured milk	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Hibiscus	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Allamanda	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		palm wine	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Local gin ‘kaikai’	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Mortar/pestle	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Snail shell	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Plantain peels	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Salt water	7	43.8	9	56.3	NA	0	00.0	160	100.0	NA
		Ashes from palm remains	16	100.0	0	00.0	A	160	100.0	0	00.0	A
5.	Water	Well	11	68.8	5	31.3	A	160	100.0	0	00.0	A
		River	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Tap	16	100.0	0	00.0	A	70	43.8	80	46.3	A
		Stream	16	100.0	0	00.0	A	110	68.8	50	31.3	A
		Borehole	15	93.8	1	6.3	A	160	100.0	0	00.0	A
		Sea water	0	00.0	16	100.0	NA	0	00.0	160	100.0	NA
		Soap	16	100.0	0	00.0	A	160	100.0	0	00.0	A
6.	Carbon and its compounds	Stick (wood)	16	100.0	0	00.0	A	150	93.8	10	6.3	A
		Paper	11	68.8	5	31.3	A	160	100.0	0	00.0	A
		Coal	0	0.00	16	100.0	NA	00.0	0	160	100.0	NA
		Soot	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Petrol	15	93.8	1	6.3	A	110	68.8	50	31.3	A
		Diesel oil	11	68.8	5	31.3	A	160	100.0	0	00.0	A
		Grease	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Kerosene	16	100.0	0	00.0	A	150	93.8	10	6.3	A
		Decaying fruits	16	100.0	0	00.0	A	150	93.8	10	6.3	A
		Decaying food	16	100.0	0	00.0	A	160	100.0	0	00.0	A

		Decaying vegetables	16	100.0	0	00.0	A	160	100.0	0	00.0	A
7.	Petroleum by-products	Plastics	16	100.0	0	00.0	A	160	100.0	0	00.0	A
		Insecticides	15	93.8	1	6.3	A	120	75.0	40	25.0	A
		Vaseline	15	93.8	1	6.3	A	120	75.0	40	25.0	A
8.	Human resources	Professional chemistry teachers	12	75.0	4	25.0	A	120	75.0	40	25.0	A
		Laboratory attendants	11	68.8	5	31.3	A	110	68.8	50	31.3	A
		Factory workers	13	81.3	3	18.8	A	120	75.0	40	25.0	A
		Resource persons	11	68.8	5	31.3	A	110	68.8	50	31.3	A

NB: Freq= Frequency; %= percentage; N= Number of respondents; Rem.= Remark; A= Available; NA= Not Available

Table 1 revealed that majority (50% and above) of the chemistry teachers and students that rated the instrument agreed that local resources are available in the study area for teaching and learning of chemistry. However, they rated seawater, saltwater and coal not available (below 50%) in the area for teaching chemistry. This means that the following are the available materials for teaching of chemistry in the zone: soap industry, vegetable oil industry, local gin industry, detergent industry, bread industry, palm oil industry, ogiri industry (local seasoning), native dye ‘uri’, camwood ‘ufie’, ‘odo’ and some fruits (lime, grape, orange, mango etc) soot, shells, plastics, insecticides. Also, available materials include professional chemistry teachers, resource persons, pap, bambara nuts sand, cubes of sugar, pieces of magnet, pawpaw, soured milk, hibiscus flower, pieces of cloth as filter paper, salt, tap water, and kerosene etc.

Hypothesis One: There is no significant difference in the responses of chemistry teachers and students on the availability of community resources for chemistry instruction in secondary schools.

Table 2: Summary of X^2 Analysis of the Rating of Teachers and Students on the Availability of Community Resources for Teaching Chemistry

Chi-Square Tests					
	Value	Df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	0.87	1	0.35		
Continuity Correction[b]	0.79	1	0.38		
Likelihood Ratio	0.88	1	0.35		
Fisher's Exact Test				0.37	0.19
Linear-by-Linear Association	0.87	1	0.35		
N of Valid Cases	10912				

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 162.36.
b. Computed only for a 2x2 Table

Table 2 shows that probability of 0.19(Asymp.sig. (2-sided)) is greater than the level of significance of 0.05. Therefore the null hypothesis was upheld. Hence, there is no significant difference in the responses of chemistry teachers and students on the availability of community resources for chemistry instruction in secondary schools.

Research Question two: How frequently do teachers use community resources for teaching chemistry in Nsukka Education Zone

Table 3: Mean and standard deviation of ratings by chemistry teachers and students on the frequency of use of community resources for teaching chemistry

S/N	Topics	Community Resources	Teachers (N=16)			Students (N=160)		
			Mean	SD	Remark	Mean	SD	Remark
1	Chemical industries	Soap	2.19	0.91	SU	2.31	0.96	SU
		Vegetable oil (P.K.O)	1.81	0.54	SU	2.00	0.74	SU
		Cassava	2.13	1.15	SU	2.20	1.15	SU
		Kaikai	2.25	0.86	SU	2.46	0.89	SU
		Pap	2.88	1.09	AU	2.99	1.02	AU
		Detergent	2.38	1.26	SU	2.45	1.21	SU
		Bread	2.00	0.89	SU	2.18	0.96	SU
		Palm oil	1.63	0.89	SU	1.73	0.94	SU

		Ogiri	1.81	0.83	SU	1.91	0.87	SU
		Okpa	2.63	1.20	AU	2.80	1.13	AU
2	Chemical combination	Camphor balls	1.56	0.81	SU	1.94	1.06	SU
		Iodine						
		Coloured beads for models	2.00	0.63	SU	2.29	0.83	SU
3	Standard separation techniques for mixtures	Sand	2.44	1.03	SU	2.36	1.03	SU
		Common salt	2.19	0.66	SU	2.49	0.85	SU
		Cubes of sugar	2.56	1.26	AU	2.76	1.18	AU
		Leaf (as funnel)	1.88	0.81	SU	1.94	0.86	SU
		A piece of cloth (as filter paper)	1.88	1.02	SU	1.99	1.03	SU
		Native dye (‘uri’)	1.94	0.85	SU	2.05	0.89	SU
		(‘odo’)	2.25	1.06	SU	2.31	1.09	SU
		Camwood (‘ufie’)	1.88	0.89	SU	2.21	1.05	SU
		Clay tray pot (evaporating dish)	1.94	0.85	SU	2.30	1.06	SU
		Palm oil	2.00	1.09	SU	2.31	1.16	SU
		A piece of magnet	2.38	0.62	SU	2.39	0.72	SU
		Iron fillings	2.25	1.24	SU	2.31	1.22	SU
4	Acids and bases	Ripe and unripe fruits e.g. lime	2.19	1.11	SU	2.48	1.14	SU
		Grape	2.06	1.06	SU	2.38	1.14	SU
		Orange	2.13	1.26	SU	2.44	1.28	SU
		Lemon	1.94	0.85	SU	2.25	0.99	SU
		Paw-paw leaves	2.88	1.15	SU	3.01	1.06	SU
		Soured milk	2.44	1.36	SU	2.33	1.27	SU
		Bright coloured e.g. Hibiscus	2.38	1.26	SU	2.38	1.23	SU
		Allamanda	2.19	0.83	SU	2.42	0.92	SU
		Ethanol –palm wine	2.06	1.12	SU	2.32	1.15	SU
		Local gin (kaikai)	2.19	1.22	SU	2.42	1.22	SU
		Mortar/pestle	1.94	1.06	SU	2.21	1.12	SU
		Snail Shells	2.13	1.20	SU	2.38	1.21	SU
		Plantain peels	2.13	1.20	SU	2.36	1.19	SU
		Salt water	2.44	1.31	SU	2.31	1.24	SU
		Ashes from palm remains	2.41	1.28	SU	2.29	1.19	SU
5.	Water	Well	1.94	0.99	SU	2.14	1.06	SU
		River	2.94	1.06	AU	3.48	1.22	AU
		Tap	2.88	0.89	AU	2.61	0.61	AU

