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FACTORS AFFECTING CHEMISTRY STUDENTS' ACADEMIC PERFORMANCE IN SENIOR SECONDARY SCHOOLS IN ANAMBRA STATE

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Abstract
The study evaluates the factors affecting chemistry students' academic performance in Senior Secondary Schools in Onitsha South Local Government Area of Anambra State, Nigeria. Specifically, this study determines the significant effect of laboratory adequacy and practical classes on chemistry students' performance in Senior Secondary Schools. Survey research was adopted and data were collected through the questionnaires distributed to the respondents (the selected senior secondary schools in Onitsha South Local Government Area of Anambra State). The analysis was carried out through four point likert scale and the hypotheses were tested with regression analysis. The findings revealed that laboratory adequacy and practical classes have significant effect on students' performance in chemistry for Senior Secondary Schools

Keywords: Laboratory adequacy**,** Practical classes and Chemistry students' performance

Introduction

Science and technology are essential for long-term, responsible, and global growth (Ben, 2010). Man ensures the longevity of his existence by applying scientific knowledge in different discoveries, innovations, and interventions that have improved mankind's quality of life. The world's developing countries are so named because of their progress and expansion in science and technology. To put it another way, in order for Nigeria to catch up to the industrialized nations of the globe, it is necessary to make science more appealing to the general public and to ensure that science is taught effectively in our schools (Obamamu, 2010).

Chemistry is a human endeavor that is based on fundamental characteristics such as activity, weight, recordkeeping, and skills (Banya, 2005). Chemistry is known as the "Central Science" because understanding of its notions about matter structure is required for continued study in all sciences. In essence, chemistry serves as a gatekeeper for secondary school students interested in studying pure and applied science, medicine, pharmacy, engineering, agriculture, and other vocations. On the other hand, there are consistent reports in the literature on students' performance in science in Nigerian senior secondary schools (Olatoye &. Afuwape, 2004). Many new curriculum projects, such as the Chemistry study, the Elementary Science Study (ELSS), and the Science Curriculum Improvement Study (SCIS), were also developed and completed through close collaboration between teachers and scientists, with the goal of improving science education and supporting students' science interests. To remain relevant in society and to contribute to the creation of new technologies, science students must acquire the necessary concepts and abilities and be able to use them in everyday life.

Chemistry teaching can only become result-oriented when both students and teachers are willing to use the proper methods and resources in their instruction (Adesoji and Olatunbosun, 2008). With the current expansion in scientific knowledge around the world, there is a lot of demand for and attention on the teacher, the learner, the curriculum, and the development of the entire science teaching and learning process (Adesoji and Olatunbosun, 2008). Academic achievement refers to a student's academic success at school, and it is measured in terms of a score or a percentage (Ajayi, 2017a). Academic accomplishment is a significant marker for students; it is the primary purpose of learning Chemistry around the world. Learners in similar academic contexts, on the other hand, have varying levels of academic achievement (Imomotimi, 2013). Learning is more than just the acquisition of proper replies; it is a process of concept development and positive lasting change (Broman et al., 2018). The difficulties connected with high-quality chemistry education have been documented in studies. For example, Akram et al. (2017), Imomotimi (2013), and Tümay (2016) identified attitudes and learning experiences, non-professionalism, time limits, class size, and service circumstances as impediments to effective Chemistry teaching. However, according to Ajayi (2017b) a Chemistry teacher aimed at changing the instruction from lecture to innovative learning strategies, such as learning cooperatively, using concept maps by making improvised materials where there is no standard equipment would not necessarily succeed in teaching Chemistry.

Students grasp the course unit on physical and chemical changes, but struggle to understand events at the micro level, according to previous chemistry research. The absence of laboratory practice is commonly cited as the cause of this shortcoming (Yang and Hey, 2007). Although laboratory work is an essential part of learning chemistry, previous research has found that it is difficult to integrate it into traditional chemistry courses for a variety of reasons, including safety concerns, a lack of self-confidence, and the time and effort required

to conduct accurate experiments (Elton et al., 2010). Nonetheless, by providing teachers with regular laboratory training, these barriers can be overcome.

