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Impact Of Inadequate Instructional Materials On The Effective Teaching And Learning Of Physics In Bwari Area Council Of Nigeria Federal Capital, Abuja Implication For Preparing Future Engineers.

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ABSTRACT
The study investigated the impact of inadequate instructional materials on the effective teaching and learning of Physics in senior secondary schools. . A single research question and one research hypothesis served as the study's compass. Both were developed and tested at the P < 0.05 significant level, providing the data needed to determine whether the hypothesis should be accepted or rejected. The study employed a descriptive research design. The instrument for the research is a structured questionnaire. Three hundred and sixty SSII Physics students from senior secondary schools in Bwari Area Council, Abuja, make up the study participant population.The stratified random sampling was used to accommodate every stratum of people that make up the population. The data was analyzed with the use of mean, standard deviation and T-test. The result of the study showed that the teaching and learning of Physics is greatly impacted by inadequate instructional materials. The researcher recommends that; the government and stake holders should make available adequate instructional materials for the teaching and learning of Physics and Physics teachers should get used to the culture of using instructional materials during lessons as this will help to develop future engineers.

Key words: Impact, Inadequate, Instructional Materials, Teaching, Learning, Physics.

I. Introduction

All through the ages, the only vital means for building the nation has been education. In a world of problems, uncertainties and ignorance, education is the key which opens the door of growth and success, the only source of influence to rule the world (Yahaya, 2019). It is also the sole source of power that can truly govern the globe. In order to prepare the workforce of the future generation, society's main service is education. Education must to therefore align with the needs of a world that is changing. There is rising support in the research literature for the idea of learner-centered, active learning (Freeman et al., 2014). This approach can be taught in formal, non-formal, or informal settings and is supported by empirical evidence.

There are different stages at which science is taught in education. Modern technology is said to have its roots in science. Because science is becoming more and more important in everyday life and the world is becoming a more scientific place, nations everywhere, but especially emerging nations like Nigeria, are working hard to advance their technological and scientific capacities, a country needs research and technology (Onu, 2017). Moreover, Fadipe etal (2022), stated that many factors militate against the growth of science in schools, such as parents' socio-economic status, which in turn can affect a nations technological advancement. Science has helped man greatly to explore the other planets of the world with its application. The basic disciplines of science are Physics, Chemistry, Mathematics and Biology. In Nigeria today, science subjects constitute a major part of the subjects offered in secondary schools. The federal government in the National Policy on

Education section 3 item 45 regarded the importance of science subject as it states that in recognition of the fundamental importance of science and technology, adequate funds shall be provided for the science and technology education.(National Policy on Education-FRN 2013) This recognition could have been due to the belief that with science, there is possibility of improving student's skills and attitude by increasing their knowledge of themselves, their environment and their world. Despite this, secondary school students' interest in science subjects, particularly physics, is falling, according to a number of surveys and studies (Esiobu, 2005).

As science and technology advance globally, both in developed and developing nations, physics serves as the cornerstone and basis. Physics directly produces a wide range of tools, which are the foundation of scientific and technological advancement and also a majorfoundation for development of future engineers. Physics becomes a fundamental subject in science and technology as a consequence. Matter, energy, and their interactions are the subjects of physics. In the WAEC test (2015–2019), students performed poorly in Physics (59.32%), which is not an acceptable mark for WAEC. It deals with the study of natural phenomena and aids in people's understanding of the rapidly changing modern society. According to Taangahar et al. (2021), students' perception of physics as a challenging subject may be the reason for their poor performance. Since the required materials are unavailable, the Physics students revealed that their physics classes are taught using abstract concepts (Fadipe et al., 2024). Additionally, physics educators employed verbal and theoretical approaches to teaching the subject and lack the necessary background knowledge to support effective learning. In addition to making students dislike physics, this antiquated theoretical approach to teaching the subject has also left them with a poor comprehension of it (Taangahar et al., 2021).

Instructional tools are necessary to enable the successful teaching and learning of physics, as the subject is currently taught in secondary schools as an abstract subject, which is not promising. Though, various authors ascertain that activities of teaching and learning are interesting, practical, realistic, and appealing when instructional materials are used appropriately, effectively and efficiently in a classroom-teaching situation. It equally sustains students' attention for effective learning. Okpe (2018) added that students must be appropriately guided by their teachers in order for teaching and learning to be effective. Making teaching and learning relevant is accomplished by utilising a variety of strategies and resources. Notwithstanding these positive developments, there are still certain obstacles that teachers and students must overcome to effectively teach and study physics. Theorised as a multidimensional notion that assesses a range of various characteristics of teaching, such as subject mastery, communication effectiveness, lesson preparation, and presentation, effectiveness in teaching has been found to be beneficial. Teaching involves a continual process that, when done with the right approach, helps students achieve the intended results. According to Ayeni (2011) in Ganyaupfu 2013, teaching entails a continuous process which help to bring out a desired outcome in learners when the appropriate method is used. Chima (2017) opined that it is a process of simplifying students learning.

