

## Assessment of the Challenges Affecting the Teaching of Chemistry in Public Secondary Schools in Akoko Edo Local Government Area of Edo State

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### Abstract

*The achievement of the nation's education objectives has a lot to do with curriculum implementation, and it is one of the major tasks that must be performed by teachers. These teachers need the right teaching aids to optimally carry out their duties. This study delves into the persistent problems of unqualified teachers, insufficient instructional materials, and dilapidated chemistry laboratories, which have long hindered effective chemistry teaching in secondary schools. The research seeks to determine if these issues have been mitigated in Akoko Edo Local Government Area of Edo State. To achieve this, a simple random sample of 23 public secondary schools was selected from a total of 30 in the area. Data was gathered using a self-designed questionnaire with a reliability coefficient of  $r = 0.67$ . Descriptive statistics and Pearson correlation were employed to analyze the data using SPSS, and the results were presented in tables and figures. Findings from the study revealed that out of the twenty-three secondary schools sampled, eighteen of them had chemistry teachers while five of them had no chemistry teachers at all hence didn't participate in the survey. Of the eighteen chemistry teachers, only 16.7 % are qualified teachers while 83.3% were not qualified. Results also showed that 77.8 % of the schools had existing laboratories while 22.2 % had no laboratories. Similarly, results showed that only 5.6 % of the schools had their laboratory equipped with instructional materials while 94.4 % of the schools' chemistry laboratories remained moribund with no instructional materials. The researchers recommend that the government with community involvement should provide adequate funds for recruiting more qualified chemistry teachers, renovation/equipping existing chemistry laboratories with tools/instructional materials in schools and setting up monitoring team to ensure teachers are performing their jobs effectively.*

**Keywords:** Assessment, challenges, chemistry, teaching, public schools.

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### Introduction

A teacher guides and supports others in acquiring knowledge, skills, and understanding. In informal settings, anyone can assume the role of a teacher. Teaching as an activity can be complex and complicated, this is in part because teaching is a social practice, that takes place in a specific context (time,

place, culture, sociopolitical-economic situation etc.) and therefore reflects the values of that specific context (Nnoli, 2014). The specific skills and knowledge needed to be an effective teacher can differ depending on cultural and educational contexts. The employment of nonprofessionals qualified to teach chemistry has led to having people with poor method of instructions saturating our classrooms. These teachers may not be

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well-versed in the most effective teaching methods for chemistry. Teachers' quality has been found to be an influencing factor on students' academic performance and hence, there should be a country wide in-service course for all science teachers in secondary schools (Muhammad *et al.*, 2011).

Chemistry is fundamental to every aspect of life. It is the science that explores the properties, composition, and structure of matter, as well as the chemical reactions and energy changes associated with these transformations. At its core, chemistry is concerned with atoms and their interactions, particularly the formation and breaking of chemical bonds (RSC, 2021)). Chemistry is a science springing from the principles of physics with its applications in other sciences such as life-sciences, engineering, technology, earth sciences and medicine (RSC, 2021; Abanikannda, 2016). Chemistry is a fundamental science that finds applications in various fields. Chemistry is a very important science subject due to its importance in scientific and technological development of any nation (Ibrahim *et al.*, 2017). Chemistry is a pre-requisite subject for offering science-oriented courses in tertiary institutions, and this calls for the need to put efforts into its teaching for effective outcomes. Chemistry is a branch of science that is being taught because of its relevance to the need of the society (Edomwonyi-out & Aava, 2011). Chemistry instruction cultivates scientific literacy and promotes a scientific approach to problem-solving and the role/place of chemistry as a subject is a major pre-requisite for the attainment of scientific and technological development worldwide (Mabel *et al.*, 2024). A subject like chemistry, which has been regarded as the foundation of technology without which advancement in any nation's industrial and economic development will be jeopardized, is observed by researchers as not been properly handled by teachers in secondary schools in Nigeria.

Science and Technology education is primarily concerned with teaching individuals how to gain systematic skills, knowledge, and attitudes, as well as how to apply them to society (Sabine *et al.*, 2020).

Chemistry is a science and science education is an important aspect of education that requires to be handled by specialist in the field, but unfortunately it's been handled by out-of-field teachers, these are teachers that teach subjects for which they have inadequate qualification and training (Aina & Keith 2015). Teaching is an activity which aims at bringing about meaningful learning through a method that is morally and pedagogically acceptable (Oladosu, 2001). Positive outcomes in chemistry education depend on a combination of student motivation, teacher expertise, and the use of suitable teaching strategies and materials.

For chemistry teaching to be successful, teachers must possess a thorough understanding of the subject. The purpose of teaching chemistry in schools is to enable the students to develop their skills and knowledge in chemical sciences and project their efforts in education so as to be useful to themselves and the society (Chukwu & Adolphus, 2022). Research has shown that in most schools, teachers who are employed to teach chemistry have very poor background in chemistry, most are unqualified while some are unregistered with the regulatory body (Teacher's registration Council of Nigeria). Because of their poor knowledge of the subject matter, they make chemistry so complicated a subject making students to develop a misconception in chemistry concepts such as redox reaction, balancing chemical equations, electrolysis, organic chemistry, thermodynamics, and acid-base reactions (Johnstone, 2006). Many bad Teachers in our secondary schools have made chemistry a nightmare to most students and this has made them lost interest in the subject forever.

Chikendu *et al.*, (2021) noted that chemistry instruction is supposed to be outcome-oriented and student-centered, and this can only be accomplished when students are eager to learn, and teachers are willing to use appropriate methods and resources in their instruction. To capitalize on their inherent curiosity, students should be actively involved in all aspects of the learning process. Students must be allowed to engage actively in constructing their

own understanding under the guidance of teachers in the practice-based learning environment (Alphonse & Eduidge. 2022).

