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Utilization of Instructional Materials and Academic Performance of Senior Secondary School Students in Chemistry in Enugu State

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ABSTRACT

The study assesses the level of the availability and utilization of instructional materials for teaching chemistry in Oji-River Local Government Area of Enugu State. A survey research approach was used in this study. The target population was 114 pupils from three selected senior secondary schools in Oji-River Local Government Area of Enugu State. The study employed one sample t-test to test the hypotheses. This study found that instructional materials affect academic performance of chemistry students in senior secondary schools. Another finding was that teachers utilized the available instructional materials in teaching chemistry in senior secondary schools. Based on the findings, the researcher recommended among others that chemistry teacher training should be revised to provide a greater emphasis on knowledge and abilities linked to emerging technologies, such as the use of visual and audio-visual instructional resources in chemistry classrooms.

KEYWORDS: *Instructional materials, Chemistry students and academic performance*

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INTRODUCTION

Teaching resources are extremely crucial, particularly for rookie teachers. In every element of teaching, teachers rely on instructional resources. They require content to provide context for the subject they are teaching. When young teachers first enter the job, they usually do not have a lot of experience. Lesson plans are frequently based on instructional materials. Teachers will also require these tools in order to assess their pupils' knowledge. Teachers frequently evaluate pupils by assigning assignments, developing projects, and administering tests. All of these activities require instructional materials (Adalikwu and Iorkpilgh, 2012). According to Kochhar (2012), instructional materials are critical learning and teaching aids. He proposed that teachers should seek out additional instructional materials to augment textbooks in order to extend concepts and pique students' interest in the subject. During the teaching and learning process, Abdu-Raheem (2014) stated that teachers employ instructional resources to help explanations and make subject matter learning understandable to students. Instructional materials are important and necessary resources for teaching and learning that help teachers be more efficient and attract students' attention in the classroom (Abdu-Raheem, 2014).

Science is valued in modern schooling as a tool for societal advancement. Chemistry is an important part of science and one of the science disciplines taught in senior secondary schools. It plays a crucial role in training students for careers in medicine, industrial chemistry, food science, engineering, and other applied related fields (Taber, 2014). Chemistry is the study of matter's nature, composition, and properties, as well as the changes that it undergoes (Ojokuku, 2010). Chemistry is defined as a branch of science that examines the qualities of matter in terms of compositions, structures, transformations, interactions, and energy implications of chemical changes, according to the Science Teachers Association of Nigeria (STAN, 2016). Chemistry also refers to the structure, qualities, and applications of matter, as well as the changes that occur as a result of changes in the composition of their molecules. The objectives of chemistry education, according to the

Nigerian Federal Ministry of Education's Senior Secondary Education Curriculum, are to develop interest in the subject of chemistry, acquire basic theoretical/practical knowledge and skills in chemistry, apply skills to meet societal needs of creating employment and wealth, and be adequately prepared for further studies in chemistry. Chemistry is an activity-oriented science subject, and the suggested teaching style, guided discovering, is resource-based (NTI, 2007).

This implies that understanding of chemical principles cannot be fully realized without the use of instructional materials. Without instructional resources, teaching chemistry will almost surely result in low achievement in the course. A professionally prepared scientific teacher, no matter how well trained, will be unable to put his or her ideas into practice if the school setting lacks the equipment and supplies necessary for him or her to translate his or her expertise into reality. Instructional materials media, according to Basssey (2002), are a system component that can be employed as part of the instructional process to transmit useful messages and ideas or to facilitate communication in the teaching-learning process. Many abstract topics are typically included in chemistry curriculum since future chemical concepts or theories cannot be easily understood if these foundational notions are not well understood (Cell, 2011).

Objects or devices that assist the teacher in making learning meaningful to the students are known as instructional resources (Ikerionwu and musician, 2000). Because of the favorable impact instructional materials have on students' performance, their value in increasing successful teaching and learning of science, particularly chemistry, cannot be overstated. The teacher can use instructional resources to help him or her attain the stated aims and objectives. During teaching and learning, all kinds of instructional materials appeal to the sense organs Agina-Obu (2005). Educational inputs, such as instructional materials, are critical to the teaching of any subject in the school curriculum. In his own words, Abdu-Raheem (2014) stated that teachers employ instructional resources to help explanations and make subject matter learning understandable to students during the teaching and learning process. Instructional materials are essential and significant tools need for teaching and learning to promote teacher's efficiency and capture the student's attention in classroom situation. Kochhar (2012) agreed that instructional materials are crucial learning and teaching resources. He proposed that teachers should seek out additional materials for instruction to augment what is provided in textbooks in order to extend concepts and pique students' interest in the subject. Fadeiye (2005) defined instructional materials as concrete or intangible visual and audio-visual aids used by teachers to improve the quality of teaching and learning activities.

