AVAILABILITY AND UTILIZATION OF RESOURCES FOR TEACHING CHEMISTRY IN SENIOR SECONDARY SCHOOLS IN AGUATA EDUCATION ZONE OF ANAMBRA STATE, NIGERIA

Chibueze, Miracle Onuigwe & Prof. D.N. Ezeh
Department of Science Education, University of Nigeria, Nsukka, Enugu State, Nigeria
E-mail Address: - miracleonuigwe9@gmail.com

Abstracts
This study investigated the availability and utilization of resources for teaching chemistry in Aguata Education Zone, Anambra State. Two research questions guided the study. The study adopted a descriptive survey research design. The population of the study comprised 33 chemistry teachers, 728 senior secondary II chemistry students from 48 public secondary schools in the zone, and all the chemistry laboratory equipment. A sample size of 283 was used. Questionnaire instrument on availability and utilization of material resources was used for data collection. The internal consistency reliability index for AMRQ and UMRQ was determined to be 0.94 and 0.97respectively using Cronbach alpha. The data collected was analyzed using mean and standard deviation. The finding shows that source of water supply is not available in schools, and there is a high extent of utilization of material resources for teaching and learning of chemistry in senior secondary schools in Aguata Education Zone of Anambra State. Based on the findings, the study recommends among others that source of water supply should be provided for schools, also, chemistry teachers should make each of the lessons an interesting one to attract and retain the attention of the students throughout the period of lesson.

Keywords: Availability, chemistry, resources, senior secondary, teaching, utilization.

Introduction

The effective teaching of chemistry in senior secondary schools is crucial for fostering scientific literacy and promoting interest in science-related careers. However, the availability and utilization of educational resources play a significant role in determining the quality of education delivered. This study examines the current state of resources for teaching chemistry in the senior secondary schools within the Aguata Education Zone of Anambra State, Nigeria, highlighting the challenges and opportunities for enhancing science education in the region. Teaching resources are the equipment and materials which the teacher can use to help students to achieve lesson objectives. They are those elements needed for teaching chemistry in senior secondary schools. Agugu (2017) defined teaching resources 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. BusIjeta (2013) also view teaching resources as the instrument of presentation and transmission of the prescribed educational materials. Based on the above definitions, teaching resources require availability and proper utilization. Without putting the available teaching resources into use, it cannot yield good performance in the life of students.

Availability of resources is the quantity of resources at hand for teaching chemistry. Teaching and learning is enhanced only if resources are available, hence, availability of resources aids its utilization. Utilization means putting into service for a particular purpose. Utilization is the act of using methods and resources for learning (Echendu, 2006). Utilization of teaching resources is the ability to put those resources into use for effective teaching and learning of chemistry. Ugwuanyi (2013) sees utilization as making use of the available services

at the individuals' disposal. According to Olagboye (2004), Utilization of chemistry resources simply means using the resources for chemistry teaching to achieve the purpose of teaching. One thing is to make resources available, while another thing is to put those available resources into use. When resources are not adequately put into use, the purpose will become futile. Agugu, (2017) observed that there is wastage of human and material resources for teaching and learning. This claimed to be as a result of inefficiency, misuse, underutilization, non-utilization, lack of maintenance, and lack of appreciation of these resources. The author maintained that chemistry teachers combine all material resources together through his skills to utilize them for teaching in such a way that will be interesting to students. If the teacher fails in the area of utilization of resources, the students will be frustrated. Therefore, teachers and students should make adequate and proper utilization of resources during the on-going of the lesson in order to make the teaching more real and students remember the facts more easily.

Utilization of resources during teaching is of utmost importance in the development and performance of students in chemistry. Several research and reports have revealed the need for proper utilization of resources during teaching. Despite the facts that the Federal Republic of Nigeria stressed so much on science learning, reports still have that poor performance of students in chemistry has been so high in many Nigerian public schools in the recent years. Also, reports from West African Examination Council (WAEC) Chief Examiner indicated that students performed poorly in Chemistry from 2016-2019. The mean scores of 2016, 2017, 2018 and 2019 out of 50 are 25.0, 26.0, 24.0 and 27.0 respectively. The WAEC Chief Examiner's report indicated some weaknesses of students which centered on the practical aspect of chemistry teaching and learning. The chief examiners, therefore, emphasized that inadequate laboratory practices, and teachers' lack of exposure of students to a lot of practical exercises has been some of the factors contributing to students' poor performance in chemistry. Yet many chemistry teachers tend to avoid proper utilization of resources during teaching.