When appropriately used by teachers, effective chemistry instruction that incorporates learners' active engagement leads to socioeconomic growth, and developing countries have begun programs to encourage the development of science education at secondary and higher educational levels (Mahdi, 2014). Flexible teachers must use innovative teaching strategies that adapt information to learners of all backgrounds and abilities in a supportive classroom environment (Sibomana et al., 2021). Academic success is heavily reliant on teaching and learning, as well as the completion of educational goals. Lecture-based instruction does not motivate students to learn, and there is no one-size-fits-all teaching approach (Tümay, 2016). However, good teaching methods increase students' interest in the issue, because good teachers respect students' views. As a result, teaching tactics are appealing; they form students' positive attitudes toward the subject; and it is the facilitator's (teacher's) responsibility to handle such aspects (Ejidike & Oyelana, 2015; Farzaneh & Nejadansari, 2014). Based on the backdrop, this study ascertains factors affecting chemistry students' academic performance in Senior Secondary Schools in Onitsha South Local Government Area of Anambra State, Nigeria. Specifically, this study intended to:

1. Determine the significant effect of Laboratory Adequacy on chemistry students' performance in Senior Secondary Schools in Onitsha South Local Government Area of Anambra State.

2. Ascertain the significant effect of Practical classes on chemistry students' performance in Senior Secondary Schools in Onitsha South Local Government Area of Anambra State.

Literature Review

Nigeria is no exception to the importance of chemistry in the development of a country's scientific backbone. Despite the growing relevance of chemistry in today's society, Nigerian secondary school students continue to struggle with the subject. Despite the relative importance of chemistry, however, students' performance in chemistry at internal and external examinations has remained dismal (Saage 2009). A number of theories have been proposed to explain why students perform poorly. The student factor, the teacher factor, the societal factor, the governmental infrastructural problem, the language problem, and the examination body related variables, curriculum related variables, test related variables, textbook related variables, and home related variables are all mentioned by Korau (2006). Saage (2009) identified specific variables such as poor school background in science, lack of incentives for test, lack of interest on the part of students, students not interested in hard work, incompetent teachers in the school, large classes, fear of the subject psychologically etc.

Laboratory Adequacy and Students' Achievement in Chemistry

Laboratories provide a real-world atmosphere and procedures, which are defined as an academic setting in which students use experiments to translate their theoretical knowledge into practical knowledge (Woodfield, 2005). Laboratories allow students to engage in meaningful virtual experiences while also introducing them to crucial concepts, principles, and procedures. Students can use virtual laboratories to replicate any incorrect experiments or to delve further into the desired experiences. Furthermore, the participatory character of such teaching methods creates an academic setting that is both clear and pleasant (Ardac and Akaygun, 2004). In addition to laboratory facilities, class size is an important school-based element that influences students' academic progress in chemistry (Banjoko, Gbadamosi, Abudu, Moyib & Lawal, 2015).

Tai, Sadler, and Loehr (2005) discovered several interesting high school pedagogical experiences that appeared to be linked with varying laboratories for understanding associated with higher student grades, whereas over emphasis on laboratory procedure in high school chemistry was associated with lower college grades. These findings revealed that a high school teacher's instructional choices may influence the performance of future students. Students who reported more instances of repeating laboratory to improve their understanding had higher chemistry marks than their counterparts who reported few or no instances of repeating laboratory for comprehension, according to Tai, Sadler, and Lochr (2005). As a result, they stressed that laboratory work has more promise in terms of preparing students for higher-level study.

They went on to say that if there are few resources, they are frequently in poor condition, and the few that are in good condition are insufficient to cover everyone who needs them. This presents a significant problem to the government in terms of meeting the financing needs of schools that teach science topics such as chemistry.

Practical classes and students' achievement in Chemistry

Because scientific process skills like observation and prediction require "doing," and doing entails practical action, the frequency of practical sessions is also an essential educational component. It is considered that the teacher's frequent use of the laboratory for practical instruction can help students learn scientific facts, laws, and theories. Nwosu and Jimoh both pointed out that the employment of laboratory activities surpasses other techniques of scientific instruction in the core of experimental disciplines like Chemistry. This is to demonstrate that the usefulness of frequent practical teaching in unraveling the enigma of chemistry concept perception is undeniable (Nwosu, 1994; Jimoh, 2002).

Good teaching methods influence students' interest in the topic (Tolsdorf, Kousa, Markic, & Aksela, 2018); and learning is a societal advancement that includes language, everyday situations, communication, and teamwork among learners, who are considered to be central in the learning process, which is enhanced by assimilation and accommodation (Amineh & Asl, 2015; Kara, 2018).