Despite all of Nigeria's attempts to assure effective chemistry teaching and learning at the secondary school level, the problem of pupils' low chemistry performance in internal and external examinations has remained unaddressed. This high failure rate has been attributed to many factors including non-availability and non-utilization of instructional materials in teaching and learning science subjects in secondary schools in Nigeria. Experience over the years has shown that teachers have been depending on excessive use of words to express, convey ideas or facts in the teaching-learning process. The 'chalk-talk' method is the name given to this method. Today's technological advancements have made it possible to create materials and devices that can be used to reduce the amount of time teachers spend talking while also making the message clearer, more interesting, and easier to understand for the students (Onasanya, Adegbija, Olumorin, and Daramola, 2008). Graphics include charts, posters, sketches, cartoons, graphs, and drawings, according to Soetan et al. (2010). Graphics convey information in a clear and concise manner to the materials being studied. They aid in the visualization of the entire set of concepts acquired as well as their interrelationships.

The implications of these contradictory studies point to the need for greater research in this area. Therefore, the study assesses the level of the availability and utilization of instructional materials for teaching chemistry in Oji-River Local Government Area of Enugu State. The specific objectives are to:

1. Ascertain the extent instructional materials affect academic performance of chemistry students in senior secondary school in Oji-Rive L.G.A.
2. Determine the extent to which teachers utilize the available instructional materials in teaching chemistry in senior secondary schools in Oji-Rive L.G.A.

Literature Review

Instructional Materials

In the teaching and learning process, Allen (2010) described instructional materials as devices that convey a complete body of information and are primarily self-supporting rather than supplementary (Allen, 2010). Educational resource materials that are either visual, audiovisual, or mechanical devices or

tools that render audible or visible in the teaching and learning environment with the goal of making teaching and learning more effective have been classified as instructional materials. In Nigerian education, chalkboards and notice boards were more or less educational resources. Realizations of the value of instructional materials in the classroom as a medium for broad improvement of students' cognitive, affective, and psychomotor domains led to the provision of locally generated materials as instructional materials in the classroom or the purchase of readymade commercial resources such as filmstrips, video disc players, flat pictures, and so on (Iwu and Ike, 2009).

However, according to Lawal, Rumah, and Amadi (2020), the majority of teachers do not care to employ instructional materials and instead rely on the old-fashioned way (Lawal, Rumah and Amadi, 2020). However, it has been noticed that, among other things, teachers' incapacity to improvise and their lack of manipulative abilities are variables that work against the use of instructional resources (Obey, 2019). Instructional materials, according to Agina (2005), are real or physical objects that deliver auditory, visual or both to the sense organs during education. Instructional materials, according to Offorma (1994), are items that enable teaching and learning activities and, as a result, the achievement of lesson objectives. She divided them into three categories: Visual aids that appeal to the sense of sight (examples: charts, maps, objects, pictures, etc.); audio aids that appeal to the sense of hearing (examples: radios, radio cassettes, record players, gramophones, etc.); and audio-visual aids that appeal to both the senses of sight and hearing (examples: radios, radio cassettes, record players, gramophones, etc.); and audio-visual aids (examples are; television, computers, projectors, video films). Instructional material, according to Ukoha (1996), is educational media that aids learners in understanding concrete concepts, principles, and ideas during teaching and learning process. He divided them into two categories: printed media (textbooks, photographs, pictures, pamphlets, journals, and so on); non-printed media made of low-cost media (posters, models, wall charts, diagrams, and so on); and electronic media (examples include posters, models, wall charts, diagrams, and so on) (examples are audio cassettes, video films, computers, film projectors, television sets, radio recorders, etc). Effective teaching cannot be fully done without the use of instructional resources, according to Megbo and Saka (2015), because they create closer and more effective communication between the teacher and the students. Adding to the significance of educational materials By offering direct experience with the reality of the physical and social environment, educational materials help to improve retention, stimulate students' interest, and make learning more lasting (Mwangi, 2006).