Even though chemistry plays a crucial role in our educational system and societal progress, and the dying wish of everyone concerned for improved performance by students, the performance of students over the years has remained very low. Poor teaching methods by unqualified personnels, absence of instructional materials, lack of laboratory equipment, poor attitude of students towards learning, examination malpractice are some the reasons given for this continued abysmal failure. These factors have been identified in the past by various authors and recommendations/solutions proffered to solving this age long problem hindering the teaching of chemistry in secondary schools. Hence, this study tends to assess these challenges of effective teaching of chemistry in public secondary schools in Akoko Edo L.G.A of Edo State and also to determine if these problems still persist or have improved or even deteriorating.

Non availability of qualified teachers is a very common problem in public secondary schools today as employment of teachers is frequently determined by school-based management committees, such as the PTA. This body uses the lean financial resources as put together by parents in the form of terminal dues to employing the services of unqualified personnel (cut and nail teachers as they are popularly called in the local parlance) to teach chemistry as they cannot afford the services of qualified personnels. This community effort is aimed at filling the void created by the government so as to keep the students busy. It is unfortunate that this problem that used to be typical and most prevalent among mushroom private secondary schools has find its way into our public secondary schools over the time. A teacher's academic and professional qualifications are crucial for delivering subject matter effectively. One significant issue in public secondary schools is the lack of adequately qualified chemistry teachers, both academically and professionally. An academically and

professionally qualified teacher is a teacher that possesses the basic skills and abilities of the teaching profession through the right teaching body as enshrined in the National policy on education (FRN 2013).

One of the most widely recognized problems in chemistry teaching in our secondary schools is the inadequacy of instructional materials. This statement agrees with Akilu & Olatunbosun (2022) who said that educational instructional materials and equipped laboratories are lacking in schools. One of the activities of science is experimentation, as it provides a forum for putting the theoretical knowledge acquired in the classroom into practice and also, to demonstrate the psychomotor skills of the teacher and students (Nbina *et al.*, 2010). This assists chemistry students in comprehending the abstract and challenging ideas inherent in scientific inquiry. Experimentation in science is however dependent on the availability of instructional materials (Ogwo, 2014).

Numerous factors have been cited for students' underperformance in chemistry, with a persistent issue being the shortage of adequate teaching and learning resources. The factors that are responsible for students' poor performances in chemistry include ineffectiveness in teaching process, poor laboratory facilities and inadequate number of learning facilities in schools as against the consistent increase in the number of students (Onasanya & Omosewa, 2010). Another reason for poor performance in chemistry includes abstract nature of chemistry, student and teacher factors, concept difficulty and teaching of chemistry without instructional materials (Nnoli, 2014). Over the years, there have been public outcries over the persistently poor performance of secondary school students in science-oriented subject in public examination across the country (Amoke 2020).

Performing experiments is a major activity in the teaching of chemistry. There is no doubt that Students' practice of new knowledge processes or skills under a teacher's supervision will attract attention and interest and will help the teacher explain abstract concept

easily. A conducive learning environment, characterized by well-equipped laboratories and up-to-date materials, is crucial for inspiring and motivating students in chemistry. The working conditions and safety standards in the chemistry laboratory must be above average (Mojisola, 2021). A well-equipped laboratory offers a space for teachers and students to apply theoretical knowledge and practice practical skills. Using laboratories in the teaching of science and chemistry in particular helps students grasp and remember what they hear, (Zuhrieh *et al.*, 2020).

Unfortunately, only a handful of our public secondary schools have good chemistry laboratories. While most of them have laboratories that are under equipped, others have no chemistry laboratories at all. This is a major set-back in the effective teaching of chemistry. Many authors have reported the issue of inadequate science equipment in educational institution (Mojisola, 2021 and Jimoh *et al.*, 2024). Non-availability of laboratory equipment and lack of practical exposure have been identified as barriers to successful science instruction (Dike & Salisu, 2015). Inadequate government funding is a significant obstacle to equipping public secondary schools with sufficient science equipment. Also, the proliferation of mushroom private secondary by hungry individuals who do not have the financial capacity to fund such elephant projects is a reason why most private secondary schools do not have good science laboratories. Also, research have shown that the secondary schools that have chemistry laboratories do not have trained laboratory assistant. Those that manage to have, are always untrained. Untrained laboratory assistant constitutes a nuisance to the teacher and hampers smooth running of chemistry practical. The teaching of chemistry as a science subject should be based on experiment and observations related with practical work particularly performed by the students themselves.

This study seeks to investigate the following: The extent to which public secondary schools in Akoko Edo L.G.A. are staffed with qualified chemistry teachers,

the level of availability of chemistry instructional materials in these schools and the extent to which the state of chemistry laboratories in these schools has been improved. To guide this study, the following research questions were posed: To what extent have public secondary schools in Akoko Edo L.G.A. been provided with qualified chemistry teachers, what is the level of availability of chemistry instructional materials in public secondary schools in Akoko Edo L.G.A., and to what extent have the moribund chemistry laboratories in public secondary schools in Akoko Edo L.G.A. been revitalized through the provision of equipment?

The following null hypotheses were formulated and tested at the 0.05 significance level: Ho1: There is no significant relationship between the availability of qualified chemistry teachers and the overall quality of chemistry education in public secondary schools in Akoko Edo L.G.A., Edo State. Ho2: There is no significant relationship between the availability of chemistry instructional materials and laboratories, and the overall effectiveness of chemistry teaching in public secondary schools in Akoko Edo L.G.A., Edo State.