		Stream	2.19	1.05	SU	2.07	0.97	SU
		Borehole	1.88	0.89	SU	2.18	1.03	SU
		Sea water	1.94	1.06	SU	2.18	1.10	SU
		Soap	2.00	1.32	SU	2.29	1.33	SU
6.	Carbon	Stick (wood)	1.75	0.93	SU	2.01	1.06	SU
		Paper	2.19	1.22	SU	2.43	1.21	SU
		Coal	1.94	1.06	SU	2.21	1.13	SU
		Soot	1.94	1.12	SU	2.21	1.19	SU
		Petrol	2.50	1.26	AU	2.68	1.20	AU
		Diesel oil	2.44	1.03	SU	2.33	1.03	SU
		Grease	2.13	0.89	SU	2.37	0.98	SU
		Kerosene	2.25	1.24	SU	2.48	1.21	SU
		Decaying fruits	2.25	1.13	SU	2.49	1.13	SU
		Decaying food	2.25	1.18	SU	2.31	1.19	SU
		Decaying vegetables	2.13	1.15	SU	2.28	1.17	SU
7.	Petroleum by products	Plastics	2.25	1.24	SU	2.43	1.24	SU
		Insecticides	1.94	0.99	SU	2.09	1.05	SU
		Vaseline	1.98	1.02	SU	2.13	1.08	SU
8.	Human resources	Professional chemistry teachers	2.63	1.20	AU	2.68	1.20	AU
		Laboratory attendants	2.38	1.15	SU	2.44	1.07	SU
		Factory workers	1.69	0.79	SU	2.34	1.15	SU
		Resources persons	2.56	1.26	AU	2.44	1.07	SU
		Total						

NB: N= Number of respondents; SU= Seldomly utilized; AU= Always Utilized; SD= Standard Deviation

Decision Rule = 2.50

Table 3 revealed that both chemistry teachers and students agreed that chemistry teachers always utilize pap, bambara nuts cubes of sugar, orange, river, tap water, petrol, and professional chemistry teachers during teaching and learning of chemistry. However, all other fifty-six items are seldomly utilized or not utilized at all.

Hypothesis Two: There is no significant difference in the mean responses of chemistry teachers and students on the utilization of community resources for chemistry instruction in secondary schools.

Table 4: t-test of comparing the mean and standard deviation ratings of chemistry teachers and students on the utilization of community resources for chemistry instruction in secondary schools

	grouping	N	Mean	Std. Deviation	t	Df	Sig. (2-tailed)	Decision
Overall	**teachers**	16	2.18	0.16	-1.77	174	0.08	NS
	students	160	2.38	0.45				

NB: NS= Not Significant; t= t-test calculated; df= Degree of Freedom; and N= Number of Respondents

Table 6 above shows t-score (-1. 77) with associate, probability of 0.08 being greater than the level of significance of 0.05. Therefore the null hypothesis was upheld. Hence, there is no significant difference in the mean responses of chemistry teachers and students on the utilization of community resources for chemistry instruction in secondary schools.

Research Question Three: What are the problems associated with the use of community resources for teaching chemistry in Nsukka Education Zone?

Table 5: Mean and standard deviation ratings by chemistry teachers and students on the problems associated with the use of community resources for teaching chemistry

S/N		Mean	SD	Remark
1	Teachers lack of knowledge of available community resources	3.75	0.45	A
2	Teachers have too much teaching loads per week	3.56	0.51	A
3	Teachers have other administrative work	3.75	0.45	A
4	Lack of interest on the part of teachers	3.75	0.45	A
5	Lack of interest on the part of students	3.88	0.34	A
6	Over population of students	2.38	0.50	D

7	Unavailability of the community based material resources	2.13	0.72	D
8	Lack of co-operation from school principal	1.56	0.51	D
9	Lack of co-operation from the community	1.81	0.75	D
10	Lack of co-operation from parents	1.81	0.75	D
11	Lack of fund	3.88	0.34	A
12	Lack of chemical industries	1.58	0.53	D
13	Lack of prior preparation before using the community resources	2.81	1.05	A
14	Lack of sufficient time to use available community resources	4.00	0.00	A
15	Lack of professionalism on the part of the teachers	1.63	0.50	D
16	Lack of in-service training/workshop for teachers	3.19	1.05	A
17	Lack of incentives from school authorities	3.50	0.52	A
18	Lack of incentives from the government	3.56	0.51	A
19	Lack of professional chemistry teachers	2.38	1.02	D
20	Lack of laboratory attendant	3.75	0.77	A
21	Lack of factory workers	2.23	0.62	D
22	Lack of resource persons	2.03	0.45	D
	Total			

NB: A = Agree; D = Disagree; Decision Rule = 2.50

Table 5 reveals that chemistry teachers agreed on item 1,2,3,4,5,11, 13,14,16,17,18,and 20 as problems associated with the utilization of community resources in chemistry teaching. This is because their mean ratings were above 2.5 mean benchmark for agree. However, teachers disagreed on item 6,7,8,9,10 and 15 as being problems associated with the utilization of community resources in chemistry teaching. This is because their mean ratings were below 2.5 mean benchmark for agree. This indicates that teachers lack of knowledge of available community resources, teachers have too much teaching loads per week, teachers have other administrative work, lack of interest on the part of teachers, lack of interest on the part of

students, lack of fund, lack of prior preparation before using the community resources, lack of sufficient time to use available community resources, lack of in-service training/workshop for teachers, lack of incentives from school authorities, lack of incentives from the government, and Lack of laboratory attendant are the problems associated with the utilization of community resources in chemistry teaching.

Research Question Four: What is the influence of school location on the availability of community resources in Nsukka Education zone?

Table 6: Mean and standard deviation ratings by chemistry teachers and students on the influence of school location on the availability of community resources for teaching chemistry

S/N	Topics	Community Resources	**Urban Respondents (N= 113)**					**Rural Respondents Schs.(N=63)**				
			Available		**Not Available**			**Available**		**Not Available**		
			Freq.	**%**	**Freq.**	**%**	**Rem.**	**Freq.**	**%**	**Freq.**	**%**	**Rem.**
1	Chemical industries	Soap	83	73.5	30	26.5	A	38	60.3	25	39.7	A
		Vegetable oil (P.K.O)	83	73.5	30	26.5	A	38	60.3	25	39.7	A
		Cassava	66	58.4	47	41.6	A	44	69.8	19	30.2	A
		Local gin ‘kaikai’	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Pap	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Detergent	89	78.8	24	21.2	A	43	68.3	20	31.7	A
		Bread	89	78.8	24	21.2	A	43	68.3	20	31.7	A
		Palm oil	77	68.1	36	31.9	A	33	52.4	30	47.6	A
		‘Ogiri’	83	73.5	30	26.5	A	38	60.3	25	39.7	A
		Okpa	113	100.0	0	00.0	A	63	100.0	0	00.0	A
2	Chemical combination	Camphor balls (Iodine)	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Coloured beads for models	113	100.0	0	00.0	A	63	100.0	0	00.0	A
3	Standard separation techniques for mixtures	Sand	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Common salt	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Cubes of sugar	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Leaf (as funnel)	83	73.5	30	26.5	A	38	60.3	25	39.7	A
		A piece of cloth (as filter paper)	83	73.5	30	26.5	A	38	60.3	25	39.7	A
		Native dye (‘uri’)	83	73.5	30	26.5	A	38	60.3	25	39.7	A
		(‘odo’)	113	100.0	0	00.0	A	63	100.0	0	00.0	A

		Camwood 'ufie'	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Clay tray pot (evaporating dish)	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Palm oil	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		A piece of magnet	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Iron fillings	113	100.0	0	00.0	A	63	100.0	0	00.0	A
4	Acids and bases	Lime	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Grape	113	100.0	0	00.0	A	63	100.00	0	00.0	A
		Orange	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Lemon	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Pawpaw leaves	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Soured milk	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Hibiscus	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Allamanda	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Palm wine	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Local gin 'kaikai'	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Mortar/pestle	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Snail Shells	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Plantain peels	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Salt water	0	00.0	113	100.0	NA	28	44.4	35	44.6	A
		Ash from palm remains	113	100.0	0	00.0	A	63	100.0	0	00.0	A
5.	Water	Well	42	37.2	71	62.8	A	38	60.3	25	39.7	A
		River	83	73.5	30	26.5	A	63	100.0	0	00.0	A
		Tap	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Stream	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Bore hole	113	100.0	0	00.0	A	60	95.2	3	4.8	A
		Sea water	8	7.1	105	92.9	NA	0	00.0	63	100.0	NA
		Soap	113	100.0	0	00.0	A	63	100.0	0	00.0	A
6.	Carbon	Stick (wood)	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Paper	113	100.0	0	00.0	A	38	60.3	25	39.7	A
		Coal	8	7.1	105	92.9	NA	0	00.0	63	100.0	A
		Soot	83	73.5	30	26.5	A	63	100.0	0	00.0	A
		Petrol	113	100.0	0	00.0	A	60	95.2	3	4.8	A
		Diesel oil	105	92.9	8	7.1	A	38	60.3	25	39.7	A
		Grease	83	73.5	30	26.5	A	63	100.0	0	00.0	A
		Kerosene	113	100.0	0	00.0		63	100.0	0	00.0	A
		Decaying	113	100.0	0	00.0	A	63	100.0	0	00.0	A

		fruits										
		Decaying food	113	100.0	0	00.0	A	63	100.0	0	00.0	A
		Decaying vegetables	113	100.0	0	00.0	A	63	100.0	0	00.0	A
7.	Petroleum	Plastics	113	100.0	0	00.0	A	63	100.0	0	00.0	A
	by-products	Insecticides	89	78.8	24	21.2	A	46	73.0	17	27.0	A
		Vaseline	113	100.0	0	00.0	A	63	100.0	0	00.0	A
8.	Human resources	Professional chemistry teachers	87	77.0	26	23.0	A	45	71.4	18	28.6	A
		Laboratory attendants	83	73.5	30	26.5	A	38	60.3	25	39.7	A
		Factory workers	88	77.9	25	22.1	A	45	71.4	18	28.6	A
		Resources persons	83	73.5	30	26.5	A	38	60.3	25	39.7	A