According to Azubuike (2013)a teacher who employs this strategy, he continues, is always a friend to the kids since his or her class hours are typically stimulating, vibrant, and sufficiently inspiring to the students, who eagerly anticipate his or her lessons. Additionally, Azong and Olaitan (2019) claimed that in order for teaching to be effective, the educator must possess a thorough understanding of the subject matter, be able to impart that knowledge to the students, and be adept at using a variety of teaching techniques to achieve the goals of instruction in the classroom. Some researchers also contend that teachers need to be more adept at gauging their stuents' aptitudes and skill levels as well as their capacity to pique their curiosity and encourage critical thinking and problem-solving. Students can only be effectively taught to study and do well in a subject, especially Physics, by a resourceful and affable teacher who can maintain their interest in the material for an extended period of time. Onuoha, (2014) is of the opinion that effective teaching helps students to unlearn, learn and relearn, it brings about general development in students which in return fulfils the basic aims of education. Effective teaching gives students the opportunity to act and interact directly with other students and the teacher who acts as a friend and helper.

Recently, there have been a lot of issues with physics education, including inadequate or nonexistent physics laboratories and unfavourable learning environments, which might make it more difficult to achieve the goals of the subject (Okagbare, 2021). The manner in which physics is taught and the learning style of the students may have affected how differently the students performed in physics of the West African Senior School Certificate Examination (WASSCE).

International Journal of Humanities Social Science and Management (IJHSSM)
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Performance of physics students who took Physics exams from 2017 to 2020 in Nigeria are represented in the table below.

Table 1. Physics students' performance in WASSCE and SSCE from 2017 to 2020

Year	Total No. of candidates	Total passed	% passed	Total failed	% failed
2017	704504	176,126	25	528,378	75
2018	728904	313,487	43	415,487	57
2019	762340	327,806	43	434,534	57
2020	714871	412,457	51	302,414	49

Source: WAEC chief examiner's report (2017-2020)

Objectives of the Study

The main objective of the study;

Ascertain if the inadequacy of instructional materials has an impact on the teaching and learning of Physics among t senior secondary schools BwariArea Council, Abuja.

Research Questions

One research question was raised to guide the study;

1. To what extent doesinadequate instructional materials affect the teaching and learning of Physics among senior secondary schools in BwariArea Council, Abuja?

Hypotheses

One null hypothesiswas raised to guide the study,

H01: There is no significant difference in the influence of inadequate instructional materials on the effective teaching and learning of Physics in BwariArea Council, Abuja.

II. Methodology

Research Design

The procedure of necessities for the processing data in such a way that seeks to combine economic and operational connotation to the research objective is referred to as a study design (Ahuja, 2010). A descriptive survey research design was used in this study.

Population of the Study

The study population are the all SS2 male and female Physics students from government senior secondary schools in Bwari Area Council, the Federal Capital Territory, Abuja, Nigeria.The target population is 4,323 SSII Physics students. They were chosen because they are well prepared to understand the problem being investigated. These selected students are considered ideal for this research because finding a sample from these students will constitute a fair depiction given their size and location.

Table 2: Population of the study

S/N	Name of school	male	female	total
1	GSS Bwari (Kuduru)	223	137	360
2	GDSS Bwari	120	404	525
3	GSS Byazhin	133	216	349
4	GSS Dei-Dei	92	108	200
5	GGSS Dutse	157	189	350
6	GGSS Dutse	0	405	405
7	GSS Jibi	167	188	355
8	GSS Kawu	153	97	250
9	GSS Kubwa	246	340	586
10	GSS Kubwa PH3	5	10	15
11	GDSS Mpape	155	165	320
12	GSS Shere	161	136	297
13	GSS Ushafa	148	163	311

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 4, Issue 3, May.-June, 2024, pp: 1511-1518 www.ijhssm.org

Grand Total	**1,770**	**2,563**	**4,323**

Source: Measurement and Evaluation Office Kuduru, Bwari Area Council (2023)

Sample and Sampling Technique

A stratified random sampling is employed in this study. Using this sample technique, Sekaran and Bougie (2016) opined that, it is possible to create distinct strata according to variables such as gender, wealth, and age differences. Based on gender considerations, a random sample of both male and female participants was taken. Given that it is varied when compared to entities outside of it yet homogeneous inside it, it can be inferred that the population was adequately sampled.

