AJEMATES
African Journal of Educational Management, Teaching and Entrepreneurship Studies
VOL.13 (3), September-December, 2024 https://ajemates.org

# AN ASSESSMENT OF LABORATORY FACILITIES FOR ENSURING QUALITY TEACHING IN PUBLIC SENIOR SECONDARY SCHOOLS IN LAGOS STATE, NIGERIA

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## ABSTRACT

*The state of laboratory facilities in schools is a major concern in achieving and promoting quality teaching. Hence, this study embarked on the assessment of laboratory facilities for quality teaching in public secondary schools in Lagos State Education District V. The research involved a sample of 198 study participant. A structured rating scale with face and content validity and a reliability coefficient of 0.77 via a test-re- retest reliability method served as the primary research instrument, and four research hypotheses were formulated. The one-way ANOVA test was employed as the statistical technique at a 0.05% significance level. The findings revealed that there is a significant difference in the mean response of male and female teachers in the provision, availability, adequacy and utilisation of laboratory facilities for quality teaching among public senior secondary schools in Lagos State Education District V. Based on these findings, several recommendations are proposed. Firstly the government should prioritize equitable provision of laboratory facilities across all public secondary schools in Education District V. Secondly, Investments should be made in upgrading existing laboratory infrastructure to meet modern educational standards in Education District V. Thirdly, Continuous professional*

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African Journal of Educational Management, Teaching and Entrepreneurship Studies
VOL.13 (3), September-December, 2024 https://ajemates.org

*development programs should be instituted for teachers, focusing on the effective use of laboratory facilities in their teaching in promoting quality. lastly, government should engage with educational stakeholders, including Parent-Teacher Associations (PTAs), non-governmental organizations (NGOs), and community leaders, to advocate for improved laboratory facilities.*

**Keywords:** *Laboratory Facilities, Provision, Availability, Adequacy and Utilisation.*

## Introduction

Education is generally considered one of the basic needs of human beings. In Nigeria as well as in other countries, education is perceived as a tool for socio-economic and political developments and as such it is accorded the necessary attention. This position is amplified in the Nigerian national policy on education, which stated that education is an instrument par excellence for effecting national development, (the National Policy of Education, 2004). It is added further that education shall continue to be highly rated in the national development plans because education is the most important instrument of change and that any fundamental change in the intellectual and social outlook of any society has to be preceded by educational revolution.

Laboratory facilities in schools are essential for several compelling reasons, encompassing educational, developmental and practical aspects. Without laboratory facilities, teaching and learning of science will not take place effectively, especially in STEM where the teachers must always be around to guide and direct students in their learning process (Nkwocha, 1998). On the other hand a teacher can only achieve his objectives in teaching if enough resources are made available to him more importantly in science subjects where we need teaching resources that will ensure that the learner is exposed to a learning experience that ensures the cultivation of scientific knowledge which is of much importance to science subjects.

Academic achievement of students in practically based subjects (physics, chemistry, biology, agriculture) generally is witnessed a deplorable trend in the past decade at all levels in Nigerian secondary schools and tertiary institutions due to inadequate science facilities in the laboratories for which has contributed to student's academic performance in these subjects. Nevertheless, other factors of teaching and learning science include adequate classrooms, laboratories, use of teacher centered approach to teaching among others. According to Gbesoevi *et al* (2023) school facilities, which are a component of educational planning and administration and are pertinent to the current study. Gbesoevi *et al* (2023) see School facilities as comprising location,

weather, lighting, ventilation, floor, space per pupil, health, and safety conditions, play areas, cafeteria and library among all other things.

Practical work occupies an important place in the education of students. It is based on the assumption that learning by doing is best for acquiring process skills. Practical work may involve several facets such as illustrations of a phenomenon; exercises or routines for students to follow; developing a particular skill or becoming used to a piece of equipment or instrument. The provision, availability and utilization of laboratory facilities have been bones of contention in teaching and learning as far as one cares to go back in the literature. Laboratory facilities are costly and since its effectiveness has been difficult to substantiate compellingly, some responsible administrators have viewed it as a luxury we cannot afford. The whole educational environment that administrators, instructors and students employ to run any school with the primary goal of facilitating an effective and meaningful teaching and learning process is referred to as the school facility (Asiyai, 2019).

In the present age, new information is constantly added to the existing information in different subjects. Therefore, the main aim of providing laboratory facilities is that students should be equipped with the skills of accessing information, rather than trying to transfer information. Instead of learning by rote, students should be equipped with problem solving skills for new situations and transferred accumulated knowledge properly. Furthermore, their skills of accessing and producing information should also be improved.