Table 6 revealed that both teachers and students in the urban and rural areas agreed that the items of the instrument are available except seawater, saltwater and coal. Which means that the following are the available materials for teaching of chemistry in the zone: soap industry, vegetable oil industry, local gin industry, detergent industry, bread industry, palm oil industry, ‘ogiri’ industry (local seasoning), native dye ‘uri’, camwood ‘ufie’, ‘odo’ and some fruits (lime, grape, orange, Lemon etc) soot, snail shells, plastics, insecticides. Also, available materials include professional chemistry teachers, resource persons, pap, okpa, sand, cubes of sugar, pieces of magnet, pawpaw leaves, soured milk, hibiscus flower, pieces of cloth as filter paper, salt, tap water, kerosene etc.

Research Question Five: What is the influence of school location on utilization of community resources in Nsukka Education Zone?

Table 7: Mean and standard deviation ratings by chemistry teachers and students on the influence of school location on the utilization of community resources for teaching chemistry

S/N	Topics	Resources	Urban Respondents (N= 113)			Rural Respondents(N= 63)		
			Mean	SD	Remark	Mean	SD	Remark
1	Chemical industries	Soap	2.33	0.94	SU	2.25	0.98	SU
		Vegetable oil (P.K.O)	2.02	0.72	SU	1.92	0.75	SU
		Cassava	2.08	1.11	SU	2.39	1.19	SU
		Local gin	2.49	0.92	SU	2.37	0.85	SU
		Pap	2.98	1.04	AU	2.97	0.99	AU
		Detergent	2.53	1.23	AU	2.29	1.17	SU
		Bread	2.20	0.98	SU	2.08	0.90	SU
		Palm oil	1.67	0.88	SU	1.79	1.02	SU
		‘Ogiri’	1.87	0.82	SU	1.97	0.95	SU
		‘Okpa ‘	2.79	1.15	AU	2.78	1.11	AU
2	Chemical combination	Camphor balls (Iodine)	1.96	1.06	SU	1.81	0.99	SU
		Coloured beads for models	2.30	0.82	SU	2.19	0.80	SU
3	Standard separation techniques for mixtures	Sand	2.62	1.00	AU	2.67	1.08	AU
		Common salt	2.46	0.86	SU	2.46	0.82	SU
		Cubes of sugar	2.76	1.23	AU	2.71	1.14	AU
		Leaf (as funnel)	1.89	0.82	SU	2.02	0.91	SU
		A piece of cloth (as filter paper)	1.98	1.03	SU	1.97	1.05	SU
		Native dye (‘uri’)	2.02	0.86	SU	2.08	0.96	SU
		(‘odo’)	2.47	1.09	SU	2.52	1.08	SU
		Camwood (‘ufie’)	2.20	1.05	SU	2.14	1.01	SU
		Clay tray pot (evaporating dish)	2.27	1.07	SU	2.25	0.99	SU
		Palm oil	2.31	1.14	SU	2.24	1.19	SU
		A piece of magnet	2.58	0.72	AU	2.54	0.71	AU
		Iron fillings	2.32	1.25	SU	2.43	1.17	SU
4	Acids and	Lime	2.49	1.15	SU	2.38	1.13	SU

	bases	Grape	2.37	1.14	SU	2.30	1.12	SU
		Orange	2.48	1.29	SU	2.29	1.25	SU
		Lemon	2.24	0.98	SU	2.19	0.99	SU
		Pawpaw leaves	2.21	1.02	SU	2.14	0.96	SU
		Soured milk	2.64	1.26	AU	2.56	1.30	AU
		Hibiscus	2.43	1.23	SU	2.41	1.22	SU
		Allamanda	2.42	0.94	SU	2.35	0.86	SU
		Palm wine	2.35	1.15	SU	2.21	1.15	SU
		Local gin ‘kaikai’	2.46	1.24	SU	2.29	1.17	SU
		Mortar/pestle	2.24	1.14	SU	2.09	1.09	SU
		Snails Shells	2.42	1.22	SU	2.22	1.17	SU
		Plantain peels	2.39	1.19	SU	2.25	1.19	SU
		Salt water	2.35	1.27	AU	2.49	1.19	SU
		Ash from palm remains	2.13	1.06	SU	2.08	1.02	SU
5.	Water	Well	2.18	1.09	SU	2.02	0.98	SU
		River	2.31	1.22	AU	2.37	1.18	SU
		Tap	3.38	0.62	AU	3.33	0.72	AU
		Stream	2.13	0.99	SU	1.98	0.94	SU
		Bore hole	2.22	1.05	SU	2.02	0.94	SU
		Sea water	2.24	1.10	SU	2.02	1.08	SU
		Soap	2.32	1.33	SU	2.16	1.32	SU
6.	Carbon	Stick (wood)	2.02	1.06	SU	1.92	1.02	SU
		Paper	2.49	1.20	SU	2.25	1.22	SU
		Coal	2.26	1.13	SU	2.05	1.11	SU
		Soot	2.30	1.22	SU	1.97	1.09	SU
		Petrol	2.75	1.18	AU	2.51	1.24	AU
		Diesel oil	2.67	1.04	AU	2.49	0.99	SU
		Grease	2.44	1.01	SU	2.17	0.89	SU
		Kerosene	2.50	1.22	AU	2.57	1.21	AU
		Decaying fruits	2.49	1.16	SU	2.43	1.09	SU
		Decaying food	2.30	1.23	SU	2.27	1.11	SU
		Decaying vegetables	2.34	1.17	SU	2.13	1.14	SU
7.	Petroleum by - products	Plastics	2.48	1.26	SU	2.29	1.18	SU
		Insecticides	2.13	1.09	SU	1.96	0.97	SU
		Vaseline	2.21	1.02	SU	1.58	0.83	SU
8.	Human resources	Professional chemistry teachers	3.49	1.17	AU	2.14	1.11	SU
		Laboratory attendants	2.44	1.10	SU	2.41	1.04	SU

	Factory workers	2.37	1.15	SU	2.11	1.11	SU
	Resources persons	2.52	1.10	AU	2.32	1.06	SU
	Total						

Table 8 revealed that both urban respondents (teachers and students) and rural respondents always utilize the following available resources: pap, okpa, sand, cubes of sugar, pieces of magnet, orange, soured milk, petrol and kerosene. However, they seldomly utilize the following: soap industry, vegetable oil (P.K.O) industry, local gin ('kaikai') industry, detergent industry, bread industry, palm oil industry, 'ogiri' industry(local seasoning), native dye ('uri'), ('odo)' camwood ('ufie'), some fruits (lime, grape, orange, lemon etc) pawpaw leaves, coal, soot, snail shells, plastics, and insecticides. Also, the urban respondents agreed to utilize professional chemistry teachers and resource persons, whereas the rural respondents seldomly utilize them.

Research Question Six: What is the influence of school location on chemistry teachers' ratings of problems associated with the utilization of community resources in Nsukka Education Zone?

