**Evaluation of Teaching Resources and Learning outcome of science students across Federal, urban and rural schools in South-west Nigeria**

 **BY**

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**ABSTRACT**

*The study evaluated the teaching resources and learning outcome of science students across federal, urban and rural schools in south west, Nigeria. A survey descriptive research design was used, to collect comprehensive data from teachers across the schools. Three hundred teachers were used for the research across Southwest Nigeria. The results showed no significant disparities in teaching resources and learning outcome between federal schools and urban schools under the state government. Federal and Urban schools had better equip laboratory, digital devices, digitally competent teachers and teaching aids while rural schools faced challenges in these areas. The study highlights the need for the Nigeria Government to address these disparities and provide equitable access to qualify chemistry education for all students*

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*Key words: Laboratory equipment, Digital resources, state school, federal schools, Teaching Resources*

**INTRODUCTION**

Nigeria is a country with a large population and growing economy but its education sector faces significant challenges. The country’s education system is characterized by inadequate infrastructure; shortage of qualified teachers and poor learning outcome (federal ministry of education (2019). Science education in particular chemistry is critical for Nigeria’s economy development and technological advancement, however the teaching and learning of chemistry in Nigerian schools are hindered by several factors including inadequate laboratory facilities, shortage of qualified science teachers and lack of access to modern technology, Okebukola (2017), Science education is essential for developing critical thinking, problem solving and analytical skills, Chemistry as a fundamental component of science plays a crucial role in the educational framework of Nigeria. It forms an essential part of the secondary school educational system, training pupils for many scientific and health-related occupations.

The goal of chemistry education in Nigeria is to give students a thorough grasp of the processes involved in learning chemistry, how to teach it most effectively, and how chemistry interacts with the environment. The curriculum seeks to improve students' critical thinking, problem-solving, and other abilities The National Policy on Education, which oversees the Nigerian educational system, places a strong emphasis on science education as a means of advancing the country. Despite this emphasis, there can be considerable regional variations in the implementation and quality of chemistry instruction due to a variety of factors, including digital devices, teachers that are proficient in digital technology, laboratory facilities, and teaching aids.

Teaching and learning are central functions of schools, with teaching aimed at transforming a learner's behaviours, including changes in attitude, knowledge, skills, or appreciation Paul, (2016). Effective teaching not only sparks student interest but also improves academic achievement. For this reason, the availability and effective use of instructional materials are crucial, as they help students grasp ideas more effectively Eze & Ojuro, (2020). While teachers play a pivotal role, they alone cannot provide all the conditions necessary for successful teaching and learning; supportive instructional resources are also essential. Instructional resources—such as visual aids, models, and hands-on materials—engage multiple senses and enhance understanding (; Maran & Burke, 2019; Nwike & Onyejegbu, 2019). Mezieobi, Fabura, and Mezieobi (2018) argued that teaching with instructional resources greatly enhances learning and content retention compared to instruction without these resources.

Effective chemistry instruction requires the use of teaching tools because they give students concrete, interactive ways to connect with difficult ideas. These materials, which improve the learning process by giving abstract concepts more tangible form, include textbooks, laboratory apparatus, multimedia aids, and practical kits. For example, printed resources like reference books, workbooks, and textbooks offer fundamental information and thorough explanations in line with academic standards (Johnson & Lee, 2021; Miller et al., 2023). Reference books facilitate advanced learning, workbooks reinforce concepts through exercises, and textbooks provide thorough covering (Wilson & Thompson, 2020). Chemistry principles can be applied practically and hands-on with the use of laboratory equipment, such as apparatus and chemical reagents. By providing dynamic and adaptable learning possibilities, educational software, online simulations, and interactive movies improve engagement and comprehension in the digital age Norton & Davis, (2023). By offering visual aids that clarify complicated information and accommodate a variety of learning styles, supplemental materials such as charts, posters, and models further enhance learning (Reid & Evans, 2022).