To uphold the quality education delivery, educational facilities such as buildings, equipment, transportation, furniture, books and utilities are used. It is also worth noting that the supply, adequacy, use and administration of these educational facilities have a big role in determining the quality and standard of a learning institution. Facilities in schools are physical resources that facilitate efficient teaching and learning, since their availability, adequacy and relevance affect efficiency and high production from all indications.

The laboratory facilities have a direct effect on both students' attitudes and academic performance as per the instructional theory of learning interaction. It is generally believed that constant practice leads to proficiency in what the learner learns during classroom instruction; hence, the dictum "practice makes perfect". The quality of teaching and learning experiences depends on the extent of the adequacy of laboratory facilities in secondary schools and the teacher's effectiveness in the use of laboratory facilities with the aim of facilitating and providing meaningful learning experiences in the learners. Subjects cannot be properly taught without adequate facilities and equipment; all these

are lacking in our secondary schools today. There are situations where laboratories are seen without equipment during and after practical, with the outcry against poor performance of students in senior secondary school examination, there is need to assess secondary school's laboratory equipment to ascertain their status vis-à-vis their stat in meeting teaching and learning needs that will lead to national development. According to Gbesoevi *et al* (2023) quality teaching includes regular class attendance by the lecturers, and on time, lecturers communicating effectively for better understanding, prompt completion of the course contents by the lecturers, lecturers providing clinical instructions, and clinical supervision as well as the use of a professionally constructed questionnaire for the evaluation of instructors' teaching quality.

The role of laboratory for the success of an academic system is quite enormous. Knowledge is acquired as students carry out experiment. In the laboratory, scientific practices and applications are made more meaningful as they are carried out practically and the result arrived at after the tests are carried out. UNESCO in Usen (2016), observed that practical or experimental work are essential to the study of mathematics and other science subjects. It is further observed that practical teaching and learning have a positive relationship with academic achievement. They argued that an object used in practical work leaves an impression on the mind than merely seeing that object from a distance.

Enderle and Leeanne (2016) added that instructional materials/facilities promote hands-on and interactive laboratory experience. Instructional materials also support effectiveness, learning experience and enable the student to get the best out of it. Adequate provision of laboratory facilities stimulates and engages students learning at different levels, challenging them mentally and physically.

Availability of laboratory facilities for science teachers in public secondary schools can solve problems of student's poor performance in internal and external examination in science. Adebisi, Tewogbade and Olajide (2017) studied the assessment of laboratory resources in science education and their findings about laboratory facilities are that laboratory facilities help to improve science process skills by expanding the basis of interference and the ability to access large data base to activate learning. Etubon (2018) observes that the availability of laboratory facilities in schools results in increased effectiveness of the educational process and increased productivity through enhanced human capacity. This enhances the acquisition of basic knowledge and skills for economic and educational development.

Utilisation of laboratory facilities is the frequency with which the available laboratory facilities are used during

laboratory experiments. According to Adebisi, Tewogbade and Olajide (2017), laboratory facilities can be available, adequate but not utilized during teaching and expressed fervent need for utilization of instructional resources in teaching and learning. Nwagbo & Uzoma (2014) asserted that "the greatest hindrance to effective teaching in schools is not lack of necessary apparatuses but rather lack of their effective utilization". This assertion implies that there is an urgent need to ensure that teacher trainees receive adequate training in laboratory practical work during their period of training at the teacher training colleges so that they can replicate the same in schools. Anyadiegwu (2018) analyzed the extent of utilization of laboratory facilities and students' academic performance in science and found out that students who utilized laboratory facilities during science teaching and learning achieved higher than those who had no experience in laboratory activities.

Edet (2008) investigated the influence of utilization of laboratory facilities and students' academic performance in biology. Using a sample of two hundred senior secondary school students taught by utilization of laboratory facilities and the control group taught without utilization of laboratory facilities during the biology teaching. The results showed that students taught using laboratory facilities frequently achieved higher than those taught without utilizing the laboratory facilities during biology lessons. The recommendation made based on this finding was that utilization of laboratory facilities should be encouraged at all levels of the education sector. Neji (2010) in contrast found no significant relationship between utilization of laboratory facilities and students' academic performance in chemistry. Yet, inappropriate, inadequate and non-utilization of laboratory facilities have been identified by some authors as some of the possible cause of students' poor performance. For instance, Aderonmi (2006) found that students often complained from non-familiarization with biology equipment until a few weeks to external examinations and in most cases, even the teachers of the subjects did not know the use of the laboratory equipment and chemicals until the practical examination.

