

Impediments to Effective Teaching and Learning of Chemistry Practicals in Secondary Schools in Zaria Local Government Area, Kaduna State

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ABSTRACT

This study aims to examine the barriers to effective teaching and learning of Chemistry practical in secondary schools within the Zaria Local Government Area of Kaduna State, Nigeria. The study intends to identify and analyze problems related to teachers, students, and schools to determine the extent to which they impede the success of students at the mid-level educational stage in the country. The study population consisted of teachers and students from public schools in the Zaria Local Government Area. A total of 120 respondents were selected for the sample, comprising 60 science teachers and 60 science students specializing in Chemistry. The study sought to answer three research questions: (1) what are the problems related to teachers that affect the teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State? (2) What are the problems related to students that affect the teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State? (3) What are the school-related problems that affect the teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State? A structured questionnaire was used as the research instrument, and the data collected were analyzed using descriptive statistics, specifically mean deviation. The mean of the scaling point was computed as $4+3+2+1 = 10/4 = 2.50$. Therefore, the decision rule was established as follows: Mean > 2.50 = Accepted; Mean < 2.50 = Rejected. The findings of the study revealed that the major setbacks to effective teaching and learning of Chemistry practical were school-related problems, such as the absence of Chemistry laboratories in schools and non-payment of teachers' salaries. Additionally, teachers' inadequate understanding of Chemistry practical and students' inability to think scientifically were identified as significant obstacles to achieving expected results in the studied secondary schools. Based on the study's findings, it is recommended, among other things, that parents, teachers, and school authorities collaborate to create a conducive learning environment for secondary school students to effectively learn and practice Chemistry practical. This can be accomplished through the provision of adequate reading materials, proper guidance in the subject, and the establishment of well-equipped laboratories in schools that are easily accessible to the learners.

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INTRODUCTION

The Nigeria National Policy on Educational (2013) stipulated that acquiring

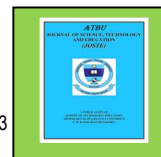
relevant economic and productive skills among science students is required most especially at secondary school level. Secondary education

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was aimed to develop both physical and mental competencies among graduates in order to meaningfully contribute to personal lives as well as learners' immediate environment and the world at large. This testifies to the fact that the importance of secondary education in Nigeria educational system cannot be overemphasized. Apart from serving as the link between primary and tertiary education, it provides opportunity for the learner to acquire additional knowledge, skills, and traits beyond the primary School level. The aforementioned reasons necessitate the attainment of secondary instruction in Nigeria. According to Mathew (2012), the education being provided at the elementary level is becoming insufficient in this modern day for the learner to attain everlasting knowledge, communicative and numeracy proficiency anticipated from the child at the end of the training and to effectively cope in this modern technological society.

In the world of technology, Igwe (2015) considered chemistry as a subject meant to equip learners with adequate capacity building services needed in modern day's science and to create personal saleable skills to become self-reliance. Therefore, it could be inferred that Chemistry as a science subject helps in molding science and technological advanced-minded persons (students) in the modern time tech-world, with the intention to improve human and material development and to make the world a better place of abode through scientific researches, which are mostly carried out in a laboratory. Similarly, Adesoji and Olatunbosun (2008) in Olanrewaju (n.d), stressed the importance of Chemistry to its capacity to stimulate scientific and technological development in every society therefore, calls for effective teaching of the subject at secondary school level. Thus, it is pertinent to emphasize the importance of well-planned Chemistry laboratory in secondary schools to achieve the aims of the subject in this 21st Century. In support of this assertion, Udogu, Emenduand, Nnamdi (2017) affirmed that practical activities in Chemistry among secondary school students should be thorough and inclusive without any hindrance. Teaching chemistry through laboratory practicals promotes scientific knowledge and instigate science-oriented attitude in learners

(Igwe, 2015). Therefore, one of the reasons Chemistry is made compulsory for all science students from secondary school level.

Consequently, as the present world revolved around economic development of human and materials, inadequate production of industrial and consumer goods in Nigeria has been described to be one of the major problems bedeviling the country's progress therefore causing economic woes for the nation. More so, the ever-increasing unemployment among youth in Nigeria could also be considered as an off-shot of lack of production of which is capable of containing the best brains among Nigerian graduates, provide jobs for semi-skilled youth and non-educated ones respectively. To solve these problems, Chikendu, Maxwell and Abumchukwu (2021) submitted that one of the major strategies to enhance high level of production in Nigeria to combat unemployment among the teeming youths is to pay more attention to science and technological subjects from secondary school level.