Table 8: Mean and standard deviation ratings by chemistry teachers and students on the influence of school location on the problems associated with utilization of community resources for teaching chemistry

S/N		**Teachers in Urban Schs. (N=)**			**Teachers Rural Schs.(N=)**		
		Mean	**SD**	**Remark**	**Mean**	**SD**	**Remark**
1	Teachers lack of knowledge of available community resources	3.75	0.46	A	3.75	0.46	A
2	Teachers have too much teaching loads per week	3.50	0.53	A	3.63	0.52	A
3	Teachers have other administrative work	3.75	0.46	A	3.75	0.46	A
4	Lack of interest on the part of teachers	3.75	0.46	A	3.75	0.46	A
5	Lack of interest on the part of students	3.88	0.35	A	3.88	0.35	A
6	Over population of	2.38	0.52	D	2.38	0.52	D

	students						
7	Unavailability of the community based material resources	1.75	0.46	D	2.50	0.76	D
8	Lack of co-operation from school principal	1.50	0.53	D	1.63	0.52	D
9	Lack of co-operation from the community	2.13	0.83	D	1.50	0.53	D
10	Lack of co-operation from parents	1.88	0.99	D	1.75	0.46	D
11	Lack of fund	3.88	0.35	A	3.88	0.35	A
12	Lack of chemical industries	2.38	0.52	D	2.38	0.52	D
13	Lack of prior preparation before using the community resources	2.75	1.04	A	2.88	1.13	A
14	Lack of sufficient time to use available community resources	4.00	0.00	A	4.00	0.00	A
15	Lack of professionalism on the part of the teachers	1.50	0.53	D	1.75	0.46	D
16	Lack of in-service training/workshop for teachers	3.00	1.19	A	3.38	0.92	A
17	Lack of incentives from school authorities	3.38	0.52	A	3.63	0.52	A
18	Lack of incentives from the government	3.50	0.53	A	3.63	0.52	A
19	Lack of professional chemistry teachers	1.75	0.46	D	3.50	0.53	A
20	Lack of laboratory attendant	3.75	0.46	A	3.63	0.52	A
21	Lack of factory workers	2.38	0.52	D	3.63	0.52	A
22	Lack of resource persons	1.75	0.46	D	3.38	0.74	A
	Total						

NB: A = Agree; D = Disagree; Decision Rule 2.50

Table 8 shows that both urban and rural teachers agreed on item 1,2,3,4,5,11, 13,14,16,17,18, and 20 as problems associated with the utilization of community resources in chemistry teaching. This is because their mean ratings were above 2.5 mean benchmark for agree. However, both urban and rural teachers disagreed on item

6,7,8,9,10 and 15 as being problems associated with the utilization of community resources in chemistry teaching. This is because their mean ratings were below 2.5 mean benchmark for agree. Also, urban teachers disagreed on item 19, 21 and 22, while rural teachers agreed. This means that teachers lack of knowledge of available community resources, teachers have too much teaching loads per week, teachers have other administrative work, lack of interest on the part of teachers, lack of interest on the part of students, lack of fund, lack of prior preparation before using the community resources, lack of sufficient time to use available community resources, lack of in-service training/workshop for teachers, lack of incentives from school authorities, lack of incentives from the government and lack of laboratory attendant are the problems associated with the utilization of community resources in chemistry teaching.

Hypothesis Three: There is no significant difference in the responses of chemistry teachers in urban and rural areas on the problems associated with the use of community resources for chemistry instruction in secondary schools.

Table 9: t-test of independent showing mean and standard deviation ratings of urban and rural teachers on the problems associated with the use of community resources for chemistry instruction in secondary schools.

	Grouping	N	Mean	Std. Deviation	t	df	Sig. (2-tailed)	Decision
Overall	**urban**	8	2.81	0.12	-5.69	14	.00	S
	Rural	8	3.16	0.13				

NB: NS= Not Significant; t= t-test calculated; df= Degree of Freedom; and N= Number of Respondents

Table 9 above shows t-score (-5.69) with associate, probability of 0.00 being less than the level of significance of 0.05. Therefore the null hypothesis was rejected in favour of the alternative hypothesis. Hence, there is a significant difference in the mean rating score of chemistry teachers in urban and rural areas on the problems associated with the

use of community resources for chemistry instruction in secondary schools in favour of rural teachers with high mean rating.

Summary of the Findings

Below are the summary of the findings of this work:

1. The following are the available materials for teaching of chemistry in the zone: soap industry, vegetable oil (P.K.O) industry, local gin (‘kaikai’) industry, detergent industry, bread industry, palm oil industry, local seasoning (‘ogiri’) industry, native dye (‘uri’), (‘odo’), camwood (‘ufie’), some fruit (lime, grape, orange, lemon etc), pawpaw leaves, snail shell, plastics , insecticides etc. Also, available resources include professional chemistry teachers, resource persons, pap, okpa, sand, cubes of sugar, pieces of magnet, soured milk, hibiscus flower, a piece of cloth as filter paper, salt, tap water, kerosene etc.
2. There is no significant difference in the response of chemistry teachers and students on the availability of community resources for chemistry instruction in secondary schools.
3. Chemistry teachers always utilize the following local available materials: pap, okpa, sand, cubes of sugar, pieces of magnet, soured milk, a piece of cloth as filter paper, salt, tap water and kerosene.
4. However, chemistry teachers seldomly utilize the following: soap industry, vegetable oil industry, local gin industry, detergent industry, bread industry, palm oil industry, ogiri industry (local seasoning), native dye (‘uri’), (‘odo’), camwood (‘ufie’), some local fruits (lime, grape, orange, lemon etc), pawpaw leaves, coal, soot, shells, plastics and insecticides. The urban respondents agreed to utilize professional chemistry teachers and resource persons, whereas the rural respondents seldomly utilize them.

5. There is no significant difference in the mean responses of chemistry teachers and students on the utilization of community resources for chemistry instruction in secondary schools.
6. The problems associated with the utilization of community resources in chemistry teaching are as follows: teachers lack of knowledge of available community resources, teachers have too much teaching loads per week, teachers have other administrative work, lack of interest on the part of teachers, lack of interest on the part of students, lack of fund, lack of prior preparation before using the community resources, lack of sufficient time to use available community resources, lack of in-service training/workshop for teachers, lack of incentives from school authorities, lack of incentives from the government, and lack of laboratory attendant.
7. School location has no influence on availability of community resources in the teaching of chemistry.
8. School location has no influence on chemistry teachers' utilization of community resources in the teaching of chemistry.
9. There is a significant difference in the mean responses of chemistry teachers in urban and rural areas on the problems associated with the use of community resources for chemistry instruction in secondary schools in favour of rural teachers with high mean rating.

CHAPTER FIVE

DISCUSSION OF RESULTS, CONCLUSION, RECOMMENDATIONS, AND SUMMARY

This chapter deals with the discussion of results, conclusion, educational implications, limitations of the study, recommendations, suggestions for further studies and summary.

Discussion of Results

Studies on available resources for teaching chemistry

The results of research question one showed that above 50% of community resources for teaching chemistry are available in the study area, they include soap industry, local gin industry, vegetable oil industry, sand, common salt, native dye (‘uri’), palm oil, orange, lime, hibiscus flower pawpaw leaves, palm wine, well, river, snail shells, plastics, professional chemistry teachers, resource persons etc. From the chi-square analysis for hypothesis one, the association probability of (0.19) is greater than the level of significance of 0.05. The null hypothesis was upheld. This shows that there is no significant difference in the responses of chemistry teachers and students on the availability of community resources for chemistry instruction is secondary schools in Nsukka Education zone.

This finding is in line with the findings of Ezeudu (2000) who enumerated some of the resources for teaching certain concepts in chemistry as local gin, ‘kaikai’, palm wine, lime, lemon, orange plantain and banana peels, chalk, sand etc. The results are also in agreement with the findings of Nnamdi (2010) which indicated the resources for teaching the concepts of acids, bases and indicators as lime, lemon, unripe orange, ashes from palm kernel, plantain peels, pawpaw leaves and hibiscus flower.

Studies on Utilization of Available Resources for Teaching Chemistry

Responses from both chemistry teachers and students agreed that chemistry teachers always utilize pap, okpa, cubes of sugar, orange, a piece of cloth (as filter paper), river, petrol and professional chemistry teachers during teaching and learning of chemistry. They revealed that all other fifty-six items are seldomly utilized or not utilized at all. That is to say that majority of the available resources are not utilized by chemistry teachers during chemistry instruction. From the t-test analysis for hypotheses two, the t-score (-1.77) with associate probability of 0.08 is greater than the level of significance of 0.05. Therefore the null hypothesis was upheld. Hence, there is no significant difference in the mean responses of chemistry teachers and students on the utilization of community resources for chemistry instructions in secondary schools in the study area.

This is in agreement with the findings of Ezeugwu (1995) who found out that the resources are available but are not adequately utilized. It is also in agreement with the findings of Nwabuike (1991) who found out that the resources are available but the teachers do not always use them for instructions. Again, it is in agreement with the findings of Ukoha and Chukwudobe (2001) who found out that the teachers rarely utilize the local resources. The result is also in support of the findings of Mba (2011) which revealed that the resources are available but they are inadequately used by teachers.