This study is significant to all stakeholders (government, educational planners and administrators, and policy makers). It will help to realize what problems stand as impediments to achieving quality teaching in education seeing the state of provision, availability, adequacy and utilization of laboratory facilities in secondary schools.

The main purpose of this research work is to assess state of laboratory facilities for quality teaching in terms of their provision, availability, adequacy and utilisation in public senior secondary schools in Lagos state Education District V. The sub-purpose is stated below:

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1. Find out the provisional status in term of who makes provision for laboratory facilities for quality teaching in public senior secondary schools in Lagos State Educational District V.
2. Determine the difference in the mean response of male and female teachers on the availability of laboratory facilities for quality teaching in public senior secondary schools in Lagos State Education District V.
3. Find out the difference in the mean response of male and female teachers on the adequacy of laboratory facilities for quality teaching in public senior secondary schools in Lagos State Education District V.
4. Examine the difference in the mean response of male and female teachers on the frequency of utilisation of laboratory facilities for quality teaching in public senior secondary schools in Lagos State Education District V.

**Research Question**

1. Who makes provisions for labouratory facilities for quality teaching in public senior secondary schools in Lagos State Education District V.

**Hypotheses**

1. There is no significant difference in the mean response of male and female teachers on the availability of laboratory facilities for quality teaching in public senior secondary schools in Lagos State Education District V.
2. There is no significant difference in the mean response of male and female teachers on the adequacy of laboratory facilities for quality teaching in public senior secondary schools in Lagos State Education District V.
3. There is no significant difference in the mean response of male and female teachers on the frequency of utilisation of laboratory facilities for quality teaching in public senior secondary schools In Lagos State Education District V.

**Research Method**

This study adopted a descriptive survey research design to describe the existing situation of the laboratory facilities in terms of the provision, availability, adequacy and utilisation of laboratory facilities in public senior secondary schools in Lagos state. The population of the study consists of all teachers and students in public senior secondary schools in education district V, Lagos State. This study adopted a multistage sampling technique which has established the adoption of stratified sampling technique by the placement of the educational zones. A simple random sampling technique was adopted in selecting five (4) public senior secondary schools in each zone under Education District V. equally, This study adopted a multistage sampling technique which have established the adoption of

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stratified sampling technique by the placement of the educational zones simple random sampling technique was used to select five teachers and five students from each sampled school making a total of 10 respondents from each school with a ground total of 160 participants sampled for the study across education district V. Two major instruments were used to collect data for this study. These include a rating scale on the 'Assessment of laboratory facilities rating scale" (ALFRS) in line with the common indices of facilities approved by federal ministry of education, on 0 - 5 rating scale which was responded to by students and teachers. The questionnaire contained 186 items to collect necessary information on indices of laboratory facilities which includes provision of laboratory facilities, biology laboratory, physics laboratory, chemistry laboratory, agricultural science laboratory and home economics laboratory. The rating scale was structured on rating scale of 0 - 5 points which was responded to by teachers and students. The instruments were validated through face and content validity to ensure it suit the purpose of the study. Also a test-retest reliability method was adopted to measure the consistency of the instrument with a Cronbach's Alpha of coefficients of 0.963. However, the instrument was found to be substantially reliable. Data collected was analyzed using both descriptive and inferential statistics. Descriptive statistics would include tables, charts, figures and percentages, mean and standard, while inferential statistics of analysis of variance - ANOVA was used to test the stated hypotheses through use of SPSS – Statistical Package for Social Sciences, version 27

## Results

### Research Question 1

**Table 1: Descriptive Analysis of Laboratory Facilities for Quality Teaching in Public Senior Secondary Schools in Lagos State Education District V**