Empirical Studies

Ibezim (2018) looks into some of the elements that influence Chemistry students' performance in secondary schools in the Mbaitolu Local Government Area of Imo State. A study sample of 50 teachers and 120 students was randomly selected from five secondary schools in the Mbaitolu local government region for an effective research project. They were given a 15-item questionnaire to complete. We came up with four research questions. Teachers' academic performance, workload, sex, and parents' attitude/educational background are among the characteristics examined. For research questions, the frequency and percentage statistical approaches were used. As a result, the findings of this study are extremely valuable to students, teachers, and curriculum planners. Examining bodies, educators, the general public, and future researchers are all involved. Banjoko, Gbadamosi, Abudu, Moyib, and Lawal (2015) investigated the extent to which school factors influence students' chemistry achievement in senior secondary school. A total of 200 senior secondary school chemistry students were chosen at random from five secondary schools in the Sagamu local government area of Ogun State, in southern Nigeria. The results of this study revealed that each of the three factors studied (Science library facilities, instructional materials used, and laboratory adequacy) had a probability value less than 0.05 (P 0.05), indicating that there is a significant difference in performance between students exposed to these factors and those who were taught without them. The current findings imply that if school factors are changed, kids'

academic performance will improve. Finding the amount to which school characteristics affect senior secondary school students' achievement in Chemistry by Oginni, Awobodu, Alaka, and Saibu (2013). The study used an ex-post facto research method with a survey methodology. The participants were senior high school Chemistry students and teachers from fifty-seven (57) Lagos state local governments and development areas. For the study, instruments were created and verified. In the study, three research questions were posed and answered. The data was analyzed using Pearson Product Moment Correlation and Multiple Regression Statistics. The study found that as the conditions associated with school factors improve, students' chemistry proficiency increases. On the basis of these findings, recommendations were made. Nbina (2012) looked on kids' weak Chemistry performance. The research instrument was a 20-item likert-type questionnaire that was presented to 109 secondary school students to elicit responses on the factors that contribute to students' low Chemistry performance. T-test statistics were used to analyze the responses. As a result, there were no significant differences among the respondents when it came to the variables that cause students in Nigerian secondary schools to score poorly in Chemistry. The necessity for efficient and effective instructors who are professionally and academically competent to enhance Chemistry learning in schools was one of the recommendations offered.

Methodology

Research Design

A survey design was adopted for the study. This design helps to present factors systematically and accurately in response to the problems under investigation.

Population of the Study

This study consists of five randomly selected Senior Secondary Schools in Onitsha South Local Government Area of Anambra State, Southeast Nigeria. Twenty (20) students were selected from each School. The population consists of both public and private schools. A total of one hundred (100) Senior Secondary School Chemistry Students (SS II) purposively selected constituted the sample for this study.

The schools are:

- Urban Girls' Secondary School, Onitsha
- Urban Boys' Secondary School, Onitsha
- Our Lady's High School, Onitsha
- Christ The King College, (C.K.C.), Onitsha
- Modebe Memorial Secondary School, Onitsha

The instrument of data collection in this study was primary data. The questionnaire which was divided into two parts was used to elicit demographic information from the students while the second part was used to obtain information on the other variables of interest in the study.

Data Collection and Analysis

The questionnaires were administered to the senior students and retrieved. Data were collected and analyzed with five point likert's scale. Simple regression analysis was used to test the hypotheses.

Model Specification

The model takes these following specifications:

$STP_{it} = \beta_1 LBA_{it}\, u_{it}$ ……..……(i)

$STP_{it} = \beta_2 PRC_{it} + u_{it}$……....(ii)

Where:
STP = Students performance.
LBA = Laboratory adequacy.
PRC = Practical classes
i = (number of the sampled banks) and t = (number of the years to be covered)
u_{it} = firm-specific error term
β_1, β_2, = Beta Coefficients to be estimated

Decision

In decision making as whether to accept or reject the null hypotheses, the p-value was compared with the alpha sig. value which stands at 0.05. The null hypotheses were accepted if the computed p-value is greater than 0.05 while it was rejected if otherwise.

Data Analysis and Results

Table 1: Summary of data collected for hypotheses testing

S/N	Statements	SA	A	D	SD
	Students' Performance:				
1	Interest on the part of students	30	51	17	2
2	Competent teachers	31	45	19	5
3	Laboratories adequacy	29	50	21	0
4	Fear of the subject psychologically	24	54	20	2
5	Incentives for test	27	40	23	10
	Laboratory Adequacy:				
6	Laboratories stimulate a real practical environment	28	49	20	3
7	Laboratories enable students to convert their theoretical knowledge into practical knowledge	33	52	15	0
8	Students reporting more instances of repeating laboratory to enhance their understanding earned higher chemistry grades	22	56	26	6
9	Virtual experiences and essential concepts and principles are presented in laboratories.	30	40	25	5
10	Laboratory work shows more promise in terms of assisting students in their preparation for higher-level academics.	24	51	20	5
	Practical Classes:				
11	Good teaching methods influence students' interest in the topic	27	50	11	12
12	Efficacy of frequency of practical teaching to unravel the mystery behind perception of Chemistry concepts	29	40	21	10
13	Frequency of practical classes since scientific process skills such as observation and prediction involves.	30	49	18	3
14	Frequent use of laboratory for practical lessons by the teacher can translate chemical knowledge	25	53	22	0
15	Effective chemistry teaching that involves learners' active engagement when properly used	29	42	24	5