Well-equipped labs, current textbooks, and contemporary multimedia tools all contribute to a more engaging and comprehensive educational experience. Therefore, the availability and quality of these resources are essential for guaranteeing that students receive a strong and effective chemistry education. High-quality teaching resources can significantly improve student understanding, retention, and interest in chemistry, leading to better academic outcomes and a stronger foundation for future scientific endeavours. Inadequate or outdated teaching resources can hinder the learning process, leading to diminished educational outcomes.

Urban and rural educational contexts differ greatly, and these variations can have a substantial impact on learning results in chemistry education as well as the quantity and Caliber of instructional resources available. Students typically gain from having more access to a variety of resources in urban schools. These institutions frequently have more sophisticated facilities, such as modern technology, a wide range of texts and online resources, and well-equipped labs. The greater funding levels generally associated with urban schools, which can afford to invest in top-notch instructional materials and cutting-edge equipment, encourage the availability of these resources (Smith & Jones, 2022). Moreover, urban schools frequently attract better skilled teachers who have had significant training and professional development opportunities. This concentration of trained educators contributes to higher teaching standards and the effective use of existing resources, which can enhance the entire learning experience and lead to enhanced academic outcomes (Johnson & Lee, 2021). Although urban and rural issues might not apply in federal schools, the combination of resources and qualified teachers fosters an atmosphere that encourages high levels of student activities and achievement.

On the other hand, rural schools frequently deal with a variety of issues that may affect the standard and efficacy of instruction. Because of their lower budget levels and logistical limitations, these schools usually have limited access to resources. Consequently, rural schools could have restricted access to digital resources, obsolete laboratory equipment, and fewer textbooks (Carter & Patel, 2022). The practical components of chemistry education may be further hampered by infrastructure deficiencies, such as inadequate laboratory facilities and poor upkeep of current resources. Furthermore, compared to their urban counterparts, teachers in rural areas might not have as many possibilities for teacher training, which could result in a gap in their professional growth (Adams & Thompson, 2023). The quality of instruction as well as the capacity to use and incorporate accessible resources into the curriculum might be impacted by this lack of continuous training. As a result, these difficulties may affect kids' learning outcomes, making it more challenging for them to reach the same standard of academic achievement and conceptual comprehension found in urban schools. However, there may be unequal distribution, bureaucratic obstacles, and variation among schools. Federal schools in Nigeria may have different levels of teaching resources but greater funding, access to teaching resources, and qualified teachers.

As such, a focused evaluation of chemistry teaching resources and the impact on learning outcomes in both federal and state (urban and rural) schools is essential for formulating strategies to improve educational quality and ensure that all students receive a robust and effective education result in gaps in knowledge and understanding, ultimately factors affecting academic performance and future opportunities in science-related fields. The purpose of this study is to compare the existing condition of teaching resources in federal and state (rural and urban) schools and determine how these variations affect students' learning outcomes, particularly between federal and state (urban) schools that has almost similar factors.

## ****Research Hypotheses****

The following hypotheses guide the study

1. There is no significant difference in the current state of chemistry teaching resources between federal and state(urban) schools in southwest Nigeria
2. There is no significant difference in the current state of chemistry teaching resources between federal and state(rural) schools in southwest Nigeria
3. There is no significant difference in the learning outcome of Students between federal and state (urban)schools in southwest Nigeria.

**Literature Review**

**Concept of Teaching Resources**

Teaching resources are all the tools a teacher employs to help him or her explain or assess the topic, content, or subject to the student so that the student may fully understand it, according to the National Teachers Institute NTI, (2021). According to Mezieobi, Fubura, and Meziobi (2018), instructional resources are facilities that support instruction and learning. Pretomode (2015) asserts that teaching resources, whether they are referred to as instructional media, curriculum resources, teaching aids, or something similar, are information carriers that teachers utilize to meet learning objectives. Moses (2019) emphasizes that their designation has no other purpose than to teach, which is to bring about the desired change in students.