Accordingly, Udogu et al (2017) affirms that chemistry subject is adequately taught and learnt through effective laboratory practicals is highly useful as an organ of producing experts such as Chemical Engineers, Medical Doctors, medical personnel, Food Scientists, Environmentalists, Pharmacists, Food and Beverages producers, Fertilizers' producers, Transporters and Educationists among others. In the same vein, Chikendu et al (2021) added that job prospects in several economic industries such as petroleum, metallurgical, ceramics, glass and plastics technologists, cement factory, pharmaceuticals and food and beverages, chemical engineering and geologists all depend on product and knowledge of chemistry. Meanwhile, Olanrewaju (n.d) had opined that effective Chemistry teaching would yield positive and expected results with the readiness of learners and teachers appropriate use of teaching techniques and equipment capable of motivating and retaining students' interests throughout the lesson period including practical sessions in the laboratory.

Statement of Problem

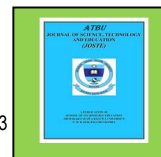
The major objectives of Chemistry practical in secondary school is to expose

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students at the basic levels to scientific skills and attitudes such as; observation, classifying, hypothesizing, generalizing, open mindedness, evaluation and meaningful conclusion that can lead to objectivity. Which provide students with opportunity to understand practicals and theoretical concepts by preferring solutions to scientific problems. Nevertheless, despite the robust objectives of the practicals in Chemistry at secondary school level, evidences of poor performance among these learners have been repeatedly reported on yearly basis. For examples, the Chief Examiner, West African Council Examination (WAEC, 2016) Report indicated that students' academic performance in Chemistry, especially at Senior Secondary level worsen as years goes by and many students seem to have negative attitude towards the subject.

More so, it has been observed that secondary school students' inability to score higher marks in Chemistry in internal and external examinations has very strong relationship with their inaccessibility to adequate and detailed practical sessions in the school laboratories. Other obstacles include teachers- students' related problems in learning the subjects effectively. For instance, some secondary school Chemistry teachers prefer teaching only theories in the classroom without practicalizing those concepts in the laboratory with the learners. Again, some learners are very lazy towards learning through practicals. Also, many schools completely lack laboratory and lab equipment/apparatuses thereby inhibiting students' academic success in Chemistry. Thus, when secondary school students possess adequate knowledge and practical skills to carryout practical activities in Chemistry laboratory, such learners perform extraordinary in both practical and theoretical aspects of the subject since there is a strong synergy between theory and practical activities. Therefore, the major aim of this study is to examine the impediments to effective teaching and learning of Chemistry practicals among senior secondary school students in Zaria Local Government Area, Kaduna State.

REVIEW OF RELATED LITERATURE

In order to describe the challenges facing teaching and learning in Nigeria

education including Chemistry subject, Chikendu et al (2021) reported the challenges of effective teaching of chemistry in the secondary schools in Enugu State. Specifically, the study ascertains the extent student's attitude towards chemistry and inadequacy of laboratory equipment affect effective teaching of chemistry in secondary schools in Enugu State. The population for this study consists of nineteen secondary schools in Oji-River L.G.A. of Enugu State. The sample of 180 students spread through SS1-SS3 in the two sampled schools. Data for the study was collected through questionnaire administered to the sampled school students. The study found that student's attitude towards chemistry and inadequacy of laboratory equipment is among the challenges influencing the effective teaching of chemistry in secondary schools in Enugu State. Similarly, Olanrewaju (n.d.) enumerating problems of teaching Chemistry in Nigerian secondary schools to include; teaching experience, academic qualification, professional qualifications, non-availability of resources and teacher salary among other major problems impeding students learning progress in the subject.

In 2012, Otieno carried out research to determine factors responsible for consistence poor performance of students in Chemistry in Kwale County in the Kenya Certificate of Secondary Education (KCSE). Using sample of 482 forms three from 9 public schools in the country, the study discovered that students' background characteristics; attitude factors particularly Chemistry teachers negative perception of their learners' abilities; inadequate use of resource in the teaching and learning process and negative socio-cultural factors as well as inappropriate learning environment were the main causes of the students' persistent poor performance in Chemistry in the study area.