Source: Field survey, 2022

Table 2: Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
STP	4	19.00	240.00	125.0000	91.90938
LBA	4	19.00	248.00	127.5000	94.59563
PRC	4	30.00	234.00	125.0000	85.58037
Valid N (listwise)	4				

Interpretation

Descriptive statistics are ways to describe and present information from large amounts of data. Descriptive statistics provide a description of data seen from the average value (mean), standard deviation, maximum, minimum, sum range, kurtosis and skewness (slope distribution). The mean value of 125.00 for STP demonstrates the degree at which sample firms disclose their students' performance items. The maximum value of STP = 240.00 while the minimum degree of students performance stood at 19.00. The average mean value for the laboratory adequacy is 127.50% with a maximum of 248.oo and minimum of 19.00. For practical classes, the average mean value is 125.00. Meanwhile, the maximum value of is 234.00 while the minimum value is30.00.

Test of hypotheses

Hypothesis One

Ho: Laboratory adequacy has no significant effect on students' performance in chemistry for Senior Secondary Schools in Onitsha South Local Government Area of Anambra State.

Table 3: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25274.662	1	25274.662	750.682	.001[b]
	Residual	67.338	2	33.669		
	Total	25342.000	3			

a. Dependent Variable: STP
b. Predictors: (Constant), LBA

Table 4: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.285	5.367		.239	.833
	LBA	.970	.035	.999	27.399	.001

a. Dependent Variable: STP

In table 3, it study revealed that the p-value is 0.001 indicates that the hypothesis is statistically significant at level of significance (5%); hence p-value of the test statistic is less than alpha value (0.001<0.05).

In table 4, the regressed result shows that an evaluation of the laboratory adequacy of the explanatory variable shows statistically significant, hence coefficient value = 0,999 and t-statistics is =27.399, showing that laboratory adequacy is positively statistically significant at 5% level of significance.

Decision:

Since p-value of the test statistic is less or equal to alpha, we therefore, reject null hypothesis and uphold alternative hypothesis which state that laboratory adequacy has a significant effect on students' performance in chemistry for Senior Secondary Schools in Onitsha South Local Government Area of Anambra State

Hypothesis Two

Ho: Practical classes do not significant affect students' performance chemistry for Senior Secondary Schools in Onitsha South Local Government Area of Anambra State

Table 5: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	25284.221	1	25284.221	875.202	.001[b]
	Residual	57.779	2	28.890		
	Total	25342.000	3			

a. Dependent Variable: STP
b. Predictors: (Constant), PRC

Table 6: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-9.091	5.269		-1.725	.227
	PRC	1.073	.036	.999	29.584	.001

a. Dependent Variable: STP

In table 5, it study revealed that the p-value is 0.001 indicates that the hypothesis is statistically significant at level of significance (5%); hence p-value of the test statistic is less than alpha value (0.001<0.05).

In table 6, the regressed result shows that an evaluation of the practical classes of the explanatory variable shows statistically significant, hence coefficient value = 0,999 and t-statistics is =29.584, showing that practical classes is positively statistically significant at 5% level of significance.

Decision:
Since p-value of the test statistic is less or equal to alpha, we therefore, reject null hypothesis and uphold alternative hypothesis which state that practical classes has a significant effect on students' performance in chemistry for Senior Secondary Schools in Onitsha South Local Government Area of Anambra State.

Conclusion and Recommendations

Conclusion
The factors affecting chemistry students' academic performance in Senior Secondary Schools in Onitsha South Local Government Area of Anambra State, Nigeria, were investigated in this study. The information was gathered by the delivery of questionnaires to the respondents. The study found that laboratory adequacy and practical lessons have a substantial impact on students' chemistry performance in Senior Secondary Schools in Anambra State's Onitsha South Local Government Area. It is pretty crucial to conclude that several variables have a significant impact on secondary school chemistry students' performance.

Recommendations
As a result of the conclusion, the following suggestions are made:

i. Students should be exposed to more laboratory practicals to bridge the gap between theoretical experience, which many consider to be more abstract, and practical experience, which improves students' retention and learning of Chemistry while also familiarizing them with laboratory materials and equipment.
ii. Wherever possible, chemistry teachers should improvise supplies for practical work to relieve the cost load on school administrators, while the government should boost school finances to alleviate this difficulty.

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