The teacher can use instructional resources to help him or her attain the stated aims and objectives. During teaching and learning, all kinds of instructional materials appeal to the sense organs. This allows the learner to have hands-on experience when he or she sees, hears, touches, feels, or manipulates concrete items and situations, conducts experiments, or interacts with them (Ehirim, Iwuchukwu, and Okenyi, 2020). Teachers should choose and employ a variety of teaching resources that allow students to read, hear, see, touch, and taste in order to achieve stated instructional objectives or actively participate in intellectual, emotional, and physical components. When the student is fully engaged in the process through the use of well-prepared and presented instructional materials, meaningful learning occurs. Because of the relevance of instructional resources, any endeavor to improve effective chemistry teaching and learning must include the availability and use of instructional materials. Various studies on the availability and use of instructional materials for teaching chemistry have produced conflicting results. For example, Ifeakor (2006) discovered that some material resources are available and adequate, but are only partially utilized in teaching and learning chemistry, whereas Nnorom (2012) and Achimugu (2016) found that most instructional materials for teaching science are neither available nor utilized in the teaching-learning process.

In Cross River State, Adalikwu and Iorkpilgh (2012) looked into the impact of instructional resources (teaching aids) on students' academic performance in senior secondary school Chemistry. Fifty SSI students were educated with instructional materials (Experimental group) and another forty were taught without them (Control group). To acquire a dependability coefficient of 0.67, Pearson product moment correlation was used. At 0.05 significant levels, an independent t-test was employed to evaluate the hypothesis, and the Pearson product moment correlation coefficient was used to examine the research issues. The study found that students who were taught with instructional materials fared much better than students who were not, and that using instructional materials improved students' grasp of ideas and led to high academic accomplishment. In Ankpa Local Government Area of Kogi State, Achimugu (2017) focused on the availability and use of instructional resources for teaching chemistry in

senior secondary schools. It used a descriptive survey method. Simple percentage, mean, and standard deviation were used to examine the data. The findings found that a significant amount of laboratory equipment and audio instructional resources were available but underutilized, and that audio visual materials for chemistry training were neither available nor used. The study found that the barriers inclue; lack of funds, a bad implementation policy, and a lack of enthusiasm, among other things, to the successful provision and use of instructional resources for chemistry instruction. Ehirim, Iwuchukwu, and Okenyi (2020) investigated the availability and use of instructional resources in the teaching and learning of chemistry in senior secondary schools in Imo state's Owerri Municipal Council Area. Five schools were chosen using a basic random selection procedure, and 20% of the students were employed to provide a sample size of 168 chemistry students; nevertheless, all 32 chemistry professors were used because it was a reasonable quantity. The study used a descriptive survey approach, and the data was analyzed using a mean rating system. Many educational materials are accessible, but they are not being used effectively, according to the research. In the teaching and learning of chemistry, chemistry teachers do not appropriately innovate instructional materials. Lawal, Rumah, and Amadi (2020) looked into the use of instructional materials in teaching chemistry in Katsina's senior secondary schools. The research sample was selected using a random sampling procedure, which resulted in a total of twenty-four (24) chemistry teachers and three hundred and seventy (370) pupils. Both descriptive and inferential statistics were used to analyze the data collected. According to the findings, there is no substantial difference in the availability of instructional materials for teaching chemistry in senior secondary schools in Katsina metropolis.

Methodology

A survey research approach was used in this study, and information from a target respondent was sought. The study's target population was 114 pupils from three selected secondary schools in Oji-River Local Government Area of Enugu State. The students were chosen as responders because they are in the best position to judge their teachers' ability in utilizing in structural materials in the classroom. The names of these schools are;

Urban Secondary School, Oji- River L.G.A., Enugu State Nigeria;

Model Comprehensive Boys Secondary School Inyi, Oji-River L. G.A., Enugu State Nigeria; Government Technical College, Akpugoeze in Oji-River, L.G.A, Enugu State Nigeria.

Data for the study were generated from the questionnaire consisted of general questions with responses ranging from strongly agree (SA), agree (A), Undecided (Un), strongly disagree (SD), and disagreed (D), giving respondents the option of ticking the most perceived alternative. However, the data collected were analyzed and test with one sample t-test via SPSS version 202.0.

Data Analysis

Out of one hundred and fourteen (114) questionnaires distributed, ninety two (92, was completed and returned, this represent 81%.