Studies on problems Associated with Utilization of Community Resources for Teaching Chemistry

Responses on research question three, from the chemistry teachers showed that the problems associated with the utilization of community resources in teaching chemistry are; teachers' lack of knowledge of the available resources, teachers have

too much teaching loads per week, teachers have other administrative work, lack of interest on the part of teachers, lack of interest on the part of students, lack of fund, lack of prior preparation before using the community resources, lack of sufficient time to use available community resources, lack of in-service training/workshop for teachers, lack of incentives from school authorities, lack of incentives from the government and lack of laboratory attendants.

This is in agreement with the findings of Nwabuike (1991) which attributed the problems to teachers' ignorance of the resources and their heavy teaching loads per week. The findings in this work on the problems that militate against effective utilization of community resources are in contrast with the findings of Ezugwu (1995) which identified lack of co-operation by the members of the community as a problem. This shows that the situation of relationship between teachers and community might have changed over the time.

Studies on Process of Use of Community Resources for Teaching Chemistry

Responses on research question four, from the interview schedule revealed that some community resources can be used to teach certain concepts in chemistry. They are: fruits (orange, lime, lemon and grape) can be used to teach the concept of acids. The juice from the fruits can be used to test for the presence of acid, using blue litmus paper. They turn blue litmus paper red, showing that the medium is acidic. Other resources like wood, plantain peels, palm remains and pawpaw leaves can be used to teach the concept of bases. The ashes from these products can be used to test for base. The solution of these ashes in water can be tested with red litmus paper. They turn red litmus paper blue showing that the solutions are basic. Another one is the snail shell which can be used to teach the concept of salts. A well crushed snail shell on addition of any dilute acid like hydrochloric acid (HCl) or tetraoxosulphate

(VI) acid (H_2SO_4), gives effervescence, showing the presence of calcium salt and also the presence of carbon (IV) oxide in the medium which is given off. Another community resource is hibiscus flower which can be used to teach the concept of acid-base indicators. The juice from hibiscus flower added to a dilute acid, hydrochloric acid (HCl) in a beaker and stirred thoroughly, made the acid to change colour from colourless to pink. The juice of hibiscus flower added to the solution of base, sodium hydroxide (NaOH) and stirred thoroughly, made the base solution to change from colourless to yellow. This shows that hibiscus flower can be used as an indicator for an acid and a base. Another community resource is native dye (‘uri’) which can be used to teach the concept of chromatography. The juice from ‘uri’ formed different spots over an adsorbent medium when it is enclosed in a container with ethanol as solvent. This shows the rate of movement of the different solutes that constitute the native dye ‘uri’.

This is in concordance with the work of Onwu and Okorie (1996) who demonstrated how a local resource ‘uke’ latex could be used to teach certain chemical concepts like unsaturation, cyclization and decolourization. It is also in concordance with the work of Okorie (2014) who demonstrated the use of ‘uke’ latex [Landolphia Owariensis (P.Beauv)], a local resource in theoretical explanation of the concept of vulcanisation.

Studies on Influence of School Location on the Available Community Resources for Teaching Chemistry

Responses on research question five showed that both teachers and students in urban and rural areas agreed that the itemized community resources are available except sea water, salt water and coal. This means that the available community resources for teaching chemistry in the study area are; soap industry, vegetable oil

industry, local gin industry, native ink (uri), camwood (ufie), palm wine, lime, orange, soot, snail shells, plantain peels, hibiscus flower, pawpaw leaves, salt, professional chemistry teachers, resource persons etc. This is in agreement with the findings of Ezeudu (2000) and Nnamdi 2010 which indicated the available local resources for teaching some concepts in chemistryas palm wine, local gin, pawpaw leaves, lime, lemon, orange, hibiscus flower etc. This is line with the work of Ukoha and Chukwudobe (2001) which indicated some available local resources for teaching chemistry. Hence, school location has no influence on availability of community resources for teaching chemistry.

Studies on Influence of School Location on Utilization of Community Resources for Teaching Chemistry

The results of research question six revealed that both teachers and students in urban and rural areas always utilize the following available resources: pap, okpa, sand, cubes of sugar, piece of magnet, soured milk, hibiscus flower, piece of cloth as filter paper, salt, and kerosene. On the other hand, they seldomly utilize soap industry, vegetable oil industry, local gin industry, detergent industry, bread industry, palm oil industry, ('ogiri') industry (local seasoning), native dye (uri), calmwood (ufie), fruits (orange, lime, lemon, grape etc), pawpaw leaves, soot, snail shells, plastics and insecticides. Also, the urban respondents agree to always utilize professional chemistry teachers, factory workers and resource persons, whereas the rural respondents seldomly utilize them. Therefore school location has no influence on chemistry teachers' utilization of community resources for teaching chemistry.

Studies on Influence of School Location on Problems Associated with Utilization of Community Resources for Teaching Chemistry

The results of research question seven revealed that teachers in urban and rural areas agreed that the following are problems associated with the utilization of

community resources for teaching chemistry: teachers' lack of knowledge of available resources, teachers, too much teaching loads per week, teachers have other administrative work, lack of interest on part of students, lack of fund, lack of prior preparation before using the community resources; lack of sufficient time to use available community resources, lack of in-service training/workshop for teachers, lack of incentives from school authorities, lack of incentives from government and lack of laboratory attendants.

However, both urban and rural teachers disagreed on over population of students, unavailability of the community based resources, lack of cooperation from school principal, lack of co-operation from the community, lack of co-operation from parents and lack of professionalism on the part of the teachers as being problems associated with the utilization of community resources for teaching chemistry. Also, urban teachers disagreed on lack of professional chemistry teachers, lack of factory workers and lack of resource persons as being problems whereas rural teachers agreed. This means that teachers' lack of knowledge of available community resources, teachers' high teaching loads/work load per week, teachers have other administrative work, lack of interest on the part of teachers, lack of interest on the part of students, lack of fund, lack of prior preparation before using the community resources, lack of sufficient time to use available community resources, lack of in-service training/workshop for teachers, lack of incentives from school authorities, lack of incentives from government and lack of laboratory attendants are the problems associated with the utilization of community resources for teaching chemistry.

The t-test analysis for research hypothesis three showed that t-score (-5.69) with association probability of 0.00 is less than the level of significance of 0.05. Therefore the null hypothesis was rejected in favour of the alternative hypothesis.

Hence, there is a significant difference in the mean responses of chemistry teachers in urban and rural areas on the problems associated with the use of community resources for teaching chemistry in secondary schools in favour of rural teachers with high mean ratings.

The findings of this work is in line with the findings of Ezugwu (1995) who identified lack of knowledge of existence of the community resources as a major problem that is associated with the utilization of the resources. The result of this work is also in agreement with the work of Nwabuike (1991) who identified lack of finance, teachers' ignorance of the existence of the resources and heavy teaching loads per week as factors that limit effective use of community resources for teaching. This finding did not agree with the findings of Omeje (1999) who identified lack of qualified teachers as a problem that inhibit the use of local resources for teaching process.

Conclusion

Results from the study showed that majority of the itemized community resources are available e.g chemical industries, like soap, vegetable oil, detergent, local gin industries, sand, salt, native dye 'uri', palm oil, fruits like grape, lime, lemon. Others are: Pawpaw leaves, snail shells, plantain peels etc. However, teachers and students rated sea water, salt water and coal as not available in the area of study. Hence there is no significant difference in the responses of chemistry teachers and students on the availability of community resources for chemistry instruction in Nsukka education zone. Teachers and students agreed that 87.5% of the itemized resources are not utilized or seldomly utilized. There is no significant difference on the mean responses of chemistry teachers and students on utilization of community resources for teaching chemistry. Teachers in rural schools rated lack of professional

chemistry teachers, lack of factory workers and lack of resource persons as problems associated with utilization of community resources whereas teachers in urban schools disagreed. Therefore the actual problems associated with utilization of community resources are teachers' lack of knowledge of the available resources, teachers have too much work loads per week, lack of sufficient time to use available community resources, lack of incentives from school authorities and governments etc. Hence there is a significant difference in the mean responses of chemistry teachers in urban and rural areas on problems associated with the use of community resources for chemistry instruction in secondary schools in favour of rural teachers with high mean ratings.

The findings of this work are consistent with the work of previous researchers who identified some local resources which could be used for teaching certain concepts in chemistry. This work is also in line with those of other researchers who showed that teachers seldomly utilize the available community resources due to certain reasons like ignorant of the existence or how to use the available resources and lack of interest on the part of the teacher. This work in addition showed the process of use of some of the identified community resources for teaching chemistry.