According to Sulaiman (2020), teaching resources are any visual, Audio, or audio-visual materials that support the process of teaching and learning by giving abstract concepts and ideas a tangible form. Additionally, the teacher uses these tools to enhance his teaching. Resources used to assist; improved results are included in instructional resources. Teaching aids and resources are defined by Richert and Siller (2019) as written and published textbooks and related core materials, including those specific resources that the teacher will employ for classroom teaching. Furthermore, Jocob (2015) explains that teaching resources are tools that help people learn, comprehend, and value ideas, abilities, values, and attitudes. The rationale is that by using these resource tasks, students' sense organs are stimulated, which promotes their active engagement in the learning process. Additionally, reality is aroused more when more senses are used in the lesson through the usage of teaching resources.

However, Ben (2015), said teaching resources comprised all the materials a teacher utilizes to help students learn and retain the information during the class. According to Ben (2015), a teacher must use a variety of aids and appeal to a range of senses in order to accommodate individual variances in the classroom. According to psychologists, the most crucial part of education is the utilization of instructional resources since children always have the mindset that "what I hear I forget, what I see I remember, but what I do, I understand." Ajibade (2019), in his own view said teaching materials are the tools that make learning easier. It is a genetic word that describes communication, experience, tools, and resources utilized to convey instruction when learning involves using multiple senses. Retention and recall are both higher when many senses are used in the learning process. For example, "what I see I remember, what I see and hear I remember, more, what I see, hear, and touch I remember most." So Effective teaching and learning may be impeded in the absence of teaching resources. Instructional resources can also be seen as those thing teacher does to help students modify their behaviour for the better.

Ema and Ajayi (2020), identify teaching resources as instruments that a teacher might utilize to support and motivate their students' learning activities. These resources efficiently address educational issues by bringing people and resources together in a methodical collaboration. A lot of learning occurs and there is a greater probability of meeting lesson objectives when instruction is carried out using teaching tools. Argungu (2015). Collaborated his views by saying without teaching resources, students may find learning to be uninteresting and overly theoretical. In light of this, Argungu (2015) contends that almost no subject is devoid of the need for some kind of instructional materials. They allow for the development of knowledge and abilities as well as the growth of self-actualization and self-confidence. Ikerionwu (2015) in his own viewed instructional materials as tools that help the teacher deliver a lesson to the students in a logical way, while Ibeneme (2015) said that teaching aids are crucial for practical and demonstration in the classroom setting by students and teacher.

However, Fadeiye (2015), viewed instructional materials as physical or non-concrete visual and audio-visual aids that teachers utilize to enhance the Caliber of their lessons. According to Agina-Obu (2015), all types of educational resources stimulate the sense organs during the teaching and learning process. Additionally, Isola (2017), said instructional materials are tools or items that help teachers deliver their teachings to students in a logical and sequential manner. It was accepted by Oluwagbohunmi and Abdu-Raheem (2020) that teachers use instructional resources to help explain concepts and make the learning process easier for students. Abdu-Raheem (2019) said that inadequate and unavailable teaching resources are the main reasons why the educational system is unproductive and why pupils do poorly in class. The benefits of instructional materials, according to Abolade (2020), include being less expensive to develop, effective at educating a large number of pupils at once, motivating students to pay attention, and boosting their interest. Additionally, Isola (2017), said instructional materials are tools or items that help teachers deliver their teachings to students in a logical and sequential manner.

**Teaching Resources and Student Performance**

Public schools experienced severe shortages of both teaching and learning resources, according to Adeogun (2019), who also observed that the quality of teaching resources available in these institutions was low. He went on to say that without basic teaching resources, effective instruction cannot take place in the classroom. Similarly, Fuller and Clark (2020) proposed that the quality of education is determined by the quality of the instructional processes that a student experiences. Mwiria (2015), said the amount and quality of teaching and learning resources have an impact on performance. This suggests that schools with sufficient teaching resources have a higher likelihood of doing well on tests than those with inadequate resources. This supports a study on the physical infrastructure and instructional resources in Tanzanian secondary schools conducted by Chonjo (2020). Chonjo conducted interviews with educators and learners regarding the contribution of educational resources to successful learning. His research showed that having sufficient teaching and learning resources and equipment in a school might improve student performance. He suggested that having enough high-quality facilities is crucial to offering high-quality education.