## Methodology

A descriptive research design was employed to evaluate the progress made in addressing historical challenges that have impeded effective chemistry teaching in public secondary schools in Akoko Edo L.G.A., Edo State. The study population comprised all 30 public secondary schools in the area. Twenty-three (23) of them were randomly selected across the two constituencies that make up the local government area, Akoko Edo constituencies one and two. These secondary schools are distributed across these two constituencies, though not evenly distributed.

A self-structured questionnaire titled Factors Inhibiting Chemistry Teaching (FIECT) was designed by the researchers. To ensure validity, the questionnaire was reviewed by experts in research and statistics from the

Edo State College of Nursing Sciences. Reliability was established through a pilot test administered to ten chemistry teachers in Owan East Local Government Area, resulting in a Cronbach's alpha coefficient of 0.67. The questionnaire sought information on the level of improvement on the limiting factors of effective chemistry teaching, the present condition/state of their chemistry laboratories, how equipped are the laboratories with equipment and instructional materials, the extent to which available resources were utilized and impact of the resource's utilization on the outcome of chemistry teaching. A four-point Likert scale was employed to measure respondents' agreement with each statement. The scale included the following options: Strongly Agree (4 points), Agree (3 points), Disagree

(2 points), and Strongly Disagree (1 point). The researchers administered the instrument to the respondents personally after seeking for permission and approval from the schools' principals. The questionnaire issued were retrieved from the respondent after filling.

### Results

The responses from the eighteen questionnaires administered to chemistry teachers from eighteen secondary schools in Akoko Edo Local Government Area of Edo State was analyzed using statistical package of social science (SSPS) tool and the results presented below:

**Table 1: Distribution of chemistry teachers across the schools by status**

Staff status	Frequency	Percentage
Permanent	1	5.6 %
Edostar	17	94.4 %
<b>Total</b>	<b>18</b>	<b>100 %</b>

The table 1 shows data of the distribution of chemistry teachers across the schools under study. Only one teacher which is 5.6 % of the total respondents is a

permanent teacher while the remaining seventeen teachers which is 94.4 % of the total respondents are Edostar.

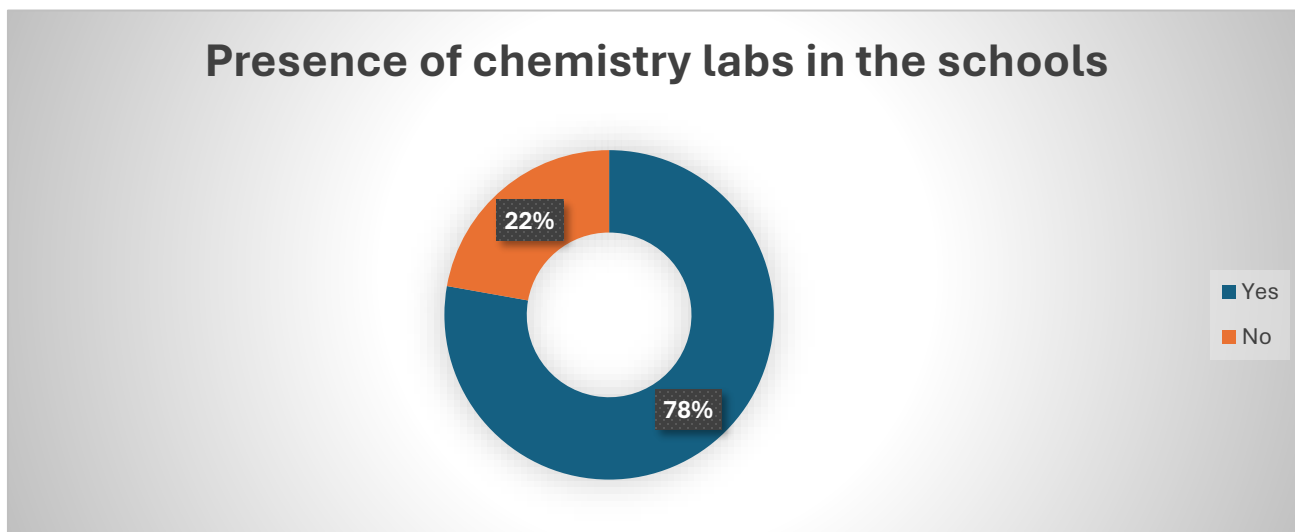
**Table 2. Distribution of chemistry teachers across the schools by qualification**

Teachers'educational qualification	Frequency	Percentage
NCE Chemistry	2	11.1 %
B.Sc Ed Chemistry	1	5.6 %
B.Sc Chem/Ind Chem	8	44.4 %
Others	7	38.9 %
<b>Total</b>	<b>18</b>	<b>100 %</b>

Results from table 2 show data of the distribution of chemistry teachers across the schools by qualification. From the data, two of the teachers which is 11.1 % of