| SN | Items | NC | VLC | LC | MC | HC | VHC | Mean | SD |
|---|---|---|---|---|---|---|---|---|---|
| 1 | Laboratory facilities are primarily provided by the government | 7 (4.4%) | 20 (12.5%) | 16 (10.0%) | 11 (6.9%) | 16 (10.0%) | 90 (56.3%) | 3.74 | 1.68 |
| 2 | Government agencies play roles in the provision of laboratory facilities | 10 (6.3%) | 21 (13.1%) | 23 (14.4%) | 25 (15.6%) | 37 (23.1%) | 44 (27.5%) | 3.19 | 1.59 |
| 3 | Private investors/companies/donors contribute to the provision of laboratory facilities | 41 (25.6%) | 26 (16.3%) | 23 (14.4%) | 29 (18.1%) | 18 (11.3%) | 23 (14.4%) | 2.16 | 1.76 |
| 4 | Parent Teachers Association (PTA) provide laboratory facilities | 52 (32.5%) | 18 (11.3%) | 28 (17.5%) | 24 (15.0%) | 16 (10.0%) | 22 (13.8%) | 2.00 | 1.79 |
| 5 | NGOs provide or contribute to laboratory facilities and equipment | 40 (25.0%) | 23 (14.4%) | 25 (15.6%) | 20 (12.5%) | 19 (11.9%) | 33 (20.6%) | 2.34 | 1.87 |
| 6 | Community organizations provide laboratory facilities | 76 (47.5%) | 32 (20.0%) | 18 (11.3%) | 11 (6.9%) | 15 (9.4%) | 8 (5.0%) | 1.26 | 1.57 |
| 7 | The school provides laboratory facilities and equipment | 21 (13.1%) | 20 (12.5%) | 26 (16.3%) | 29 (18.1%) | 27 (16.9%) | 37 (23.1%) | 2.83 | 1.71 |
| 8 | International organizations provide funding or support for laboratory facilities | 25 (15.6%) | 26 (16.3%) | 38 (23.8%) | 22 (13.8%) | 26 (16.3%) | 23 (14.4%) | 2.42 | 1.65 |
| 9 | Philanthropic organizations support | 44 | 32 | 26 | 21 | 19 | 18 | 1.96 | 1.71 |

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| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | laboratory facilities | (27.5%) | (20.0%) | (16.3%) | (13.1%) | (11.9%) | (11.3%) | | |
| 10 | Alumni contribute or support the provision of laboratory facilities | 31 (19.4%) | 28 (17.5%) | 27 (16.9%) | 25 (15.6%) | 23 (14.4%) | 26 (16.3%) | 2.37 | 1.74 |
| 11 | Laboratory facilities aid quality delivery of teaching and learning | 19 (11.9%) | 23 (14.4%) | 21 (13.1%) | 19 (11.9%) | 25 (15.6%) | 53 (33.1%) | 3.04 | 1.81 |
| 12 | Laboratory facilities enhance quality academic performance | 23 (14.4%) | 21 (13.1%) | 19 (11.9%) | 14 (8.8%) | 18 (11.3%) | 65 (40.6%) | 3.11 | 1.92 |
| | | | | Mean | | | | **2.53** | **1.73** |

**Source: Field Survey, (2024)**

The descriptive analysis of laboratory facilities for quality teaching in public senior secondary schools in Lagos State in Table 1 reveals noteworthy insights regarding the roles of various stakeholders. The government stands out as the primary provider of laboratory facilities, with 56.3% of respondents affirming this role, leading to a mean score of 3.74 and a standard deviation of 1.68. This relatively high mean indicates a strong consensus among respondents on the government's pivotal role, while the accompanying standard deviation suggests some variability in opinions about the adequacy and effectiveness of these facilities. In contrast, contributions from private investors, Parent Teachers Associations (PTA), and NGOs are significantly lower, with mean scores of 2.16, 2.00, and 2.34, respectively, indicating that these stakeholders are perceived to be less influential in providing laboratory facilities. The low score for community organisations, with a mean of 1.26 and a standard deviation of 1.57, underscores a broad agreement that their involvement is minimal and possibly ineffective.

The overall mean of 2.53 and a standard deviation of 1.73 imply that responses are clustering around the midpoint of the scale, suggesting a mixed perception regarding the state of laboratory facilities in public senior secondary schools. This clustering indicates that while some respondents recognize the importance of these facilities, there remains a significant portion who may feel that the existing provisions are insufficient or not adequately meeting educational needs. The relatively high standard deviation reflects considerable variation in perceptions, indicating that while a segment of respondents may view laboratory facilities favorably, others hold contrasting views, highlighting gaps in access or quality. Additionally, the positive impact of laboratory facilities on teaching quality and academic performance is emphasized, with mean scores of 3.04 and 3.11 for their roles in quality delivery and enhancement of academic outcomes, respectively. However, the notable standard deviations of 1.81 and 1.92 indicate varied perceptions, suggesting that while many recognize the value of laboratory facilities, there is still uncertainty regarding their consistency and overall effectiveness. These findings underscore the necessity for improved support from non-governmental sources; enhanced collaboration from private investors, PTAs, and NGOs could significantly augment the provision of laboratory facilities, thereby

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improving educational outcomes in Lagos State.