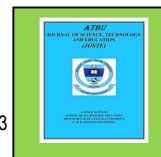
In another similar studies that examined teaching and learning problems among secondary school science students, Olajide, Odoma, Okechukwu, Iyare and Okhaimoh (2015) examined the problems of teaching practical in secondary schools in Delta State, Nigeria. Sample size of 246 respondents was drawn using Stratified random sampling technique. The results of the

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analysis revealed that science teachers in Delta State were qualified to teach science. However, most schools have the required instructional materials to teach science practical except for electronic materials and other heavy equipment required to teach science practical. Students in the schools view physical science as not important as Mathematics and English Language which they view as core subjects. Also, students are of the perception that studying science has no future prospects for them. These notions affected the teaching of science practical negatively in the schools.

Omiko (2015) found out that majority of secondary schools in Ebonyi State lack standard Chemistry laboratories. There was dearth of qualified skilled chemistry teachers while the available laboratories' assistants were neither untrained nor unprofessional hence, inhibiting effective and functional teaching and learning of practical chemistry in the State. These aforementioned problems are similar to the findings of Chikendu et al (2021) and Olanrewaju (n.d.) in teaching and learning chemistry subject in Nigeria secondary schools. Hence, this present study tends to determine the impediments to effective teaching and learning of Chemistry practicals in secondary schools in Zaria Local Government Area in Kaduna State taking into consideration teachers-related problems, student-related problems and school-related problems.

Objectives of the Study

1. To determine the extent to which teachers' related problems affect teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State.
2. To examine the extent to which students' related problems affect teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State.
3. To study the extent to which school-related problems affect teaching and

learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State.

Research Questions

1. What are the teachers' related problems that affect teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State?
2. What are the students' related problems that affect teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State?
3. What are the school related problems affect teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State?

METHODOLOGY

The study made use of descriptive survey research design. The design was suitable for the study because the research was quantitative in nature and data was collected through the use of questionnaire from staff and students of senior secondary school in Zaria Local Government Area of Kaduna State. The population for this study includes the 180 science teachers and 1205 SS II and SS III science students in Zaria Local Government Area, Kaduna State. Sample size for this study was one hundred and twenty 120 comprising of 60 Science teachers and 60 senior secondary school students in Zaria Local Government Area, Kaduna State from 5 selected senior secondary schools.

Stratified random sampling technique was used to select five secondary schools for the study. Purposive random sampling was used to select 120 teachers and students from the five (5) sampled secondary schools. The selection of 120 respondents was in line with Research Advisor sample table (2006), which stated that 120 sample size was recommended from the population of 1358 size. Table 1 below shows the samples of the study.

Table 1: Sample Size of the Study

S/No	5 selected Secondary Schools in Zaria Local Government Area	Samples		Total Sampled
		Teachers	Students	Sample
1.	Government Secondary School, Zaria	13	15	28
2.	Government Secondary School, T/Saibu	12	13	25
3.	Government Sec. Sch., Dakace	10	11	21
4.	Govt. Sec. Sch., Gyallesu	11	12	23
5.	Alhuda Huda College, Zaria	13	10	23
Total		60	60	120

Field Survey, 2022

The researcher used structured questionnaire titled "Impediments to Effective Teaching and Learning of Chemistry Practicals in Secondary Schools in Zaria Local Government Area, Kaduna State (IETLCP) to collect data for the study. The items were generated based on the information gathered from the objectives and research questions of the study. The instrument used a modified four-point Likert scale for rating the response options as Strongly Agreed (SA), Agree (A), Strong Disagree (SD), and Disagree (D) for categorization of responses. The questionnaire was distributed to the respondents' hand to hand by the researcher with the help of one teacher in each school visited. This was to prevent cases of missing of instrument.

Collected data was analyzed using descriptive statistics of mean deviation to devoid the study from any ambiguity of data interpretations. Therefore, for decisions to be made the mean of the scaling point was computed as $4+3+2+1 = 10/4 = 2.50$. Therefore, decision rule is $\text{Mean} \geq 2.50 = \text{Accepted}$; $\text{Mean} < 2.50 = \text{Rejected}$.

RESULTS:

Research Question One: *What are the teachers' related problems that affect teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State?*

Table 1: Mean responses on teachers' related problems that affect teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State.