Sampling Size

Taro Yamane's approach was applied in order to calculate the sample size needed for this investigation. The population under study is finite, which is why this strategy was chosen.

$$n = \frac{N}{1 + N(e)^2}$$

n = necessary sample size
N = population (number of individuals)
e = permitted error (%) = 0.05
The thirteen secondary schools in the Bwari Area Council now have about 4,323 SS2 students offering Physics, based on the demographic figure above. By substituting the variables in the previous formula, we obtain;

$$\mathbf{n} = \frac{4{,}323}{1+4{,}323(0.05)^2}$$

$$\mathbf{n} = \frac{4{,}323}{1+11} = \mathbf{360}$$

Stratified random sampling technique was employed to obtain the appropriate metric for every sample.

$$\text{Stratified Random Sampling} = \frac{\text{sample size}}{\text{Entire Population}} \mathbf{X} \text{ Population of groups}$$

Male $\frac{360}{4{,}323}$ **X 1770 =147**

Female $\frac{360}{4{,}323}$ **X 2563 = 213**

Research Instrument for Data Collection

This research uses primary data which was obtained by a self-administered questionnaire. An introduction letter outlining the rationale behind the research was sent by the researcher to the correspondents. Using a five-point Liker scale, which comprises Strongly Agree (SA), Agree (A), Neutral (N), Disagree (D), and Strongly Disagree (SD), the study was conducted.

MethodofDataAnalysis

Central tendency measures (mean and standard deviation) were used to analyse the data that were collected. The rating scales were given values in the following manner: Definitely Agree (SA) = 5. (Agree) = 4; (Neutral) = 3; (Disagree) = 2; (Strongly Disagreed) = 1. The independent T-test was utilised for evaluating the hypotheses, descriptive statistics were utilised to show the findings. To conduct this analysis, SPSS was used as the tool.

Data Presentation and Analysis

The descriptive analysis of the demography, research question, hypothesis testing, major findings and discussion of the findings of the study. SPSS was used to analyse the questionnaire items. Because of its accuracy level and capacity to analyse a larger range of data, SPSS is easier to use and more effective than many other database or spreadsheet programmes. Evaluation of the study topic and the respondents' demographics make up the two sections of the analysis.

Demographic Analysis

Age and gender of respondents are displayed in the demographic analysis.

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 4, Issue 3, May.-June, 2024, pp: 1511-1518 www.ijhssm.org

Table 3: Age Frequency and percentage distribution table
Source: SPSS Survey

AGE OF RESPONDENTS

Age	Frequency	Percentage
11-15	176	48.9
16-20	184	51.1
Total	360	100

The distribution of respondents' ages into two categories is seen in Table 3 above. 48.9% of the 176 responders who fall into the first age group of 11 to 15 years are in this category. With 184 respondents, or 51.1%, the second age group is 16–20 years old.

Table 4: The gender distribution frequency and percentage.
Source: SPSS Survey

GENDER OF RESPONDENTS

Gender	Frequency	Percentage
Male	147	40.8
Female	213	59.2
Total	360	100

The respondents' gender breakdown is seen in table 4 above. Just 213 respondents, or the female gender, make up the 59.2% of the study, compared to 147 male respondents, who make up 40.8% of the male gender. According to this, there are more female students than male students who offer science courses, such as physics, and thus are more readily available for this research's use.

Descriptive Analysis of Research Questions
In order to investigate the issues impacting the efficient teaching and learning of Physics in Abuja's secondary schools, the researcher collected data, which is presented and analysed in this part. Utilising the measure of central tendency, the questions presented in the tables were addressed.

Research Question
What is the influence of inadequate instructional materials on the effective teaching and learning of Physics among senior secondary schools in Bwari?Five questions are asked to the respondents to test this variable. This is the interpretation and analysis. Absence of descriptive statistics for instructional materials

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 4, Issue 3, May.-June, 2024, pp: 1511-1518 www.ijhssm.org

Table 5: Lack of Instructional Materials descriptive statistics
Source: SPSS Survey

S/N		SA	A	N	D	SD	Mean	Std.	
1.	Inadequate instructional materials hinders my learning of Physics	230	99	20	10	1	4.52	0.75	
2.	I do not understand Physicsconcept better withoutthe use of instructional materials	176	127	43	12	2	4.29	0.88	
3.	Theunavailability and inadequate instructional materials hinder my level of engagement and motivation	168	142	47	3	0	4.32	0.73	
4.	Inadequate materials such as models and Manipulatives hinders my understanding of physics theories and concepts	202	128	21	6	3	4.44	0.75	
5.	Inadequate technology-based materials (Simulations and multimedia resources) makes learning difficult	164	128	54	9	5	4.21	0.89	

As the answer to the first research question, table 5 above displays the descriptive statistics of the influence of the variable "lack of instructional materials." Since it's the most widely used metric to assess central tendency, the mean is just the average. Its selection for this analysis stemmed from this. Questions 1, 2, 3, 4, and 5 under the variable "instructional materials" have the following mean values: 4.52, 4.29, 4.32, 4.44, and 4.21; the corresponding standard deviation is 0.75, 0.88, 0.73, 0.76, and 0.89.