Akande (2021) asserts that interactions with one's surroundings can lead to learning. The amenities that are accessible to support students' learning outcomes are referred to as the environment in this context. Books, audiovisuals, software, and hardware for instructional technologies are all included, as are the classroom's dimensions, seating configuration, and the presence of tables, seats, chalkboards, and shelves that hold the tools used for practicals. When facilities are offered to satisfy the proportional needs of a school system, Ogunyemi (2020) reaffirmed this, there will be good performance each student will learn at their own pace in addition to having access to the reference materials that the lecturers have mentioned. As a result, all of their students' academic performance will improve very well.

Adesina (2020) cited outdated teaching lights on school facilities, poor and inadequate physical facilities, and moral guiding provisions as reasons why high academic attainment is not on the rise in Nigeria. However, Fabunmi (2021) asserted that when school facilities are provided, they will support the teaching and learning program and, as a result, improve students' academic performance. The aim of this study, therefore is to find out whether there are enough teaching resources in our federal schools, our state schools (urban & rural) and to also see the impact on learned outcome. The teaching resources to be considered are four.

**Sociocultural Theory of Teaching, Learning, and Development**

Because 21st century teaching materials are focused on the individual's immediate social environment, this research is founded on the sociocultural theory of teaching, learning, and development. This idea, which was largely influenced by Lev Vygotsky's 1967 writings, holds that human minds evolve as a result of ongoing interactions with the social material world. Which are: teacher digital competency, digital devices, laboratory facilities and teaching Aids (charts textbooks etc.)

 Human minds develop through interaction with materials during the learning process, when individuals learn from one another and successfully make sense of the objects they deal with it by drawing on their experiences, according to Vygotsky (1967). These experiences have been crystallized into "cultural tools," which students must master in order to acquire particular knowledge and abilities for resolving particular issues and, ultimately, to become proficient in a particular vocation. Because the tools mediate learners' thinking, which is the fundamental tenet of mental development, this idea suggests that educational resources promote cognitive development.

**METHODOLOGY**

The research employed a survey of descriptive Research Design to gather comprehensive data which made it quantitative in nature. This target population are all the chemistry teachers in federal schools, urban and rural schools representing the state schools in southwest Nigeria. The sample of the teachers were selected through stratified random sampling, one hundred (100) chemistry teachers were sampled from federal schools across southwest, 100 chemistry teachers from urban and100 teachers from rural schools, across the state, both representing the state schools, given a total of 300 teachers. Senior Secondary school two (2) student results were used, questionnaire was used to collect data. The expected responses were structured along strongly agree, agree, disagree and strongly disagree. In order to establish the validity, the questionnaire was given to expert for vetting, correction and suggestions. The test-retest method of reliability was used to ascertain the reliability of the instrument, data collected was tested with Pearson moment correlation coefficient, a reliability coefficient of 0.72 was obtained, it was adjudged to be reliable and the hypotheses were tested with T-test.

**Results**

***Hypothesis 1: There is no significant difference in the current state of chemistry teaching resources between federal and state (rural) schools in Southwest Nigeria.***

### , Table 1a.) Analysis of T- test of respondents on teaching resources on federal and state school (rural in southwest Nigeria

**Table 1a**: T-test Analysis of respondents (teachers) on teaching resources in federal and state (Rural) schools

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Type of school**  | **No** | **Mean**  | **Standard deviation**  | **df** | **Calculated** **t-value**  | **Critical****t-value** | **Decision** |
| Federal schools State schools (Rural)  | 100100 | 24.12215.918 | 10.6097.515 | 198 | 9.335 | 1.98 | rejected |