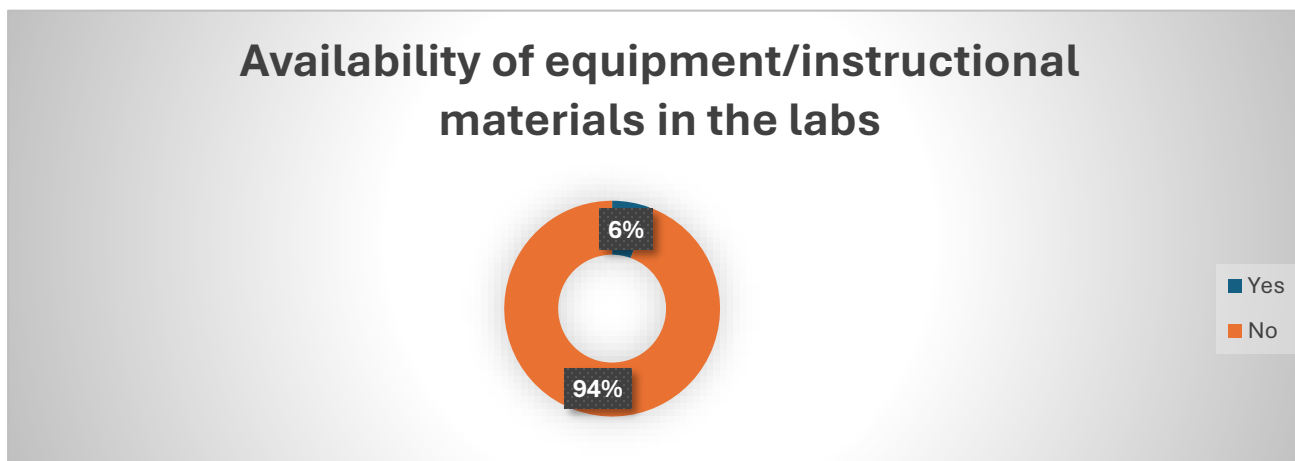
the total respondents have NCE chemistry, only one teacher which is 5.6 % of the total respondents has B.Sc Ed chemistry, eight teachers which is 44.4 % of the total respondents have B.Sc either in chemistry or

industrial chemistry and seven teachers which is 38.9 % of the total respondents have certificates in other fields except chemistry.



**Figure 1. Presence of a chemistry laboratory in the schools**

Figure 1 shows the presence of chemistry laboratory in the schools under investigation. Data show that only 78 % of the respondents said their schools have laboratories while 22 % of the respondents indicated that their schools do not have chemistry laboratories



**Figure 2: Availability of functioning chemistry equipment/instructional materials in the labs**

From figure 2, only 6 % of the respondents who said their schools have laboratories agree that the chemistry laboratories in their schools are equipped with functional laboratory equipment and teaching aids.



However, 94 % of the respondents indicated that though their schools have a chemistry laboratory building but these laboratories are not equipped with

neither equipment nor instructional materials. In other words, 94 % of the schools have moribund chemistry laboratories.

**Table 3: Teachers with a background in education qualification are more effective in delivering chemistry curriculum**

	Frequency	Percentage (%)
<b>Disagree (D)</b>	1.0	5.6
<b>Agree (A)</b>	15.0	83.3
<b>Strongly Agree (SA)</b>	2.0	11.1
<b>Total</b>	18.0	100.0

Results from table 3 shows that one teacher which forms 5.6 % of the total number of teachers who participated in the study did not agree that teachers with educational qualifications are more effective in delivering chemistry curriculum while Fifteen teachers which is 83.3 % of the respondents agreed and two

teachers which is 11.1 % of the respondents also strongly agreed that teachers with degrees in education are better at delivering the chemistry curriculum. From the responses it can be inferred that education qualification is key in the delivering of the chemistry curriculum.

**Table 4: Teachers with advanced qualifications in chemistry are better able to engage students in laboratory activities**

	Frequency	Percentage (%)
<b>Agree (A)</b>	13.0	72.2
<b>Strongly Agree (SA)</b>	5.0	27.8
<b>Total</b>	18.0	100.0

Results from table 4 shows that the respondents all agreed that teachers with advanced qualifications in chemistry are better able to engage students in laboratory activities. Thirteen of them which formed

72.2 % only agreed while five of them which is 27.8 % strongly agreed. Hence, it can be inferred that chemistry teachers must advance their knowledge in order to be able to engage their students more in chemistry laboratory activities.

**Table 5: Improvement in teachers' qualification leads to better understanding of chemistry concepts among students**

	Frequency	Percentage
<b>Agree</b>	18	100 %

<b>Total</b>	18	100 %
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From table 5, results show that all the respondents which forms a hundred percent of the entire respondents agree that improvement in teachers' qualification leads to better understanding of chemistry concepts among students.

**Table 6: Schools with qualified chemistry teachers see better overall students' performance in chemistry**

	Frequency	Percentage (%)
<b>Agree (A)</b>	11.0	61.1
<b>Strongly agree (SA)</b>	7.0	38.9
<b>Total</b>	18.0	100.0

Table 6 results show that all the respondents agreed that schools with qualified chemistry teachers see better overall students' performance in chemistry. Eleven which is 61.1 % of the total respondents agreed while seven which is 38.9% strongly agreed. In line with the respondents, it can be concluded that schools with qualified chemistry teachers see better overall students' performance in chemistry.

**Table 7: Teachers with advanced degrees are more effective in teaching chemistry than those with only NCE or a bachelor's degree**

	Frequency	Percentage
<b>Agree</b>	4	22.2 %
<b>Strongly agree</b>	14	77.8 %
<b>Total</b>	18	100 %

Results in table vii show that all the respondents were in agreement that those teachers with advanced degrees (like M.Sc and PhD) are more effective in teaching chemistry than those with only NCE or a bachelor's degree. Four teachers which is 22.2 % of the total respondents agreed and 14 teachers strongly agreed.

**Table 8: The availability of modern laboratory equipment significantly enhances students' understanding of chemistry concepts**

	Frequency	Percentage (%)
<b>Agree (A)</b>	12.0	66.7
<b>Strongly agree (SA)</b>	6.0	33.3
<b>Total</b>	18.0	100.0

Results from table 8 show that all the respondents agreed that the availability of modern laboratory equipment significantly enhances students' understanding of chemistry concepts. As shown, twelve of them which is 66.7 % just agreed while six of them which is 33.3 % of the total respondents strongly agreed. Hence, it can be inferred that the availability of modern laboratory equipment significantly enhances students' understanding of chemistry concepts.