Educational Implications

Results obtained from the study showed that majority of the itemized community resources are available. The educational implication is that chemistry teachers need to be resourceful, i.e. be eager to look for and get the available community resources for teaching chemistry. The implication is also that, the students should be made to learn concepts in chemistry with resources available in their communities. The findings of this work showed that chemistry teachers seldomly utilize the available community resources during chemistry instructions. The

educational implication is that the school administrators should encourage the chemistry teachers to be using the available resources for teaching chemistry. The implication is also that, the government should enable the teachers to utilize the available resources during instruction through organizing workshops and establishment of resource centres. The implication on the teachers is that they should help students to develop interest in the learning of chemistry by utilization of community resource for teaching concepts in chemistry.

The findings showed that many problems are associated with the utilization of community resources for teaching chemistry. The educational implication is that students, teachers, school administrators and the government should participate in their various positions in tackling these problems in order to improve the utilization of community resources for teaching and learning of chemistry.

Limitations of the Study

1. This work is limited to schools in Nsukka Education Zone of Enugu State. The other five education zones in the state were not included and needed to be investigated upon for more generalization in this problem area.
2. This work is also limited in the area of class of students used during investigations. The senior secondary (SSIII) chemistry students were used and this is an examination class. Some of the students were reluctant to fill the questionnaire on the basis of being too busy. This may have influenced the responses gotten.
3. This work is also limited to the number of respondents (students and teachers) used for the study in the investigation. In the sense that only one hundred and sixty (160) out of five hundred and ninety-eight (598) chemistry students and

sixteen (16) out of twenty-nine (29) chemistry teachers were used for the investigation.

Recommendations

Based on the findings, the following recommendations were made:

1. The chemistry teachers should always endeavour to find out the community resources which can be used to teach chemistry that are available in the communities where their schools are located.
2. The chemistry teachers should make use of the community resources available in the school communities to teach chemistry.
3. Relevant authorities should employ and assign qualified, dedicated and resourceful chemistry teachers to teach chemistry.
4. Teachers should have prior preparation of the community resources before using them in the class.
5. School authorities should endeavour to keep the teachers' teaching/work loads per week to be within acceptable limit.
6. Sufficient time, like double periods should be given to chemistry in the school time table.
7. Government should always organize in-service training/workshops for teachers to acquaint them with the available community resources.
8. Government should endeavour to pay science allowances to teachers to motivate them to use community resources during chemistry instructions.
9. School authorities should give incentives to chemistry teachers to enable them work more.

10. Laboratory attendants should be employed to assist chemistry teachers in getting some of the community resources ready for use during chemistry instructions.
11. The government should recruit more qualified chemistry teachers in order to make the work easier and accommodative for the serving teachers.

Suggestions for Further Studies

Based on the findings of this study, the researcher made the following suggestions for further studies:

Further researchers should work on:

1. Effect of community resources on students' interest, motivation and achievement in chemistry.
2. Evaluation of the availability and utilization of community resources for teaching chemistry should be carried out in another education zone.
3. The use of community resources in teaching certain concepts in chemistry.
4. Factors militating against sourcing and utilization of community resources for teaching chemistry.

Summary

This research work was carried out to investigate the availability and teachers' utilization of community resources for teaching senior secondary school chemistry in Nsukka Education Zone. Six research questions and three hypotheses were formulated by the researcher to guide the study. The design of the study was survey. The population comprises of one thousand two hundred and fifty eight (1258) Senior Secondary three (SSIII) chemistry students and sixty nine chemistry teachers in post primary schools management board (PPSMB) Nsukka Education Zone. The sample of the study is one hundred and sixty (160) SSIII chemistry students and 16 chemistry

teachers drawn from the schools in the zone. The questionnaire instruments were used to collect information from both students and teachers on availability and utilization of community resources. The questionnaire was also used to collect information from the chemistry teachers only, on problems associated with the utilization of the resources. The instruments were subjected to reliability tests. Reliability index of 0.959 and 0.96 were gotten from students and teachers responses respectively using Kuder-Rechardson on availability of community resources. Reliability index of 0.967 for students and 0.730 for teachers were gotten, using Cronbach's Alpha, on utilization of community resources. Reliability index of 0.820 was obtained using Cronbach's Alpha reliability coefficient, on teachers' responses to problems associated with the utilization of community resources. The method of data analysis are frequencies, percentages, mean and standard deviation.

Results obtained showed that above 50% of the itemized resources are available. Results also showed that available resources are not frequently utilized by the teachers. Results, showed that a lot of problems contribute to non-utilization of the community resources. Some of them are teachers' lack of knowledge of available community resources, teachers have high teaching loads per week, lack of interest on part of teachers, lack of sufficient time to use available resources, lack of in-service training, lack of incentives from school authority and government among others. It was found that some community resources can be used for teaching certain concepts in chemistry. They include, lime, lemon orange, grape-concept of acid, ashes from wood, palm remains, plantain peels and paw-paw leaves- concept of base, snail shell-concept of salts, hibiscus flower- concept of acid-base indicator and native dye 'uri'-concept of chromatography.

Results showed that students and teachers in urban and rural areas agreed that items of the instrument are available except sea water, salt water and coal. Results also showed that both urban and rural respondents (teachers and students) always utilize most of the available resource, like pap, okpa, sand, cubes of sugar, salt, kerosene etc. They however seldomly use soap industry, bread industry, palm oil industry native dye 'uri', lime, orange, snail shells and hibiscus flower. Urban respondent agreed to always utilize professional chemistry teachers and resource persons, whereas the rural respondents seldomly utilize them. There are therefore more professional teachers and resource persons in urban schools than the rural schools.

Results also showed that both urban and rural teachers agreed that problems associated with the utilization of community resources are: teachers' lack of knowledge of available resources, too much teaching loads per week, teachers have other administrative work, lack of interest on the part of teachers, lack of interest on the part of students, lack of prior preparation before using the community resources. Other problems are lack of sufficient time to use available community resources, lack of incentives from school authorities, lack of incentives from the government and lack of laboratory attendants.

Generally from the findings, it means that majority of the itemized community resources are available but they are seldomly utilized by chemistry teachers because of certain reasons enumerated above. These identified problems need to be adequately addressed in order to motivate the chemistry teachers towards using community resources during instruction and this will help to improve students' academic achievement in chemistry.

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QUESTIONNAIRE

GENERAL INFORMATION

Kindly tick (√) to indicate your status

1. Name of school ……..
2. Local Government Area----------
3. Location: Rural ☐ Urban ☐
4. Respondent: Student ☐ Teacher ☐
5. Educational qualifications: M.Sc/M.Ed ☐ B.Sc/B.Ed ☐ H.N.D ☐ PGDE ☐
   NCE ☐ OND ☐ T.C. 11 ☐
   Others, specify……

GUIDE:

For availability: Available = A
Not Available = NA

For utilization: Always used =AU; Occasionally Used = OU
Seldomly Used = SU; Never Used = NU.

For problems: Strongly Agree = SA; Agree =A;
Disagree = D; Strongly Disagree= SD

CLUSTER A:

Indicate the community resources for teaching chemistry, available in your school community and their level of utilization.

Cluster A **Cluster B**

			Level of Availability		**Level of Utilization**			
S/N	**Topics**	**Resources**	**A**	**NA**	**AU**	**OU**	**SU**	**NU**
1.	Chemical industries	Soap industry						
		Vegetable oil (P.K.O.)industry						
		Cassava industry						
		Local gin industry						
		Pap industry						
		Detergent industry						
		Bread industry						
		Palm oil industry						
		'Ogiri' industry						
		'Okpa' industry						
2	Chemical combination	Camphor balls (sublimate)						
		Coloured beads for models						
3	Standard separation techniques for mixtures	Sand						
		Common salt						
		Cubes of sugar						
		Leaf (as funnel)						
		A piece of cloth (filter paper)						
		Native dye ("uri")						
		"Odo"						
		Camwood ("ufie")						
		Clay tray pot (evaporating dish)						
		Palm oil (red oil)						
		A piece of magnet						
		Iron fillings						
4	Acids, Bases and salts	Ripe and unripe fruits; Lime						
		Grape						
		Orange						
		Lemon						
		Papaw leaves						
		Soured milk						
		Bright coloured flowers; Hibiscus						
		Allamanda						
		Ethnanol (palmwine)						
		Local gin ("kaikai")						
		Mortar/pestle						
		Snail shells						
		plantain peels						

		Salt water						
		Ash from palm remains						
5	Water	Water samples; Well						
		River						
		Tap						
		Stream						
		Bore hole						
		Sea water						
		Soap						
6	Carbon and its compounds	Carbon containing samples; Stick (wood)						
		Paper						
		Coal						
		Soot						
		Crude oil fractions like; Petrol						
		Diesel oil						
		Grease						
		Kerosine						
		Decaying fruits						
		Decaying Food,						
		Decaying Vegetables.						
7	Petroleum By-products	Plastics						
		Insecticides						
		vaseline						
8	Human resources	Professional Chemistry Teachers						
		Laboratory Attendants						
		Factory Workers						
		Resource Persons						

Cluster C: To be Answered by Teachers

Factors that constitute problems to effective utilization of community resources in the teaching of chemistry in your school.