Table 6: Cumulative inadequate instructional materials descriptive statistics
Source: SPSS Survey

Mean	standard deviation
Lack of Instructional materials	4.36	0.46

Table 6 presents descriptive data of cumulative inadequacy in educational materials.The distribution as displayed in table 6 above has a cumulative mean of 4.36. By definition, 1.8 indicates "strongly disagree," 1.81 to 2.60 indicates "disagree," 2.61 to 3.40 indicates "neutral," 3.41 to 4.20 indicates "agree," and 4.21 and above indicates "strongly agree." This is in accordance with the Likert scale norm. A lack of instructional materials has an impact on the successful teaching and learning of Physics, as the cumulative mean of the data distribution is 4.36, indicating a significant consensus among respondents. Moreover, as comparison to the mean, the 0.46 standard deviation is noticeably small. This suggests that the frequency of the question does not have a lot of extreme values. It is evident from this that the data distribution is highly consistent. The Experiential learning theory that was suggested for the study topic and this analysis work hand in together.

Hypotheses Testing
The research hypotheses formulated was tested at 0.05 level of significance using the independent T-test
H01: There is no significant difference in the influence of inadequate instructional materials on teaching and learning of Physics in senior secondary schools Bwari Area council.

International Journal of Humanities Social Science and Management (IJHSSM)
Volume 4, Issue 3, May.-June, 2024, pp: 1511-1518 www.ijhssm.org

Table 7: T-test analysis showing the significant influence of inadequate instructional materials on the teaching and learning of Physics in senior secondary schools in Bwari Area Council, Abuja.

S/N		N	Mean	Std. deviation	df	t_{-cal}	t_{-tab}	P_{-value}
~~inadequate~~ instructional	360	4.357	2.459					materials
					718	20.235	1.67	0.00
Teaching and learning of physics		360	3.722	2.379				

Significant at df=718; P≤ 0.05, $t_{-calculated} \geq t_{-tabulated}$

The teaching and learning of Physics in senior secondary schools in Bwari Area Council, Abuja, was significantly impacted by inadequate instructional materials, as demonstrated by Table 6. In comparison to the p value of 0.000, the calculated t value is 20.235. As a result of the null hypothesis being rejected and the p value being less than 0.05 and the computed t being greater than the tabulated t value.This indicated that the lack of instructional materials has a significant influence on the teaching and learning of Physics.

Major findings

The major findings of the research are as follows;
The teaching and learning of Physics is greatly impacted by inadequate instructional materials.

III. Discussion of Findings

The significant discoveryof the study revealed that the teaching and learning of Physics is greatly impacted by inadequate instructional materials. Hence, physics education is greatly aided by the use of instructional materials. With the effective use of instructional materials, students learn physics more effectively and teachers also benefit from assisted instruction. The experiential learning theory explains the learning preferences and models used to demonstrate how students' involvements in concrete learning (use of instructional materials) leads to active and effective experimentation. Based on the computed and analysed data, it can be concluded that respondents' familiarity with a cumulative mean of 4.44 indicates agreement with the experiential learning theory, which holds that the use of instructional materials greatly influences the effectiveness of physics teaching and learning. This study further supports Okonkwo's (2015) assertion that better explanations and a more thorough understanding of concepts are given to students through the efficient use of teaching and learning resources. Furthermore, Oleabhiele and Ede (2016) provided support for this finding by stating that students benefit from a richer experience when instructional materials are frequently used in the teaching-learning process. This suggests that teaching resources are crucial tools that facilitate learning and make knowledge acquisition easier when they are carefully chosen, easily accessible, and properly supervised. Therefore, effectiveness in teaching and learning physics is not possible without the use of instructional materials.

IV. Conclusion

Based on the study's findings, there is need for senior secondary schools in Bwari Area Council, Abuja, to provide sufficient instructional materials in order for teaching and learning to occur in an efficient manner.

V. Recommendations

Based on the study's findings, the following were recommended by the researchers
First, government and stake holders should make available adequate infrastructure for the teaching and learning of Physics. Secondly, teachers should imbibe the culture of using instructional materials during lessons,

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