**Table 9: The provision of sufficient laboratory equipment is crucial for effective chemistry teaching in secondary schools**

	Frequency	Percentage (%)
Agree (A)	10.0	55.6
Strongly agree (SA)	8.0	44.4
<b>Total</b>	<b>18.0</b>	<b>100.0</b>

Results in table 9 show the opinion of the respondents as to if the provision of sufficient laboratory equipment is crucial for effective chemistry teaching in secondary schools. Ten of the teachers which is 55.6 % of the

respondents agreed and eight of the respondents strongly agree. Hence, it can be concluded that the provision of sufficient laboratory equipment is very crucial for effective chemistry teaching in secondary schools.

**Table 10: Laboratory experiments are regularly conducted in chemistry classes due to their availability**

	Frequency	Percentage
Strongly disagree	4	22.2 %
Disagree	12	66.7 %
Agree	2	11.1 %
<b>Total</b>	<b>18</b>	<b>100 %</b>

Results in table 10 show the responses of the respondents as to whether laboratory experiments are regularly conducted in chemistry classes due to their availability. A total of fourteen respondents disagreed that laboratory experiments are not performed in their schools as a result of the absence of laboratory tools

and reagents. Out of the fourteen, four of them which is 22.2 % strongly disagreed while twelve which is 66.7 % disagreed. Two of the respondents which is 11.1 % agreed that laboratory experiments were been performed in their schools because materials were available.

**Table 11: Lack of laboratory equipment negatively affects the practical understanding of chemistry among students**

	Frequency	Percentage (%)
Strongly agree (SA)	4.0	22.2
Agree (A)	11.0	61.1
Disagree (D)	3.0	16.7
<b>Total</b>	<b>18.0</b>	<b>100.0</b>

In table 11, the opinion of the respondents as regards lack of laboratory equipment negatively affecting the

practical understanding of chemistry among students, four teachers which is 22.2 % of the respondents strongly agreed, eleven which is 61.1 % agreed and

three which is 16.7 % disagreed. From the above, we can conclude that it is very correct to say that lack of laboratory equipment negatively affects the practical understanding of chemistry among students.

**Table 12: Instructional materials are readily available in my school for teaching chemistry**

	Frequency	Percentage (%)
<b>Strongly disagree</b>	6	33.3
<b>Disagree</b>	10	55.6
<b>Agree</b>	2	11.1
<b>Total</b>	18	100.0

As summarized in Table 12, the majority of schools lack readily available instructional materials.. Six respondents which is 33.3 % strongly disagreed that instructional materials are available in their schools, ten

of the respondents which is 55.6 % also disagreed. Only two of the respondents which is 11.1 % agreed that instructional materials are readily available in their schools.

**Table 13: My school regularly updates and maintains laboratory equipment to support chemistry teaching.**

	Frequency	Percentage
<b>Strongly disagree</b>	5	27.8 %
<b>Disagree</b>	11	61.1 %
<b>Agree</b>	2	11.1 %
<b>Total</b>	18	100 %

The summary of the results in table 13 show that majority of the schools do not regularly update nor maintain laboratory equipment to support chemistry teaching. Five of the respondents which is 27.8 % of the respondents strongly disagreed that their schools

update and maintain on regular basis laboratory equipment to support chemistry teaching while eleven which is 61.1 % also disagreed. Only two of the respondents which is 11.1 % agreed that their schools regularly update and maintain laboratory equipment to support chemistry teaching.

**Table 14: The absence of adequate instructional materials hinders the effective teaching of chemistry in secondary schools**

	Frequency	Percentage (%)
<b>Strongly agree (SA)</b>	3.0	16.7
<b>Agree (A)</b>	13.0	72.2
<b>Disagree (D)</b>	2.0	11.1
<b>Total</b>	18.0	100.0

Results from table 14 show that most of the respondents agreed that the absence of adequate instructional materials impedes the effective teaching of chemistry in secondary schools. Three of the

respondents which is 16.7 % strongly agreed and thirteen respondents which is 72.2 % also agreed. Only two respondents which is 11.1 % disagreed which invariably means that instructional materials are readily available in their schools.

**Table 15: The availability of functional laboratory equipment and instructional materials encourage students to pursue science-related careers**

	Frequency	Percentage (%)
Agree	17	94.4
Strongly agree	1	5.6
<b>Total</b>	<b>18</b>	<b>100</b>

Table 15 shows that respondents generally agree that functional laboratory equipment and instructional materials motivate students to pursue science-related

careers in higher institution. Seventeen respondents which is 94.4 % agreed and one respondent which is 5.6 % of the total respondents also strongly agreed.

**Table 16: My school administration prioritizes the provision of laboratory equipment and instructional materials in chemistry classes.**

	Frequency	Percentage
Strongly disagree	4	22.2 %
Disagree	11	61.1 %
Agree	3	16.7 %
<b>Total</b>	<b>18</b>	<b>100 %</b>

As shown in table 16 above, most of the respondents disagreed that their school administrators' places priority in the provision of laboratory equipment and instructional materials in chemistry classes. Four of the respondents which is 22.2 % of the total responses strongly disagreed and eleven respondents which is

61.1 % of the total responses also disagreed that the administrators of their schools place any priority on instructional and laboratory equipment provision. Only three respondents which is 16.7 % agreed that the administrators of their schools' places priority in making provision for instructional materials and laboratory equipment for chemistry classes.