S/N	Item statement	SA	A	D	SD
1	Teachers' lack of knowledge of available community resources.				
2	Teachers have too much teaching loads per week.				
3	Teachers have other administrative work.				
4	Lack of interest on the part of teachers.				
5	Lack of interest on the part of students.				
6	Over population of students.				
7	Unavailability of the community based material resources.				
8	Lack of co-operation from school principal.				
9	Lack of co-operation from the community.				
10	Lack of co-operation from parents.				
11	Lack of fund.				
12	Lack of chemical industries.				
13	Lack of prior preparation before using the community resources.				
14	Lack of sufficient time to use available community resources.				
15	Lack of professionalism on the part of the teachers.				
16	Lack of in service training/workshop for teachers.				
17	Lack of incentives from school authorities.				
18	Lack of incentives from the government.				
19	Lack of Professional Chemistry teachers				
20	Lack of laboratory attendant				
21	Lack of factory workers				
22	Lack of resource persons				

APPENDIX A

POPULATION OF THE STUDY

LIST OF SCHOOLS IN NSUKKA EDUCATION ZONE

S/N	NAME OF SCHOOLS IN NSUKKA LOCAL GOVERNMENT AREA	NUMBER OF SSIIICHEMISTRY STUDENTS	NUMBER OF CHEMISTRY TEACHERS
1	St, Theresa's College Nsukka	90	4
2	Nsukka High School Nsukka	46	5
3	Queen of the Rosary Secondary School	72	2
4	Urban Girls' Secondary School Nsukka	33	2
5	Community Secondary School Isienu Nsukka	62	2
6	Urban Boys' Secondary School Nsukka	46	2
7	Opi High School Opi	24	1
8	Community Secondary School Lejja	20	1
9	Community Secondary School Edem	28	1
10	Community High School Umabor	18	1
11	Community Secondary School Ehandiagu	0	Nil
12	Community Secondary School Okpuje	16	1
13	Community Secondary School Ibagwa-Ani	24	2
14	Community Secondary Obimo	15	2
15	Community Secondary School Obukpa	40	1
16	Community Secondary School Ede-Oballa	48	2
17	Community Secondary School Ezebunagu	0	Nil
18	St. Cyprain's Girls' Secondary School Nsukka	40	2
19	Community Secondary School Nru Nsukka	29	2
20	Model Secondary School Nsukka	38	2
21	Girls' Secondary School Opi	5	1
22	Community Secondary School Alor-uno	17	2
23	Community Secondary School Opi-agu	0	Nil
24	Lejja High School Lejja	19	1
25	Agu-Umabor Secondary School Umabor	14	1
26	Community secondary school Akpatoro Obimo	20	1

27	Community secondary school Okwutu	7	1
28	Edem-Ani High School Edem-Ani	10	1
29	Community Secondary School Breme	0	Nil
S/N	**NAMES OF SCHOOLS IN IGBO-ETITI LOCAL GOVERNMENT AREA**	**NUMBER OF SS1II CHEMSTRY STUDENTS**	**NUMBER OF CHEMISTRY TEACHERS**
1	Premier Secondary School Ukehe	98	1
2	St. James Aku	10	1
3	Community High School Ukehe	32	1
4	Girls' Secondary School Aku	29	1
5	Community Secondary School Ohodo	19	1
6	Community Secondary School Ozalla	12	1
7	Community High School Ekwegbe	18	1
8	Community Secondary School Ukopi	9	1
9	Orinandu Community School Ukehe	26	1
10	Community Secondary School Umunko	22	1
11	Community Secondary School Ohebe-Dim	28	2
12	Community Secondary School Aku	32	1
13	Community Secondary School Umuna	20	2
14	Igbo-Etiti Secondary School Ikolo	11	1
15	Akutara Secondary School Ohodo	18	1
16	Comprehensive Secondary School Diogbe	0	Nil

Source: Post Primary Schools Management Board (PPSMB) Nsukka Zone,

S/N	NAMES OF SCHOOLS IN UZU-UWANI LOCAL GOVERNMENT AREA	NO OF SS III CHEMISTRY STUDENTS	NUMBER OF CHEMISTRY TEACHERS
1	Adada Secondary School Nkpologwu	10	1
2	Uzo-Uwani Secondary School Adani	0	Nil
3	Atta Memorial High School Adaba	0	Nil
4	Girls' Secondary School Umulokpa	15	1
5	Community Secondary School Abbi-Ugbene	12	1
6	Community Secondary School Ukpata	0	Nil
7	Community Secondary School Nimbo	12	1
8	Community Secondary School Ogurugu	8	1
9	Uvuru Secondary School Uvuru	12	1
10	Community High School Nrobo	10	1
11	Welfare Secondary School Opanda	4	1
12	Community Secondary School Ugbene-Ajima	10	1

2014/2015 Session.

SUMMARY OF POPULATION

S/N	Local Government Area	Number of Schools	SSIII Chemistry Students	Number of Chemistry Teachers
1	Nsukka L.G.A	29	781	43
2	Igbo-etiti	16	384	17
3	Uzo Uwani	12	93	9
	Total	**57**	**1258**	**69**

APPENDIX B

SAMPLE OF THE STUDY

LIST OF SAMPLED SCHOOLS

S/No	Schools From Nsukka (Urban Area)	No of SSIII Chemistry Students	No of Chemistry teachers
1.	St. Theresa's College Nsukka	90	4
2.	Nsukka High School Nsukka	46	5
3.	Queen of the Rosary Sec. Sch. Nsukka	72	2
4.	Urban Girls' Sec. Sch. Nsukka	33	2
5.	St. Cyprian's Girl's Sec. Sch. Nsukka	40	2
6.	Model Sec. Sch. Nsukka	38	2
7.	Urban Boy's Sec. Sch. Nsukka	46	2
8.	Community Sec. Sch. Nru, Nsukka	29	2
	Total	**394**	**21**

S/No	Schools From Igbo-etiti and Uzo-uwani (Rural Areas)	No of SSIII Chemistry Students	No of Chemistry teachers
1.	Premier Sec. Sch. Ukehe	98	1
2.	St. James Aku	10	1
3.	Community High School Ekwegbe	18	1
4.	Community Sec. Sch. Umunko	22	1
5.	Community Sec. Sch. Ohodo	19	1
6.	Adada Sec. Sch. Nkpologwu	10	1
7.	Girls' Sec. Sch. Umulokpa	15	1
8.	Uvuru Sec. Sch. Uvuru	12	1
	Total	**204**	**8**

Total population of the sample		**Students**	**Teachers**
Urban Schools		394	21
Rural schools		204	8
	Total	**598**	**29**

APPENDIX C

RESPONSES/GUIDE FROM CHEMISTRY TEACHERS ON PROCESS OF USING SOME COMMUNITY RESOURCES FOR TEACHING CHEMISTRY

Questions for Chemistry Teachers

This questions are meant to elicit information from the chemistry teachers on the process of use of some community resources for teaching certain concepts in chemistry. You are expected to supply the answers to the following questions.

A. What are the processes employed when using fruits like orange, lime, lemon and grape to teach the concept of acids.

B. What are the processes employed when using ashes from wood, plantain peels, palm remains, paw-paw leaves to teach concept of bases

C. What are the processes employed in using snail shell to teach concept of salts

D. What are the processes involved in using hibiscus flower to teach the concept of indicators

E. What are the processes involved in using native dye ‘uri’ to teach the concept of chromatography.

Kindly respond objectively, for your responses are purely for research purposes and will impact positively to teaching and learning of chemistry.

Responses from Chemistry Teachers

A. What are the processes employed when using fruits like orange, lime, lemon and grape in teaching the concept of acids.

Response: Step 1- Get a mature (unripe or ripe) orange, lime, lemon and grape and label as A, B, C, D respectively.

Step 2- Cut the above named fruits into two (halves) parts

Step 3 – Get four (4) clean dry beakers and label as A, B, C, and D.

Step 4- Squeeze the juice of respective fruit into the beakers

Step 5- Test the content of each beaker with blue and red litmus paper

Step 6- Observation- It will be observed that juice in beakers A,B,C, and D turn blue litmus paper red.

Step 7- Inference- The result shows that orange, lime, lemon and grape are acidic (both ripe or unripe)

B. What are the processes employed when using ashes from wood, plantain peels, palm remains and paw-paw leaves in teaching the concept of bases?