**Test of Hypotheses**

**Pre-estimation Test**

Since the independent t-test assumes that the data in each group is normally distributed, it becomes very critical to determine the normality of the data. The Shapiro-Wilk test and the Kolmogorov-Smirnov tests were conducted.

**Table 2: Tests of Normality Results**

| | Kolmogorov-Smirnov[a] | | | Shapiro-Wilk | | |
|---|---|---|---|---|---|---|
| | Statistic | df | Sig. | Statistic | Df | Sig. |
| Provision | .078 | 158 | .020 | .962 | 158 | .000 |
| Availability | .075 | 158 | .030 | .992 | 158 | .489 |
| Adequacy | .083 | 158 | .010 | .978 | 158 | .013 |
| Utilisation | .067 | 158 | .077 | .987 | 158 | .162 |

a. Lilliefors Significance Correction

The normality tests in Table 2 show mixed results for the four variables using the Shapiro-Wilk tests. For Provision and Adequacy, both tests indicate significant deviations from normality, with p-values below 0.05, meaning these variables are not normally distributed. Availability and Utilisation, however, show non-significant p-values in the Shapiro-Wilk test (p = 0.489 and p = 0.162, respectively), suggesting that these variables are normally distributed. Since the test indicates that Provision and Adequacy are not normally distributed, a Mann Whitney U Test (Wilcoxon Rank Sum Test- non-parametric estimation was applied while the independent sample t test was applied to Availability and Utlisation in the test of hypotheses.

## Hypothesis One

**Table 3 Descriptive Statistics for Availability of Laboratory Facilities in Public Senior Secondary Schools**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Availability | Male | 66 | 105.7424 | 19.65809 | 2.41974 |
| | Female | 94 | 97.4149 | 15.29946 | 1.57802 |

Table 3 provides descriptive statistics for the availability of laboratory facilities in public senior secondary schools, differentiated by gender. The analysis shows that male teachers (N = 66) reported a mean availability score of 105.74 (± 19.66), while female teachers (N = 94) reported a lower mean score of 97.41 (± 15.30). The standard deviations indicate that male teachers experienced a slightly higher variability in their availability scores compared to female teachers. The standard error of the mean

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suggests a more precise estimate of the mean availability for female teachers, as it is smaller than that for male teachers. Overall, these statistics highlight a notable difference in perceptions of laboratory facility availability between male and female teachers in the surveyed schools.

**Table 4: Independent Samples Test results on Availability of Laboratory Facilities in Public Senior Secondary Schools**

| | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|
| | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | Lower | Upper |
| Availability | 2.883 | 117.225 | .005 | 8.32753 | 2.88882 | 2.60648 | 14.04858 |

The Independent Samples Test results in table 4 reveal a statistically significant difference in the mean responses regarding the availability of laboratory facilities between male and female teachers in public secondary schools in Lagos State Education District V. The t-test results show a t-value of 2.883 with 117.225 degrees of freedom and a significance level of .005 ($p < .05$). The mean difference of 8.32753 indicates that, on average, male teachers perceive the availability of laboratory facilities more favorably than female teachers, with a 95% confidence interval ranging from 2.60648 to 14.04858, further supporting the significant difference between the two groups.

Since the significance level is less than 5% significance level, the null hypothesis, which posits no significant difference between the mean responses of male and female teachers, is rejected and concludes that there is a significant difference in the mean response of male and female teachers on the availability of laboratory facilities in public secondary schools in Lagos State Education District V.

**Table 5: Independent Samples Effect Sizes**

| | | Standardizer[a] | Point Estimate | 95% Confidence Interval | |
|---|---|---|---|---|---|
| | | | | Lower | Upper |
| Availability | Cohen's d | 17.22661 | .483 | .163 | .802 |
| | Hedges' correction | 17.30892 | .481 | .163 | .798 |
| | Glass's delta | 15.29946 | .544 | .219 | .867 |

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control group.

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Table 5 presents the effect sizes for the availability of laboratory facilities in public senior secondary schools, calculated using Cohen's d, Hedges' correction, and Glass's delta. Cohen's d shows a point estimate of 17.22661 with a 95% confidence interval ranging from .163 to .802, indicating a large effect size, suggesting a substantial difference in perceptions of availability between male and female teachers. Hedges' correction yields a similar effect size of 17.30892, reinforcing the findings while accounting for sample size bias. Glass's delta, which specifically focuses on the control group's standard deviation, reveals a point estimate of 15.29946 with a confidence interval from .219 to .867, also indicating a significant effect. Overall, these effect sizes underscore the practical significance of the observed differences in perceptions regarding laboratory facilities' availability between genders, emphasizing that the results are not only statistically significant but also meaningful in educational contexts.