Teachers and students should utilize the material resources well for effective teaching and learning of chemistry in Nigerian secondary schools. In every aspect, educators have proved that all teaching can be greatly improved by the use of adequate resources because, they help in making learning experiences memorable if adequately utilized. Wanjiku (2013) noted that the teaching of chemistry cannot be effective without adequate utilization of resources. This is because, resources are facility of knowledge. Wanjiku further maintained that if the level of laboratory increases maximally, used and managed properly, student's performance and interest towards chemistry would be at high level. But studies such as Achimugu (2016) and Nnorom (2012) reported that most material resources for teaching science including chemistry were neither available nor utilized for teaching and learning. Achimugu (2017) also stated that most of the laboratory equipment and materials were available but a good number of them were not utilized for chemistry teaching. Achimugu (2017) further maintained that some of the reasons such as lack of in-service training, lack of motivation of teachers among others affect the effective utilization of material resources. Without the effective utilization of material resources, effective teaching cannot take place Megbo and Saka (2015). The researcher, therefore, emphasize that teachers being the most important resources in schools should maximize their utilization of material resources for effective teaching. Owing to this, the availability and utilization of resources for teaching chemistry in secondary schools of Aguata Education Zone, Anambra State became the need for this study.

Statement of the Problem

Reports still have that poor performance of students in chemistry has been so high in many Nigerian public schools in the recent years. Also, some weaknesses of students' centers on the

practical aspect of chemistry teaching and learning as indicated by WAEC chief examiners' report. Yet many chemistry teachers tend to avoid proper utilization of resources during practical, hence the need for this study.

Purpose of the study

The general purpose of this study was to determine the availability and utilization of resources for teaching chemistry in senior secondary schools in Aguata Education Zone of Anambra State. Specifically, the study seeks to ascertain the:

1. Level of availability of material resources for teaching chemistry in secondary schools in Aguata Education Zone of Anambra State
2. Extent of utilization of material resources for teaching and learning of chemistry in secondary schools in Aguata Zone of Anambra State.

Research Questions

The following research questions guided the study

1. What is the level of availability of material resources for teaching chemistry in secondary schools in Aguata Education Zone of Anambra State?
2. To what extent are the material resources utilized in teaching and learning of chemistry in secondary schools in Aguata Zone of Anambra State?

Methodology

Research Design

The design for this study was descriptive survey design. The purpose why the researcher used this procedure was to collect data using chemistry teacher and students' questionnaire from various public schools sampled in Aguata Education zone of Anambra State, to know how resources are available and how the available resources are utilized in teaching and learning of chemistry.

Population

In this study, the population comprised 33 chemistry teachers, all the senior secondary II chemistry students from 48 public secondary schools in the zone, and chemistry laboratories equipment. The chemistry laboratories equipment was uncountable and so the total number was not mentioned by the researcher. The SSII students was used for the study because, they are not being pressurized by any external examination such as senior school certificate examination and are more stable than the SSI students.

Sample

The sample consists of18 chemistry teachers,265 SS II Chemistry students, and chemistry laboratories equipment. A total of 15 schools, 5 schools each from the local governments was drawn using multi-stage sampling procedure. This represented 36.4% percent of the population. This was as recommended by Gay (1981), that a sample of 20% is the minimum, if the population is small.

Instrumentation

The instrument used for data collection was questionnaire. The questionnaire instruments were in two forms; one for chemistry teachers and the other for chemistry students. The Availability of Material Resources Questionnaire (AMRQ) instrument was administered to chemistry teachers only, while, the Utilization of Material Resources Questionnaire (UMRQ) was administered to SSII chemistry students only. The aim of the instrument was to find out the availability of material resources and how the students used the laboratory facilities

during lesson. The instruments had two sections, A and B. Section A inquired about general information of teachers and students. While section B consisted of 37 items which sought information on the availability and utilization of material resources for teaching chemistry. The instrument was validated by three experts, one from chemistry education unit, two from measurement and evaluation unit. The instrument were trial tested using 10 chemistry teachers and 20 SSII chemistry students. The reliability of the instrument was estimated using Cronbach alpha to test for the internal consistency of the instrument for multiple choice item. The reliability of AMRQ and UMRQ was determined to be 0.94 and 0.97 respectively.