Table 1: Students responses on utilization of instructional materials and its effect on student academic performance

S/N	Statements	SA	A	Un	D	SD
1	During teaching and learning, instructional materials appeal to the sense organs.	25	35	5	20	7
2	When the student is fully engaged in the process through the use of well-prepared and presented instructional materials, meaningful learning occurs.	31	39	0	18	4
3	Instructional materials support the teacher in achieving the stated aims and objectives by allowing the student to experience as he or she sees, listens, touches, feels, or manipulates.	28	37	3	24	0
4	The importance of instructional materials in improving science achievement, particularly in chemistry, cannot be overstated due to the favorable impact they have on students' performance.	33	40	0	19	0
5	During teaching and learning, instructional materials appeal to the sense organs.	30	41	1	20	0
6	Chemistry teachers use real-life examples to explain some of the more difficult issues she encounters in class.	27	39	6	16	4
7	When teaching chemistry, the teacher uses graph charts to illustrate the concepts.	25	40	0	27	0

8	When teaching the periodic table, our chemistry teacher uses periodic charts of elements.	30	41	1	20	0
9	Chemistry teacher uses materials such as a battery, wire, salt solution, nail, beakers, and an ammeter to demonstrate electrolysis.	29	39	2	17	5
10	When teaching separation process, the chemistry teacher uses items like filter paper and funnel to demonstrate.	30	35	5	15	7

Source; Field survey, 2022

Test of Hypotheses

Hypothesis One

Ho_1: Instructional materials do not affect academic performance of chemistry students in senior secondary schools in Oji-Rive L.G.A.

One-Sample Test						
Questions	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
1	3.275	4	.031	18.40000	2.8024	33.9976
2	2.449	4	.071	18.40000	-2.4622	39.2622
3	2.545	4	.064	18.40000	-1.6712	38.4712
4	2.234	4	.089	18.40000	-4.4716	41.2716
5	2.292	4	.084	18.40000	-3.8912	40.6912

The above table show result on instructional materials affect academic performance of chemistry students in senior secondary schools. The t-test of the five questions are; 3.275; 2.449, 2.545, 2,234, and 2.292 respectively, while the t-value is 0.643, showing that t-value is less than t-test. Moreover, confidence interval does not contain 0 in the interval. We there for reject null hypothesis and uphold alternative hypothesis which stated that instructional materials affects academic performance of chemistry students in senior secondary schools in Oji-Rive L.G.A.

This means that when the student is fully engaged in the process through the use of well-prepared and presented instructional materials, meaningful learning occurs. Also that the importance of instructional materials in improving science achievement, particularly in chemistry, cannot be overstated due to the favorable impact they have on students' performance, and likes.

Hypothesis Two

Ho: Teachers do not utilized the available instructional materials in teaching chemistry in senior secondary schools in Oji-Rive L.G.A.

One-Sample Test						
	Test Value = 0					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
1	2.798	4	.049	18.40000	.1387	36.6613
2	2.317	4	.081	18.40000	-3.6478	40.4478
3	2.292	4	.084	18.40000	-3.8912	40.6912
4	2.619	4	.059	18.40000	-1.1064	37.9064
5	3.043	4	.038	18.40000	1.6123	35.1877

The above table show result on instructional materials affect academic performance of chemistry students in senior secondary schools. The t-test of the five questions are; 2.798; 22.317, 2.292, 2.619, and 3.043 respectively, while the t-value is 0.643, this mean that t-value is less than t-test.

Moreover, the confidence interval does not contain 0 in the interval. We there for reject null hypothesis and uphold alternative hypothesis which stated that teachers utilized the available instructional materials in teaching chemistry in senior secondary schools in Oji-Rive L.G.A. This indicates that when teaching chemistry, the teacher uses graph charts to illustrate the concepts; chemistry teacher uses materials such as a battery, wire, salt solution, nail, beakers, and an ammeter to demonstrate electrolysis; and when teaching separation process, the chemistry teacher uses items like filter paper and funnel to demonstrate.

Conclusion and Recommendations

Therefore, the study assesses the level of the availability and utilization of instructional materials for teaching chemistry in Oji-River Local Government Area of Enugu State. Using one sample t-test, the study revealed that when the student is fully engaged in the process through the use of well-prepared and presented instructional materials, meaningful learning occurs. Also that the importance of instructional materials in improving science achievement, particularly in chemistry, cannot be overstated due to the favorable impact they have on students' performance. In addition, during teaching chemistry, the teacher uses graph charts to illustrate the concepts; chemistry teacher uses materials such as a battery, wire, salt solution, nail, beakers, and an ammeter to demonstrate electrolysis; and when teaching separation process, the chemistry teacher uses items like filter paper and funnel to demonstrate.

This study therefore concludes that instructional materials affect academic performance of chemistry students in senior secondary schools. Also teachers utilized the available instructional materials in teaching chemistry in senior secondary schools.

Based on the findings, the researcher recommended that; chemistry teacher training should be revised to provide a greater emphasis on knowledge and abilities linked to emerging technologies, such as the use of visual and audio-visual instructional resources in chemistry classrooms.

Secondly, the government should ensure that appropriate funds are available to purchase audio-visual instructional materials as well as other necessary laboratory equipment that is not currently available in our senior secondary schools.

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