**Hypothesis Two**

$H_{03}$: There is no significant difference in the mean response of male and female teachers on the adequacy of laboratory facilities in public secondary schools in Lagos State Education District V.

**Table 6: Descriptive Statistics for Adequacy of Laboratory Facilities in Public Senior Secondary Schools**

| | N | Mean | Std. Deviation | Minimum | Maximum |
|---|---|---|---|---|---|
| Adequacy | 160 | 126.8000 | 15.71995 | 70.00 | 174.00 |
| Gender | 160 | 1.5875 | .49383 | 1.00 | 2.00 |

Table 6 presents the descriptive statistics for the adequacy of laboratory facilities in public senior secondary schools, based on a total sample size of 160 respondents. The mean adequacy score is 126.80 (± 15.72), indicating a generally high level of adequacy in the laboratory facilities, with scores ranging from a minimum of 70.00 to a maximum of 174.00. This broad range suggests notable variability in the perceived adequacy of laboratory resources across different schools, highlighting that while some institutions meet or exceed standards, others may fall short. The gender variable shows a mean of 1.59 (± 0.49), reflecting a fairly balanced representation between male and female students, with scores of 1.00 and 2.00 denoting the two categories. The standard deviation for adequacy indicates varying experiences among respondents regarding the quality of laboratory facilities, suggesting that inconsistencies in adequacy could affect the learning experiences of students.

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**Table 7: Ranks of Adequacy of Laboratory Facilities in Public Senior Secondary Schools**

| | Gender | N | Mean Rank | Sum of Ranks |
|---|---|---|---|---|
| Adequacy | Male | 66 | 87.89 | 5800.50 |
| | Female | 94 | 75.31 | 7079.50 |
| | Total | 160 | | |

Table 7 presents the ranks of the adequacy of laboratory facilities in public senior secondary schools, categorized by gender. The analysis includes a total of 160 respondents, with 66 males and 94 females participating in the survey. The mean rank for males is 87.89, indicating that male respondents generally perceive the adequacy of laboratory facilities more favorably compared to their female counterparts, who have a mean rank of 75.31. The sum of ranks reflects this difference, with males contributing a total rank of 5800.50, while females account for a sum of 7079.50. This disparity in mean ranks suggests that male teachers perceive the adequacy of laboratory facilities to be higher than female teachers do. These findings may imply differing experiences or expectations regarding laboratory facilities, highlighting the importance of considering gender perspectives in evaluating the adequacy of educational resources in public senior secondary schools.

**Table 8: Mann-Whitney U and Wilcoxon W Test result for Adequacy of Laboratory Facilities in Public Senior Secondary Schools**

| | |
|---|---|
| Mann-Whitney U | 2614.500 |
| Wilcoxon W | 7079.500 |
| Z | -1.691 |
| Asymp. Sig. (2-tailed) | .091 |

Table 8 displays the results of the Mann-Whitney U and Wilcoxon W tests conducted to examine the adequacy of laboratory facilities in public secondary schools in Lagos State Education District V, with the hypothesis that there is no significant difference in the mean responses of male and female teachers. The Mann-Whitney U statistic is 2614.500, and the Wilcoxon W statistic is 7079.500. The Z-value is -1.691, with an asymptotic significance (2-tailed) of .091. Consequently, the results suggest that there is no significant difference in the perceptions of male and female teachers regarding the adequacy of laboratory facilities. Since the p-value exceeds the conventional alpha level of 0.05, the null hypothesis cannot be rejected. This finding implies a consensus among both genders on the state of laboratory facilities in public

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secondary schools, highlighting the need for further investigation into the factors influencing these perceptions.

**Hypothesis Three**

$H_{02}$: There is no significant difference in the mean response of male and female teachers on the frequency of utilization of laboratory facilities in public senior secondary schools in Lagos State Education District V.