 P ≤ 0.05

### The responses from federal and state (rural) schools on availability of chemistry teaching resources were compared. An **Independent t-test was conducted for each of the variable while T-test was used to test the hypothesis.** The result revealed that the value of T tab (2.878) is greater than the value of critical value (1.98) given 198 degrees of freedom at 0.05 level of significance. This led to the rejection of the null hypothesis and the acceptance of the alternative hypothesis that there is a significant difference in the current state of chemistry teaching resources between federal and state (rural) schools in Southwest Nigeria. The result revealed clear disparities between federal schools and state schools in the rural environment, federal schools were significantly better equipped with modern and relevant digital devices, laboratory facilities, teaching aids which include charts, textbooks and the teachers are digitally competent. This finding aligned with the findings of Eniola and Adeyemi (2017), also Afolabi and Alabi (2021) that rural schools due to their limited access to resources often struggle to implement modern pedagogical techniques which include practical work and multimedia teaching. Furthermore, this disparity suggest that federal schools are better positioned to provide a more dynamic and engaging chemistry education.

**Table 1b: Table of** **Comparison of chemistry Teaching Resources Between federal and State(rural) Schools**

| **Statement** |  **t-value** | **p-value** |
| --- | --- | --- |
| Digital competence of teachers | 2.71 | 0.007 |
| Digital devices | 2.88 | 0.004 |
|  Laboratory facilities | 3.02 | 0.003 |
| Teaching aids (charts, textbooks etc) | 2.90 | 0.004 |
|  |  |  |
|  |  |  |

The result reveal significant differences in the availability of chemistry teaching resources between federal and state(rural) schools. The p-values for all statements related to the availability of Digital devices, digitally competent teachers, laboratory facilities, teaching aids, are all less than 0.05, indicating that federal schools generally have better access to resources than state(rural) schools. This suggests that federal schools are better equipped, which may lead to more effective teaching and learning, whereas rural schools face limitations in these essential areas.

### *Hypothesis 2; There is no significant difference in the current state of chemistry teaching resources between federal and state (urban) schools in Southwest Nigeria*

### .Table 2a: T-test Analysis of respondents based on teaching resources between federal schools and state schools (urban)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Type of School**  | **No** | **Mean**  | **Standard deviation**  | **df** | **Calculated** **t-value**  | **Critical****t-value** | **Decision** |
| Federal schools State schools (Rural)  | 100100 | 20.51819.725 | 13.25710.420 | 198 | 0.153 | 1.98 | Accepted  |

 P ≤ 0.05

Table 2b reveals that there is no significant difference between federal and state (urban) schools in terms of teaching resources meaning that the null hypothesis is accepted since the calculated t-value of 0.153 is less than the critical value of 1.98 for 198 degrees of freedom at 0.05 significant level. The findings showed that students in urban centres in the state schools are having equal opportunities with the students in the federal schools This result aligned with the findings of Afolabi and Alabi (2021) who found that urban schools have a better access to variety of educational resources due to the more teaching resources. The case of federal schools is not a surprise because federal schools are funded by the federal government which enables them to have better teaching resources, FME(2013) .This result also shows that some state schools in urban centres are enjoying the same benefit that most of the federal schools are enjoying, therefore urban schools in the state can compete well with federal schools because they have better access to a variety of educational teaching resources due to their more developed infrastructure.

**Table 2b**: **Differences in the Availability of Specific Teaching Resources Between Federal and State(urban) Schools**

| **Statement** | **t-value** | **p-value** |
| --- | --- | --- |
| Digital competence | 0.071 | 0.943 |
| Digital devices | 0.082 | 0.935 |
| Laboratory facilities |  0.092  |  0.927 |
| Teaching aids (charts, textbooks etc) | 1.26 |  0.209 |

The result shows that availability of teaching resources in federal and state (urban) schools have no significant difference. Both have more access to chemistry teaching resources. The p-values for all statements, such as access to Digital devices, Digital competences, laboratory facilities and teaching aids are greater than 0.05. Both schools benefit from better quality and greater availability of these resources.