Analysis of Data

Mean and standard deviation was used to answer the research question one and two on availability and utilization of resources for teaching chemistry. On availability of material resources, decision was taken as follows; Highly Available (HA) = 3.00 – 2.50, Available in a low extent (A) = 2.49-1.50, Not Available (NA) = 1.49-0.Any item with a mean value of 3.00 – 2.50 was regarded as available to a high extent, any item with a mean value of 2.49 – 1.50 was regarded as available, any item with a mean score of 1.49 – 0 was regarded as not available. On utilization of material resources, decision was taken as follows; Very High Extent (VHE) = 4.00 - 3.50, High Extent (HE) = 3.49 - 2.50, Low Extent (LE) = 2.49 - 1.50, Very Low Extent (VLE) = 1.49 and below. Any item with a mean value of 4.00 - 3.50 was regarded as utilized to a very high extent, any item with 3.49 - 2.50 was regarded as utilized to a high extent, any item with a mean score of 2.49 - 1.50 was regarded as utilized to a low extent while any item with a mean score of 1.49 and below was regarded as utilized to a very low extent.

Results

The result of the analysis of the data for this study was presented in table of this chapter based on the research questions that guided this study.

Research Question One

What is the level of availability of material resources for teaching chemistry in secondary schools in Aguata Education Zone of Anambra State?

Table 1: Mean and standard deviation of response on the availability of material resources for teaching chemistry

S/No	Item Statement	n	Mean	Std. Dev.	Decision
1	Source of water	18	1.44	.70	**NA**
2	Power supply	18	1.78	.73	**A**
3	Chemistry laboratory	18	2.78	.55	**HA**
4	Teacher preparatory office	18	2.56	.86	**HA**
5	Retort stand	18	2.72	.67	**HA**
6	Reagents	18	2.83	.51	**HA**
7	Reagents bottles	18	2.89	.32	**HA**
8	Pipette	18	2.83	.51	**HA**
9	Burettes	18	2.78	.55	**HA**
10	Tables	18	2.83	.51	**HA**
11	Stool	18	2.78	.55	**HA**
12	Test-tube and test-tube holder	18	2.89	.32	**HA**
13	Test-tube rack	18	2.94	.23	**HA**
14	Measuring cylinder	18	2.72	.46	**HA**
15	Clamp	18	2.89	.32	**HA**

16	Funnels	18	2.33	.59	**A**
17	Beakers	18	3.00	.00	**HA**
18	Separation techniques	18	2.67	.59	**HA**
19	Thermometer	18	2.50	.71	**HA**
20	Crucibles	18	2.50	.79	**HA**
21	Heater	18	2.06	.80	**A**
22	Wash bottles	18	2.44	.92	**A**
23	Watch glass	18	2.56	.70	**HA**
24	Weighing balances	18	2.78	.55	**HA**
25	Volumetric flask	18	2.56	.78	**HA**
26	Measuring spoons	18	2.72	.57	**HA**
27	Measuring cups	18	2.50	.71	**HA**
28	Rulers	18	2.56	.86	**HA**
29	Melting point apparatus	18	1.72	.75	**A**
30	Evaporating dishes	18	2.11	.83	**A**
31	Graduated cylinders	18	2.39	.92	**A**
32	Bottles and jars with tight-fitting lids	18	2.28	.89	**A**
33	Mortar and pestles	18	2.22	.88	**A**
34	Computers	18	1.72	.89	**A**
35	Overhead projector	18	1.56	.78	**A**
36	Litmus paper (red and blue)	18	2.94	.24	**HA**
37	Periodical charts	18	2.78	.65	**HA**
Overall Mean			**2.50**	**0.63**	**HA**

Key: Highly Available (HA), Available (A), Not Available (NA)

The result in Table 1 on the availability of material resources for teaching chemistry shows that items 3, 4, 5, 6, 7, 8, 9, 10. 11. 12. 13, 14, 15, 17, 18, 19, 20, 23, 24, 25, 26, 27, 28, 36 and 37fall within the mean availability values of 3.00 – 2.50. This means that these resources are available in a high quantity for teaching chemistry, items2, 16, 21, 22, 29, 30, 31, 32, 33, 34 and 35fall within the mean availability values of 2.49 – 1.50.This means that these resources are available in low extent, while item 1 fall within the mean availability values of 1.49 – 0. This means that source of water was not available.

Research Question Two

To what extent are the utilization of material resources for teaching and learning of chemistry in secondary schools in Aguata Zone of Anambra State?