**Table 9 Descriptive Statistics for Utilisation of Laboratory Facilities in Public Senior Secondary Schools**

| | Gender | N | Mean | Std. Deviation | Std. Error Mean |
|---|---|---|---|---|---|
| Utilisation | Male | 66 | 82.3788 | 16.39302 | 2.01784 |
| | Female | 94 | 103.0106 | 16.40580 | 1.69213 |

Table 9 presents the descriptive statistics for the utilization of laboratory facilities in public senior secondary schools, categorized by gender. The analysis reveals that male teachers (N = 66) reported a mean utilization score of 82.38 (± 16.39), while female teachers (N = 94) indicated a higher mean score of 103.01 (± 16.41). The standard deviations for both groups are relatively similar, suggesting comparable variability in utilization perceptions among male and female teachers. Additionally, the standard error of the mean indicates a more accurate estimate of female teachers' mean utilization score, as it is slightly smaller than that for male teachers. Overall, these statistics underscore a significant difference in the perceptions of laboratory facility utilization, with female teachers reporting higher utilization compared to their male counterparts, pointing to a potential disparity in how laboratory resources are accessed and employed in the educational environment.

**Table 10: Independent Samples Test results on Utilisation of Laboratory Facilities in Public Senior Secondary Schools**

| | t-test for Equality of Means | | | | | | |
|---|---|---|---|---|---|---|---|
| | t | df | Sig. (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | Lower | Upper |
| Availability | -7.833 | 15 8 | .000 | -20.63185 | 2.63380 | -25.83384 | -15.42986 |

The results from Table 10 present the independent samples t-test for the frequency of utilization of laboratory facilities in public senior secondary schools, with a focus on the hypothesis that there is no significant difference in the mean responses of male and female teachers. The analysis indicates a t-value of -7.833 with 158 degrees of freedom and a highly significant p-value of .000. This suggests a substantial difference in mean utilization between genders, specifically indicating that male teachers reported a significantly lower mean utilization score compared to female

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teachers, with a mean difference of -20.63 (± 2.63). The 95% confidence interval for the difference ranges from -25.83 to -15.43, reinforcing the conclusion that female teachers utilize laboratory facilities more frequently than their male counterparts. Since the significant value is less than 5% level, the hypothesis is rejected, indicating a significant gender disparity in the frequency of laboratory utilisation in the surveyed schools.

**Table 11 Independent Samples Effect Sizes**

| | | Standardizer[a] | Point Estimate | 95% Confidence Interval Lower | Upper |
|---|---|---|---|---|---|
| Availability | Cohen's d | 16.40055 | -1.258 | -1.600 | -.912 |
| | Hedges' correction | 16.47892 | -1.252 | -1.593 | -.908 |
| | Glass's delta | 16.40580 | -1.258 | -1.618 | -.892 |

a. The denominator used in estimating the effect sizes.
Cohen's d uses the pooled standard deviation.
Hedges' correction uses the pooled standard deviation, plus a correction factor.
Glass's delta uses the sample standard deviation of the control group.

Table 11 presents the independent samples effect sizes for the availability of laboratory facilities in public senior secondary schools, providing insights into the magnitude of differences between male and female teachers. The calculated effect sizes include Cohen's d, Hedges' correction, and Glass's delta. Cohen's d has a point estimate of 16.40, suggesting a very large effect size, with a 95% confidence interval ranging from -1.60 to -0.91. Similarly, Hedges' correction yields an effect size of 16.48, also indicating a substantial effect, with a confidence interval from -1.59 to -0.91. Glass's delta, with a point estimate of 16.41, reinforces these findings with a confidence interval from -1.62 to -0.89. These results collectively suggest that the difference in availability of laboratory facilities between genders is not only statistically significant but also practically meaningful, highlighting a pronounced disparity in perceptions of laboratory facility availability among male and female teachers. The substantial effect sizes indicate that gender plays a crucial role in how laboratory facilities are perceived and utilized in these schools.

**Discussion of Findings**

Analysis of hypothesis one shows that there is a significant difference in the mean response of male and female teachers on the status of provision of laboratory facilities in public secondary schools in Lagos state Education District V. The significant difference in male and female teachers' perceptions of the provision of laboratory facilities in public secondary schools in Lagos State Education District V may arise from various factors, including differing experiences, expectations, and perspectives on resource allocation (Marianne, 2011).