***Hypothesis 3: There is no significant difference between students learning outcome and teaching resources in federal schools compare to urban state schools in southwest Nigeria***

Table 3; T test analysis of Teaching Resources and Students learning outcome of federal schools and. state schools (urban)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| Learning outcomes  | N | Mean  | SD | df | T cal | Critical t value | Decision |
| Federal schools | 100 | 22.101 | 12.142 | 198 | 0.546 | 1.98 | Accepted |
| State schools (urban) | 100 | 16.205 | 7.420 |  |  |  |  |

Significant at 0.05; df = 198

Table 3 reveals that there is no significant difference between teaching resources and learning outcome among students in federal schools and students in state (urban) schools. The null hypothesis is accepted since the calculated t value of 0.546 is less than the critical value of 1.98 for 198 degrees of freedom at 0.05 significant level

The result revealed that the learning outcome of students in federal schools is not significantly different from that of state schools in (urban ) centres .This is not a surprise because both schools are enjoying the same teaching resources hence resulting to the same learning outcome that is not significantly different from each other, some of the factors that might have led to this is that the best students are found admitted to federal schools and urban state schools because admission is done by merit ,the two categories of schools. are better funded. This result is sharing the same idea with Olaniyan and Okemakinde (2018) who found out that the absence of practical resources adversely affects students ability to perform experiments and master theoretical concepts and vice -versa .We can also see that teachers ability to effectively integrate available resources into their teaching practice plays a significant role in students achievement for example if there are digital devices without digitally competent teachers the result would have been different. In support of this result is Adeyemi (2017) who found out that urban school’s benefit from more funding and better government investment which translate into better student learning outcome which also invariably made them to compete equally with federal schools. This study concludes that the availability and quality of chemistry teaching resources are critical to effective teaching and learning. Federal schools and Urban schools in the state have access to better resources such as modern textbooks, laboratory equipment, digital devices, digitally competent teachers, teaching aids and enjoy a distinct educational advantage, enabling students to excel academically. These resources facilitate hands-on learning and deeper comprehension of concepts, which are essential for academic success. rural schools are severely constrained by all of these. These challenges collectively can hinder students’ academic progress based on the findings, the following recommendations are made to enhance Chemistry education and address disparities in teaching resources:

**RECOMMENDATION**

* + : The government should allocate specific funds for the procurement of Chemistry teaching resources, particularly in rural schools, ensuring equitable distribution.
	+ Rural schools should be provided with access to e learning resources to complement classroom instruction and foster self-directed learning, Infrastructure development and provision of digital tools.
	+ Regular training workshops should be organized to enhance teachers' proficiency in using laboratory equipment, multimedia tools, and other modern teaching aids.
	+ Teachers in rural areas should be sensitised with training scholarships and support programs to encourage their professional growth.
	+ Educational authorities should conduct regular audits to evaluate the availability, condition, and usage of chemistry/science teaching resources in schools.
	+ Chemistry curriculum should be updated to reflect advancements in teaching materials and techniques, emphasizing hands-on practical activities and technology-enhanced instruction. Practical work should be made a mandatory part of assessments.
	+ Communities and stakeholders, including non-governmental organizations and corporate bodies, should be engaged to support schools through donations, resource provision, and infrastructure development.
	+ The government should establish special intervention programs for rural schools, focusing on bridging the urban-rural divide in educational resources.
	+ Mobile laboratories and resource-sharing initiatives could provide rural students with temporary access to practical tools and experiments.
	+ The federal government and state should also improve on what they have on ground while the state government should not concentrate their funding of schools on urban centres alone but for all schools in the state so that everyone will have equal opportunities

**ETHICAL STATEMENT**

Ethical clearance was collected from the centre for research and development (CERAD), Bamidele Olumilua University of Education, Science and Technology Ikere Ekiti (BOUESTI) to carry out the research project titled; Evaluation of Teaching resources and learning outcome of students across federal, urban and rural schools in southwest Nigerian.

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