Table 2: Mean and standard deviation of response on the extent of utilization of material resources for teaching and learning of chemistry

S/No	Item statement	N	Mean	Std. Dev.	Decision
1	Source of water	265	2.84	1.24	**HE**
2	Power supply	265	1.75	.96	**LE**
3	Chemistry laboratory	265	3.06	1.07	**HE**
4	Teacher preparatory office	265	3.13	.99	**HE**
5	Retort stand	265	3.33	.96	**HE**
6	Reagents	265	3.18	1.10	**HE**
7	Reagents bottles	265	3.29	1.09	**HE**
8	Pipette	265	3.46	.94	**HE**
9	Burettes	265	3.52	.84	**VHE**

10	Tables	265	3.60	.82	**VHE**
11	Stool	265	3.49	.91	**HE**
12	Test-tube and test-tube holder	265	3.51	.82	**VHE**
13	Test-tube rack	265	3.36	.94	**HE**
14	Measuring cylinder	265	3.38	.95	**HE**
15	Clamp	265	3.31	.98	**HE**
16	Funnels	265	3.53	.87	**VHE**
17	Beakers	265	3.46	.87	**HE**
18	Separation techniques	265	3.29	.98	**HE**
19	Thermometer	265	3.21	1.03	**HE**
20	Crucibles	265	2.65	1.12	**HE**
21	Heater	265	2.62	1.23	**HE**
22	Wash bottles	265	3.18	1.09	**HE**
23	Watch glass	265	3.12	1.13	**HE**
24	Weighing balances	265	3.02	1.15	**HE**
25	Volumetric flask	265	3.01	1.11	**HE**
26	Measuring spoons	265	3.00	1.17	**HE**
27	Measuring cups	265	2.93	1.12	**HE**
28	Rulers	265	3.38	2.62	**HE**
29	Melting point apparatus	265	2.61	1.18	**HE**
30	Evaporating dishes	265	2.72	1.24	**HE**
31	Graduated cylinders	265	2.80	1.18	**HE**
32	Bottles and jars with tight-fitting lids	265	2.72	1.21	**HE**
33	Mortar and pestles	265	2.69	1.20	**HE**
34	Computers	265	2.03	1.11	**LE**
35	Overhead projector	265	2.18	1.18	**LE**
36	Litmus paper (red and blue)	265	3.29	1.08	**HE**
37	Periodical charts	265	3.18	1.10	**HE**
Overall Mean			**3.05**	**1.10**	**HE**

Key: Very high extent (VHE), High extent (HE), Low extent (LE)

Result in Table 2 shows the mean and standard deviation on the extent of utilization of material resources for teaching and learning of chemistry. The result shows that items 9,10,12 and 16 fall within the mean utilization values of 3.50-4.00. This means that these resources are utilized to a very high extent. Items 1, 3, 4, 5, 6, 7, 8, 11,13, 14, 15, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 36 and 37 all fall within the mean utilization values of 2.50-3.49. This means that these resources are utilized to a high extent, while items 2, 34 and 35 all have low extent of utilization as their mean values fall within the mean value of 1.50-2.49. The result also shows an overall mean value of 3.05 which implies a high extent of utilization. The overall standard deviation of 1.10 indicates a high difference in the responses of students on the extent of utilization of material resources for teaching and learning of chemistry.

Discussions

Availability of Material Resources for Teaching Chemistry

The result of the analysis in table one shows that a very essential resources in teaching chemistry like source of water are not available as it falls within the mean value of 1.49 and below. The finding of this study is in line with the statement of Achimugu (2016) and Nnorom (2012) who reported that most material resources for teaching science including chemistry were neither available nor utilized for teaching and learning. The unavailability of water can hinder laboratory activity during chemistry teaching.

Utilization of Material Resources for Teaching and Learning of Chemistry

The result of the finding in table 2 shows that there is a high extent of utilization of material resources as the mean value of 3.05 falls within 2.50 - 3.49 benchmarks. The findings show that material resources are used optimally during teaching and learning. This finding collaborates with the statement of Wanjiku (2013) who maintained that if the level of laboratory increases maximally, used and managed properly, student's performance and interest towards chemistry would be at high level. This shows that chemistry teachers are making effort to see that what is taught is also practiced by the students.

Conclusion

Based on the findings of this study, the researcher concluded that there is no availability of source of water for teaching chemistry, there is also, a high extent of utilization of material resources in teaching and learning of chemistry in senior secondary schools in Aguata zone of Anambra State. The poor performance could be attributed to lack of focus during practical in other to internalize what is learnt. Also, the poor performance could be as a result of teachers not making the use of resources interesting to students during teaching in order to yield good performance in the academic life of students.

Recommendations

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

1. Source of water should be made available for teaching chemistry; water is very essential and can hinder effective teaching of chemistry.
2. Chemistry teachers should make each of the lessons an interesting one in order to attract and retain the attention of the students throughout the period of lesson.
3. Government agencies and education bodies should organize seminars and workshops in order to sensitize the teachers on the need to improve in their utilization of resources for teaching chemistry.

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