S/N	Options	SA (4)	A (3)	D (2)	SD (1)	\bar{X}	Remark
1.	Teachers' inability to teach and cover the Practical Chemistry curriculum contents.	27 (108)	15 (45)	11 (22)	7 (7)	3.03	Accepted
2.	Inability of teachers to clarify area of difficulty in practical chemistry.	22 (88)	25 (75)	13 (26)	2 (2)	3.18	Accepted
3.	Teaching many topics at a time during practical chemistry session.	21 (84)	23 (69)	13 (26)	3 (3)	3.03	Accepted
4.	Teachers' inability to foster productive learning environment during chemistry practical classes.	35 (140)	13 (26)	7 (14)	5 (5)	2.90	Accepted
5.	Teachers' inability to motivate learners through effective planning of chemistry practicals.	16 (64)	21 (63)	10 (20)	13 (13)	3.08	Accepted
6.	Inability of teachers to adequately understand Chemistry practical.	41 (164)	10 (30)	3 (6)	6 (6)	3.43	Accepted
7.	Teachers' inability to meaningfully relate previous theoretical classes with new practical chemistry classes.	20 (80)	17 (51)	12 (24)	11 (22)	2.95	Accepted
Cumulative						3.09	Accepted

Decision Rule: $\text{Mean} \geq 2.50 = \text{Accepted}$; $\text{Mean} < 2.50 = \text{Rejected}$

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Table 1 depicts the responses on the challenges affecting teaching and learning of practical chemistry in secondary schools in Zaria Local Government Area, Kaduna State. The entire 7 challenges itemized were agreed to be problems affecting students in chemistry practical classes in the study area with the highest being inability of teachers to adequately understand chemistry practical. This response had the mean score of 3.43 showing that when teachers teaching chemistry lack the proper understanding of the subject then it reflects in the performance of students in the school. The least item on the challenges was teachers' inability to create

productive learning environment suitable for learners during chemistry practicals as this response had the mean score of 2.90. This also further means that chemistry teachers should, at all times, make learning interesting through preparation of effective teaching learning situations such that allow students to participate actively during chemistry practical.

Research Question Two: *What are the students' related problems that affect teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State?*

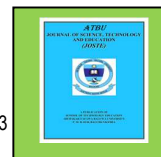
Table 2: Mean responses on students' related problems that affect teaching and learning of Practical Chemistry in Secondary Schools in Zaria Local Government Area, Kaduna State.

S/N	Options	SA (4)	A (3)	D (2)	SD (1)	\bar{X}	Remark
1.	Students' low level of interest in Chemistry Practicals which requires the willingness to engage in the effortful thinking.	21 (84)	28 (84)	06 (12)	03 (3)	3.05	Accepted
2.	Inability of students to understand Chemistry difficult concepts during practicals.	14 (56)	11 (33)	17 (34)	18 (18)	2.35	Rejected
3.	Students' inability to develop personal requisite, knowledge, skills and dispositions during Chemistry practicals.	29 (116)	16 (48)	08 (16)	07 (7)	3.12	Accepted
4.	Inability of students to adequately focus during Chemistry practicals and copy notes effectively.	11 (44)	06 (18)	23 (46)	20 (20)	2.13	Rejected
5.	Students' inability to capitalize on learning progress by revisiting previous Chemistry practical notes in more depth.	15 (60)	21 (63)	17 (34)	07 (7)	2.73	Accepted
6.	Students' inability to think abstractly and constructively during and after practical Chemistry classes.	34 (136)	12 (36)	08 (16)	06 (6)	3.23	Accepted
7.	Inability of students to develop positive attitude towards learning effective practical chemistry.	25 (100)	19 (57)	12 (24)	4 (4)	3.08	Accepted
Cumulative						2.81	Accepted

Decision Rule: Mean ≥ 2.50 = Accepted; Mean < 2.50 = Rejected

Table 2 shows responses to the students' related problems that affect teaching and learning of Practical Chemistry in Secondary Schools in Zaria Local Government Area, Kaduna State. Out of the 7 itemized challenges as related to students learning practical chemistry effectively, 2 items; inability of students to understand chemistry difficult concepts during practical and inability of

students to adequately focus during Chemistry practicals and copy notes effectively as these items two and four attracted mean score of 2.35 and 2.13 respectively, which are below the accepted level of 2.50. However, 5 items; 1, 3, 5, 6 and 7 were all agreed to as students' related problems and (item no 7) inability of students to develop positive attitude towards learning effective practical chemistry has the



highest mean score of 3.08. This further depicts that students need to develop personal positive attitude towards learning of chemistry for to achieve greater success in the subject.

Research Question Three: *What are the school related problems that affect teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State?*

Table 3: Mean responses on school related problems that affect teaching and learning of practical Chemistry in secondary schools in Zaria Local Government Area, Kaduna State.