**Table 17: The impact of inadequate laboratory equipment and instructional materials is evident in students' low interest in chemistry.**

	Frequency	Percentage (%)
Strongly agree (SA)	2	11.1
Agree (A)	12	66.7

<b>Disagree (D)</b>	4	22.2
<b>Total</b>	18	100.0

The results in table 17 show that most of the respondents agreed that the impact of inadequate laboratory equipment and instructional materials is evident in students' low interest in chemistry. Two of the respondents which is 11.1 % strongly agree and twelve of the respondents which is 66.7 % also agreed. Only four respondents which is 22.2 % of the total respondents disagreed that inadequate laboratory

equipment and instructional materials is not the reason why students are showing less interest in chemistry.

**Test of Hypotheses**

**Hypothesis One:** There is no significant relationship between the availability of qualified chemistry teachers and the overall quality of chemistry education in public secondary schools in Akoko Edo L.G.A., Edo State.

**Table 18: Pearson Correlation of qualified chemistry teachers and overall quality of chemistry education**

Variables	N	r	Sig. (2-tailed)
Qualified Chemistry Teachers	18	.159	.018
Overall chemistry achievement			

As shown in Table 18, a correlation analysis revealed a significant positive relationship between the availability of qualified chemistry teachers and the overall quality of chemistry education in Akoko Edo L.G.A. The calculated correlation coefficient (r) was 0.157, and the p-value was 0.018. The p-value was less than the 0.05 significance level, leading to the rejection of the null hypothesis. This indicates that there is a statistically significant association between the two

variables, suggesting that having qualified teachers can positively influence the quality of chemistry education in Akoko L.G.A of Edo State.

**Hypothesis Two:** Ho2: There is no significant relationship between the availability of chemistry instructional materials and laboratories, and the overall effectiveness of chemistry teaching in public secondary schools in Akoko Edo L.G.A., Edo State.

**Table 19: Pearson Correlation of availability of instructional materials/chemistry laboratories and effective chemistry teaching**

Variables	N	r	Sig. (2-tailed)
Instructional materials/chem laboratories	18	.480	.015
Effective chemistry teaching			

The analysis in Table 19 reveals a calculated correlation coefficient (r) of 0.480 and a p-value of 0.015. With a significance level of 0.05, the p-value is less than the alpha level. Therefore, the null hypothesis, which states that there is no significant correlation

between the availability of chemistry instructional materials/laboratories and effective chemistry teaching in public secondary schools in Akoko Edo L.G.A. of Edo State, is rejected.. It therefore means that there is evidence to support a significant relationship between

the availability of instructional materials, chemistry laboratories, and the effectiveness of chemistry teaching in public secondary schools. Consequently, this suggests that providing adequate resources can positively impact the quality of chemistry education.

## Discussion

This study was embarked on to act as a fact-finding document to unravel how true some of the claims of the Edo Basic Education Sector Transformation (EdoBEST) program which was established in 2018 under the Edo State Universal Basic Education law saddled with the responsibility of revamping and improving educational outcomes in primary schools are. One of the aims of the EdoBEST agency is to ensure that all schools, both urban and rural, have adequate number of qualified teachers (Edo subeb, 2018). The EdoBEST initiative originally designed mainly for the primary schools was extended to secondary schools with the launch of EdoBEST version 2.0 in 2022. Part of the achievements/contributions of the agency to secondary education was the recruitment/posting of teachers (codenamed EdoStar) to secondary schools, implementation of the use of a unified timetable for all schools, use of scripted lesson notes in all subjects by teachers, etc.

In the foregoing, results from this research will be discussed to answer the research questions as raised relying on the tested hypotheses.

### 1. To what extent has qualified chemistry teachers been provided for secondary schools in Akoko Edo Local Government Area of Edo State?

Out of the twenty-three schools originally sampled for this research, five had no chemistry teachers and as such couldn't participate in the survey. Results in table i and ii above for the remaining eighteen schools that participated show that only one chemistry teacher is a permanent teacher while the remaining seventeen are EdoStar. This implies that 94.4 % of the chemistry teachers are EdoStar and only 5.6 % are permanent teachers. Also, of all the eighteen teachers, the

educational qualifications of two is NCE, only one has a B.Sc Ed in chemistry, eight studied either chemistry or industrial chemistry and seven studied other courses other than chemistry.

It is very evident from the above that even with the recruitment and posting of teachers carried out by the EdoBEST agency to help combat the age long problem of unqualified teachers that has almost ruined our public secondary schools, not much was achieved in that regard as only 16.7 % of the total respondents were qualified teachers while a whopping 83.3 % were unqualified teachers. The ratio of those qualified was just too insignificant compared to those that were unqualified. It therefore means that the recruitment process that brought these unqualified persons to teach chemistry was faulty and must be addressed in subsequent recruitments exercise in order to overcome the challenge of unqualified teachers teaching chemistry.

Respondents alluded to the fact that teachers with background in education qualification are better equipped and effective in delivery chemistry curriculum. As shown in table 3, 88.9 % agreed and only 11.1 % of the respondents disagreed and this was insignificant when compared to those who agreed. 100 % of the respondents agreed that schools with qualified teachers see better overall students' performance in chemistry. This agrees with the position that there is a significant difference between the performance of chemistry students taught by qualified teachers and those taught by unqualified teachers (Abidoye & Bamuwagun, 2022). This may be attributed to qualified teachers' ability to effectively impart knowledge, skills, attitudes, and values. The findings as seen in hypothesis one presented in table 18 show that there is a correlation between qualified chemistry teachers and the overall quality of chemistry education. Deploying qualified teachers to teach chemistry would positively impact the effective implementation of the chemistry curriculum. A qualified teacher has a good classroom control, effective communication skills, adequate knowledge of the subject, can utilize varieties of

teaching strategies in order to enhance students' performance and all teachers need breadth and depth in the subject they will teach (James, 1991). There is no gainsaying that a teacher cannot impact more than he knows to the students. Chemistry is a science and any teacher that must administer the curriculum to the students must be well grounded with the requisite knowledge to do so.