Response:

Step 1- Get dry wood, plantain peels, palm remains and paw-paw leaves.

Step 2- Burn them separately to obtain their respective ashes.

Step 3- Put the respective ashes into four (4) clean dry beakers labeled A, B, C and D respectively.

Step 4 – Add water to the contents of beakers A, B, C, D and stir very well

Step 5- Test the contents of the beakers with blue and red litmus paper.

Step 6- observation- It will be observed that the solution in the beakers turned red litmus paper blue.

Step 7- Inference: The result shows that ashes from wood, plantain peels, palm remains and paw-paw leaves are basic.

C. What are the processes employed in using snail shell to teach concept of salts?

Response

Step 1- Get snail shells that are dry

Step 2- Crush the shell

Step 3 – Put it in a beaker

Step 4 – Add a little dilute acid like dilute hydrochloric acid (HCl) or dilute trixonitrate (v)acid (HNO_3).

Step 5- Observation: Effervescence occurs.

Step 6- Effervescence on addition of dilute acid on snail shell shows the presence of calcium salt in snail shell. It also shows the presence of trioxocarbonate (IV) which gives out carbon (IV) oxide (gas) on addition of a dilute acid.

D. What are the processes involved in using hibiscus flower to teach the concept of indicators?

Response:

Step 1- Get the flower of the plant hibiscus flower

Step 2- Crush the flower

Step 3- Add a little water to it and stir.

Step 4 – Squeeze out the juice using a piece of cloth

Step 5- Get two beakers labelled A and B, containing acid and base solutions respectively.

Step 6- Add two drops of the hibiscus flower juice to each of the beakers and shake thoroughly.

Step 7- Observation: It will be observed that the content in beaker A, i.e. acid, changed from colourless to pink and the content of beaker B i.e. base changed from colourless to yellow.

E. What are the processes involved in using native dye 'uri' to teach the concept of chromatography?

Response:

Step 1- Get the source of native dye 'uri' fruit.

Step 2- Crush the 'Uri' to obtain the juice.

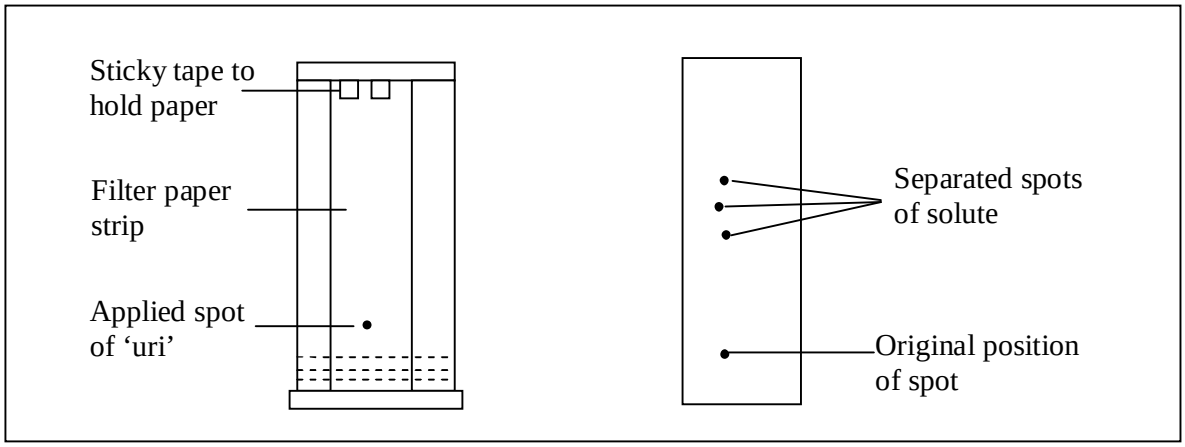
Step 3- Put a drop of the juice at one end of a filter paper strip.

- Suspended the strip of filter paper in a closed air tight jar with the spotted end (but not the spot) dipping into an appropriate solvent and allowed for some time , before removal. The solvent is ethanol.

Step 4- Observation: The different solutes in the mixture (uri juice) move along the paper strip together with the solvent at different speeds and hence separated.

Step 5- Spots are formed at different points along the strip of paper showing the rate of movement of the mixtures of solutes in ‘uri’ juice over the adsorbent medium.

Ascending paper chromatography



Reliability Analysis

Cluster A: Reliability on Availability for Teachers Using-Kuder-Richardson (K,R, 20)

S/N	NO. PASS	NO. FAIL	p	q	pq	STD
1	25	39	0.391	0.609	0.238	0.49029
2	45	19	0.703	0.297	0.209	0.452203
3	35	29	0.547	0.453	0.248	0.422902
4	38	26	0.594	0.406	0.241	0.474342
5	50	14	0.781	0.219	0.171	0.452203
6	38	26	0.594	0.406	0.241	0.220721
7	38	26	0.594	0.406	0.241	0.220721
8	25	39	0.391	0.609	0.238	0.464095
9	19	45	0.297	0.703	0.209	0.505736
10	37	27	0.578	0.422	0.244	0.266747
11	44	20	0.688	0.312	0.215	0.438529
12	22	42	0.344	0.656	0.226	0.503831
13	45	19	0.703	0.297	0.209	0.505736
14	38	26	0.594	0.406	0.241	0.220721
15	34	30	0.531	0.469	0.249	0.36162
16	39	25	0.606	0.391	0.238	0.158114
17	33	31	0.516	0.484	0.249	0.384808
18	29	35	0.453	0.547	0.248	0.452203
19	27	37	0.422	0.578	0.244	0.474342
20	39	25	0.609	0.391	0.238	0.49029
		$\sum$	**10.939**	**9.061**	**4.637**	**7.960155**

NB: p = probability of success; q = probability of failure; N = no. of items; r = reliability coefficient

Variance = $SD^2 = 7.96^2 = 63.3616$

$$r = \frac{N}{N-1}(-\frac{\Sigma pq}{\text{var}\,iance}) = r = \frac{64}{63}(1-\frac{4.637}{63.3616}) = 1.016(1-0.0732) = 1.016(0.927) = 0.94$$

Cluster A: Reliability on Availability for Students Using-Kuder-Richardson (K,R,20)

Respond/items	**No. of passes**	**No. of failure**	**p**	**q**	**pq**	**SD**
1	20	44	0.313	0.687	0.215	0.493
2	44	20	0.688	0.312	0.215	0.449
3	46	18	0.719	0.281	0.202	0.434
4	39	25	0.609	0.391	0.238	0.478
5	43	21	6.672	0.328	0.220	0.456
6	60	4	0.938	0.062	0.058	0.229
7	61	3	0.953	0.047	0.045	0.199
8	42	22	0.656	0.344	0.226	0.462
9	27	37	0.422	0.578	0.244	0.503
10	58	6	0.906	0.094	0.085	0.277
11	44	20	0.688	0.312	0.215	0.449
12	22	42	0.344	0.656	0.226	0.498
13	27	37	0.422	0.578	0.244	0.503
14	62	2	0.969	0.031	0.030	0.164
15	53	11	0.828	0.172	0.142	0.360
16	62	2	0.969	0.031	0.030	0.164
17	51	13	0.797	0.203	0.162	0.385
18	43	21	0.672	0.328	0.220	0.456
19	38	26	0.594	0.406	0.241	0.482
20	21	43	0.328	0.672	0.220	0.495
					∑pq = 3.476	**7.938**

Variance = $SD^2 = 7.938^2 = 63.012$

Kudder-Richardson, r-20 formula is

$$r = \frac{N}{N}(1\frac{\Sigma pq}{\text{var}\,ian}) = \frac{64}{63}(1\frac{3.476}{63.012}) = 1.016\ (1-0.0552) = 1.014\ (0.945) = 0.959$$

Cluster B: Reliability on Utilization for Teachers Using Cronbach Alpha

Case Processing Summary

	N	%
Valid	20	100.0
Cases Excluded[a]	0	0
Total	20	100.0

a. Listwise deletion based on all variable in the procedure.

Reliability Statistics

Cronbach's Alpha	N of items
730	64

Cluster B: Reliability on Utilization for Students Using Cronbach Alpha

Case Processing Summary

	N	%
Valid	20	100.0
Cases Excluded[a]	0	0
Total	20	100.0

a. Listwise deletion based on all variable in the procedure.

Reliability Statistics

Cronbach's Alpha	N of items
850	64

Cluster C: Reliability on Factors that Constitute Problems for Teachers Only Using Cronbach Alpha

Case Processing Summary

	N	%
Valid	20	100.0
Cases Excluded[a]	0	0
Total	20	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

	N
Cronbach's Alpha	N of items
830	22