S/N	Options	SA (4)	A (3)	D (2)	SD (1)	\bar{X}	Remark
1.	Employment of unqualified teachers to teach Chemistry subject.	58 (232)	39 (117)	17 (34)	6 (6)	3.24	Accepted
2.	Giving Chemistry subject to other science teachers therefore making it difficult to teach practical Chemistry.	70 (280)	35 (105)	9 (18)	6 (6)	3.41	Accepted
3.	Non-provision of standard laboratory for teaching practical Chemistry.	48 (240)	44 (132)	19 (38)	9 (9)	3.49	Accepted
4.	Inadequate time for practical Chemistry in the school time table.	56 (224)	45 (135)	08 (16)	11 (11)	3.22	Accepted
5.	Non-provision of laboratory apparatuses for teaching Practical Chemistry in the schools.	62 (248)	40 (120)	11 (22)	7 (7)	3.31	Accepted
6.	Non-provision of adequate laboratories therefore leading to overcrowding in Chemistry practical classes.	81 (324)	24 (72)	9 (18)	6 (6)	4.18	Accepted
7.	Non-payment of teachers' salaries therefore demotivating Chemistry teachers during practical classes.	51 (204)	56 (168)	08 (16)	5 (5)	3.23	Accepted
Cumulative						3.44	Accepted

Decision Rule: Mean ≥ 2.50 = Accepted; Mean < 2.50 = Rejected

Table3 illustrates the responses on school related problems inhibiting effective teaching and learning of practical chemistry in secondary schools in Zaria Local Government Area, Kaduna State. The entire 7 challenges itemized were agreed to be problems affecting students in chemistry practical classes in the study area with the highest being non-provision of adequate laboratories for effective teaching of practical chemistry leading to overcrowding of students in the Chemistry labs. This response had the mean score of 4.18 showing that when teachers teaching chemistry in a large crowd of students then such lesson cannot be effective hence, leading to poor understanding and performance of students in the subject. The least item on the school related problem towards effective teaching of chemistry in the study area was inadequate time for practical Chemistry in the school time

table as this response had the mean score of 3.22.

DISCUSSION OF FINDINGS

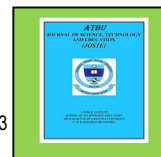
It was found out that teacher remains of the major stakeholders in effective teaching and learning of practical chemistry in schools therefore the entire teachers related problems have negative implications on effective teaching and learning of chemistry subject in Nigeria as this statement generated overall mean response of mean response of 3.09, which is higher than the decision rule of 2.50 mean score. This finding is in line with the finding of Olanrewaju (n.d); who enumerated major problems affective effective teaching and learning of practical chemistry in secondary schools to include teachers' teaching experience, teachers' academic qualifications and teachers' professional development. When

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teachers in secondary schools display level of professionalism, show high quality of experience then teaching and learning of practical chemistry for learners would be greatly enhanced.

It was also found out of from the study that students' attitude and commitment towards chemistry were part of the problems of ineffective teaching and learning of practical chemistry in Zaria Local Government Area, Kaduna State, Nigeria as the overall mean score to the students' related problems was 2.81, which is higher than the decision rule of 2.50. This finding corroborates with the findings of Otieno (2012) that students' perceptions and attitudes towards learning of Chemistry practical are part of the major problems experienced in secondary during teaching and learning of the subject.

The study discovered that school related problems are more pronounced than problems from teachers and students. The entire school related problems generated high mean scores higher than the decision rule of 2.50 with the overall mean score of 3.44, which means that for adequate and desirable results on effective teaching and learning of practical chemistry in secondary schools, the school managements have greater responsibilities providing conducive well equipped and functional laboratories for teaching practical chemistry effectively in secondary schools. This finding is similar to the findings of Omiko (2015) that majority of secondary schools in Ebonyi State have no well-equipped Chemistry laboratories for effective practical teaching of the subject. Scores of these secondary schools have shortage of experienced chemistry teachers. This is similar to the findings of Olanrewaju (n.d) that several secondary schools in Nigeria lack adequate and up-to-date chemistry practical apparatuses and some were fond of the habit of owing teacher salaries for months thereby impeding students learning progress in the subject.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations are put forward:

1. Chemistry teachers in secondary schools in Nigeria should make it self-mandatory to rigorously engage

in personal development training in Practical Chemistry to improve their personal and students' success in the subject.

2. Parents, teachers and school authorities should as a matter of urgency create conducive environment for secondary school students to effectively learn and practice practicals in chemistry through provision of adequate reading materials, proper guidance in the subject and provision of standard laboratory in schools accessible to the learners.
3. The school authorities and managers of secondary schools in Nigeria should yearly budget for provision of standardized science laboratories for teachers and learners, pay promptly teachers' emoluments and put students' achievement and success before school or personal objectives and successes.

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