## **2. What is the level of chemistry instructional materials availability/Has the Chemistry laboratories in secondary schools in Akoko Edo L.G.A of Edo state been made to function by provision of equipment?**

Instruction materials and presence of chemistry laboratories go hand in hand as both are dependent on one another, hence, have been merged and will be discussed together. From the available results from the respondents as shown in figures i and ii, 78 % of the respondents indicated that they have a chemistry laboratory in their respective schools while only 22 % responded in the negative that they do not have a chemistry laboratory at all. And on the availability of equipment and instructional materials in these laboratories, a total of 94 % of the respondents indicated that they lack materials in their laboratories and only 6 % responded in the affirmative to have materials in their laboratories. This information alone clearly shows the reason why it is becoming very difficult to effectively implement the chemistry curriculum in our secondary schools which evidently is why students' interest in chemistry and in the sciences generally is constantly decreasing. Evidence from the second hypothesis also demonstrated a significant relationship between the availability of instructional materials, chemistry laboratories, and the effectiveness of chemistry teaching in public secondary schools. It would suffice to suggest that renovating existing laboratories and equipping them with instructional materials would positively impact the overall chemistry education in public schools. It is not enough to have laboratory buildings. The most important thing is for

teachers and students to have equipment in those buildings to perform experiments.

Chemistry is a science and when taught using practical activities through instructional materials, students tend to remember what was taught (Ibe *et al* 2021). Also, instructional resources ensure that the learners see/hear/feel/recognize and appreciate as they learn/utilize almost all the five senses at the same time (Tera, 2018). The issue of inadequate or non-availability of science equipment in educational institutions has been reported by several authors (Jimoh *et al.*, 2024, Mojisola, 2021, and Ugwu 2008). The non-availability of science equipment and consequent non-exposure have been identified as barriers to successful science instruction (Jimoh *et al.*, 2024 and Ibrahim *et al.*, 2023).

The Edo State Government must do more to equipping the existing chemistry laboratory buildings which have been built years ago with functioning equipment and other instructional materials so as to afford the teachers and students the opportunity to apply the theoretical knowledge gained in class and demonstrate practical skills.

## **Conclusion**

Absence of qualified chemistry teachers, presence of moribund chemistry laboratories and absence of chemistry equipment and instructional materials in laboratories have long been identified as some of the challenges militating against the effective implementation of the chemistry curriculum in our secondary schools. With the launch of EdoBEST version 2.0 which was extended to secondary schools in Edo state coupled with recorded successes about the educational transformation this program has said to have achieved with public school education transformation in the state that the agency has put out in public domain triggered this study to really ascertain the veracity of some of the claims. While it is true that the program has been able to resuscitate our public secondary schools that were almost in comatose over the years like in the areas of employing/posting of



teachers codenamed Edostars to ameliorate the grossly inadequate teachers in the schools, operation of a unified timetable across the state public schools, use of scripted lesson notes among other things. However, the problems identified above still remains unsolved. Findings from this study have shown that teachers were actually employed and deployed to schools but most of these teachers were not qualified to teach chemistry and also the teachers are still not enough as some of the schools still had no chemistry teachers. Similarly, findings from the study also showed that chemistry laboratories were available in most of the schools, but these laboratories are unequipped with laboratories equipment and instructional materials that would make the implementation of the chemistry curriculum at the secondary school level not only easy and effective but interesting. Moreso, findings revealed that a few numbers of the secondary schools still do not have chemistry laboratories at all. Hence, it is imperative that all stakeholders and the government must look critically into these challenges which are the basic requirements of a meaningful secondary education and chat a way forward to resolve them in order to save the future of the public secondary school education in the state.

Until qualified teachers are deployed to schools to administer the curriculum to students, building new laboratories where absent and renovating the existing ones and equipping them with adequate laboratory equipment and instructional materials, no effort from the government and other stakeholders at revamping the public schools would yield any meaningful result else we would just be moving round a circle. This is no rocket science!

## References

- Abanikannda, M. (2016). Enhancing Effective Chemistry Learning Through Hypermedia Instructional Mode of Delivery. *European Journal of Educational Research*, 5(1), 27-34. <https://doi.org/10.12973.eu-jer>
- Abidoye F.O., & Bamuwagun O.A., (2022). Effect of Chemistry teachers' Gender and Academic qualification on performance of students in senior secondary schools in kwara State, Nigeria. *International Journal of Educational Research and Review*, 3(1), 9-11.
- Aina, J.K. & Keith, L. (2015). Teaching method in Science Education: the need for a paradigm shift to peer instruction (PI) in Nigerian Schools. *International journal of Academic Research and Reflection*, 3(6), 6-5.
- Akilu,I. & Olatunbosun, M.L. (2022). Availability and Utilization of Instructional Materials in Teaching and Learning of Biology in Senior Secondary Schools. *Aquademia research article*, 6(2), 2-3. <https://doi.org/10.30935/aquademia/12614>
- Alphonse, R. & Eduidge, K. (2022). Effect of Practice-Based Learning in Chemistry on Students' Academic Performance in Rwanda. *East African Journal of Education and Social Sciences*, 3(4), 166-172.
- Amoke, M. K. (2020). Analysis of Students' Performance in Chemistry in the West African Senior School Certificate Examination (WASSCE) and National Examination Council (NECO) from 2015-2018. *International Journal of Research and Analytical Reviews*, 7(1), 38-39.
- Chikendu, R.E., Obikezie, M.C., and Abumchukwu, A.A. (2021). Challenge Of Effective Teaching of Chemistry in The Secondary Schools In Enugu State. *International Journal of Research*, 8(10), 110-111.
- Chukwu G.A., & Adolphus T. (2022). Modern trends in teaching and learning chemistry in Nigeria: Prospects and constraints. *International*

- Journal of Multidisciplinary Research and Growth Evaluation*.3(4), 249-252.
- Dike, N., & Salisu H., (2015). Inadequate Laboratory Facilities and Utilization: Pedagogical Hindrance to Students' Academic Performance in Biology in Senior Secondary Certificate Examination in Zaria Metropolis, Kaduna State, Nigeria. *International Business Research*; 8(9), 125-128.
- Edomwonyi-otu L., & Avaa A., (2011). The Challenge of Effective Teaching of Chemistry: A Case Study. *Leonardo Electronic Journal of Practices and Technologies*; 10(1), 17-25
- FRN. (2013). Federal Republic of Nigeria, National Policy on Education, 6<sup>th</sup> Edition. Retrieved 12 October 2024 from: <https://doi.org/10.3926/jotse.888>
- Edo Subeb. (2018). Edo State Universal Basic Education. Retrieved 10 October 2024 from: <https://subeb.edostate.gov.ng/edobest/>
- Ibe F.N., Obikezie M.C. & Chikendu R.E., (2021). Effect of improvised instructional materials on chemistry students' academic retention in secondary school. *International Journal of Research in Education and Sustainable Development*, 1(5), 29-32.
- Ibrahim, I., Valentine, B., & Stephen, A.O., (2023). The Impact of Laboratory Practical Activities on Students' Academic Performance at Queen of Peace Senior High School in The Nadowli-Kaleo District of The Upper West Region of Ghana. *International Journal of Scientific Research and Management*, 11(3), 2229-2230.
- Ibrahim, M.S., Tairo, A.A., Aminu, I., Isah, I.I., & Muhammad, A.A. (2017). Solving the Problem of Chemistry Education in Nigeria: A panacea for National Development. *American Journal of Heterocyclic Chemistry*, 3(4), 42-46.
- James, T., (1991). Inquiry versus lecture method of teaching biology among low and high achieving male and female students in Secondary schools. Unpublished M.Ed. Thesis, Ahmadu Bello University, Zaria. 44-47.
- Jimoh, A., Iserhienrhien, M.O., Osondu, C.B., & Efeobhokhan, E.O., (2024). Examining Nursing Students' Interest and Performance in Chemistry in Nigeria Colleges of Nursing Sciences: Emerging Issues. *International Journal of Innovative Science and Research Technology*, 9(6), 761-763.
- Johnstone, A.H. (2006). Chemical education research in Glasgow in perspective. *Chemistry Education Research and Practice*, 7(2), 49-63. <http://doi.org/10.1039/B5RP90021B>
- Mabel I.D., Mary U.A., & Emem I.N. (2024). Practical Approaches and Students' Scientific Attitude in Chemistry in Uyo Local Government Area of Akwa Ibom State, Nigeria. *Ilorin Journal of Education*, 44(2), 350-352
- Mojisola, O.N., (2021). Interrogating the Teaching and Learning of Chemistry in Nigeria Private Universities: Matters Arising. *Journal of Education and Learning*, 10(3), 132-134.
- Muhammad, A.D., Rashida, A.D., & Fayyaz, A.F., (2011). Impact of Teacher Quality on the Academic Achievement of Students at Secondary Stage in Punjab (Pakistan). *European Journal of Social Sciences*, 19(1), 99-100.
- Nbina, J.B, Viko, B., & Birabil. S.T. (2010), Developing improvisation skills for alleviating poverty in Nigeria: The Place of Chemistry In Entrepreneurship Education. *Academic Leadership: The Online Journal*, 8(4) 7-9.
- Ogwo. B.A (2014). Improvisation in teaching and learning. A commissioned paper presented at the train-the teacher workshop for capacity

- building of lecturers in colleges of education, organized by the Education Tax Fund (ETF) in collaboration with the National Commission for colleges of education (NCCE). *River state college of education Port-Harcourt, august 2<sup>nd</sup> – 6<sup>th</sup>*
- Onasanya, S.A., & Omosewa, O.O. (2010). Effect of using standard instructional materials and improvised instructional materials on secondary school students' academic performance in physics in Ilorin, Nigeria. *Singapore Journal of Scientific Research*. 1(1), 70-71.
- Nnoli, J.N. (2014). Teaching chemistry for creativity, the effect of the use of improvise organic reagents on students' achievement in chemistry. in Z.C. Njoku (Ed), *55<sup>th</sup> Annual Conference Proceedings of STAN* (265-270). Ibadan: Hern, Publisher Plc.
- RSC, (2021). Definition in Chemistry, *retrieved from* <http://edu.rsc.org/resources/definition-inchemsirty/1088.article>
- Sabine S., Josef G., & Michael S. (2020). Technology-related knowledge, skills, and attitudes of pre- and in-service teachers: The current situation and emerging trends. *Computers in Human Behavior*, 115(8), 106553-106555
- Tera, G.M. (2018). The importance of physics classes for a career in STEM. *The Hechinger Report*, *retrieved 9th October 2024 from*, <https://givingcompass.org/article/the-importance-of-physics-classes-for-a-career-in-stem/>
- Ugbe A.U & Agim J.I., 2009. Influence of Teachers' competence on students' academic performance in senior secondary school chemistry. *Global journal of educational research*, 8(2). 64-65.
- Ugwu, A.N (2008). Current Issue in the Implementation of Senior Secondary Schools Science Curriculum in Nigeria. *Science Teachers Association of Nigeria Annual Conference*, 19-25.
- Zuhrich, S., & Enas, S.A., (2020). Science Practical Work and Its Impact On Students' Science Achievement. *Journal of Technology and Science Education*, 10(2), 199-215.