Gender roles and cultural influences could shape how teachers perceive the adequacy and availability of facilities. Additionally, systemic inequalities in resource distribution may contribute to these disparities, indicating a need for a more equitable approach to ensure that all educators have the necessary resources to support their students effectively. Moreover, the findings from Alufohai and Azeigbe (2016) and Mikanjuola and Sidiq (2013) reinforce the importance of specialized facilities in enhancing educational outcomes. Alufohai and Azeigbe's study revealed that students taught in a French language laboratory performed significantly better than those who received instruction solely in traditional classrooms, underscoring the value of well-equipped facilities in promoting effective learning. Conversely, Mikanjuola and Sidiq reported that all the senior secondary schools they assessed in Ekiti State lacked geography laboratories, indicating a critical deficiency in vital infrastructure. This lack of resources could lead to dissatisfaction and differences in perceptions among educators, further emphasizing the need for equitable access to laboratory facilities to ensure that all teachers, regardless of gender, can provide high-quality education. These studies collectively highlight those disparities in resource availability and utilization can shape educators' perceptions, potentially explaining the significant differences observed in this current study.

Analysis of hypothesis two shows that there is a significant difference in the mean response of male and female teachers on the availability of laboratory facilities in public secondary schools in Lagos State Education District V. The significant difference in the mean responses of male and female teachers regarding the availability of laboratory facilities in public secondary schools may stem from variations in their experiences and perceptions of resource accessibility. Male and female teachers might have different levels of engagement with laboratory facilities, influenced by factors such as departmental priorities, teaching assignments, or gender biases within the school system. Additionally, the historical context of resource allocation and infrastructural investment in education could lead to discrepancies in how each group perceives the availability of these facilities. The finding of a significant difference in the mean responses of male and female teachers regarding the availability of laboratory facilities in public secondary schools in Lagos State Education District V can be robustly discussed in light of empirical evidence from studies such as that of Ngozi and Salisu (2015). In their research, which focused on the availability and utilization of laboratory facilities in Zaria, Kaduna State, the authors found that a staggering 51.8% of students reported that teachers did not conduct practical lessons, highlighting a critical deficiency in laboratory access.

Analysis of hypothesis three shows that there is no significant difference in the perceptions of male and female teachers regarding the adequacy of laboratory facilities. The finding may stem from a shared experience of resource constraints within public secondary schools. Both male and female teachers might be facing similar challenges related to the availability and quality of laboratory facilities, leading to a consensus in their perceptions. Additionally, the collective understanding of inadequacies—such as limited access to modern equipment and insufficient laboratory space—could result in a uniform assessment of adequacy, regardless of gender. This suggests that the overall environment and systemic issues affecting laboratory facilities impact teachers equally, thereby diminishing any perceived gender-based differences in their evaluations of adequacy. The finding that support Gbesoevi *et al.* (2022) who highlighted the critical relationship between the availability of educational facilities and the quality of teaching in universities in Lagos, revealing that inadequate facilities negatively impact the teaching experience. This trend is likely to be similar in secondary schools, where both male and female teachers may share a common perception of inadequacy. Gbesoevi (2019) further presupposes that school physical facilities are essential for educational planning, stating that without adequate resources, students' academic performance cannot be enhanced. This underscores that the shared perceptions of inadequacy among teachers may stem from systemic deficiencies affecting all educators equally.

Analysis of hypothesis four shows that there is a significant difference in the mean response of male and female teachers on the frequency of utilisation of laboratory facilities in public senior secondary schools In Lagos State Education District V. The finding may stem from differing teaching methodologies and attitudes toward practical education. Male and female teachers often exhibit varying levels of confidence and comfort in using laboratory resources, influenced by social and cultural factors. These disparities can affect their engagement with hands-on teaching practices, leading to discrepancies in the actual use of laboratory facilities. The finding corroborates Mikanjuola and Sidiq (2013) who reported that all geography laboratories in Ekiti State were unavailable, indicating a critical shortage of essential facilities for effective teaching and learning. This absence of laboratories severely limits teachers' ability to conduct practical lessons, impacting their confidence and willingness to engage students in hands-on learning experiences. Equally too, Oyelami *et al* (2024), presupposes that both educational facilities and teachers' quality are integral components in shaping the academic performance of pupils in public primary schools.

## Conclusion

Conclusively, it can be drawn from this study that laboratory facilities provision, availability, adequacy and utilization is a notable determinant of quality teaching in public senior secondary schools in Lagos State. More so, it is concluded that there is a relationship between laboratory facilities, provision, availability, adequacy and utilization and quality teaching in public senior secondary schools in Lagos state, Nigeria.

## Recommendations

Following the findings of this, it is recommended that:

1. The Lagos State Ministry of Education should prioritize the equitable provision of laboratory facilities across all public secondary schools in Education District V. This includes ensuring that both male and female teachers have equal access to well-equipped laboratories, thus addressing the identified significant differences in perceptions regarding the status and availability of these facilities.
2. Investments should be made in upgrading existing laboratory infrastructure to meet modern educational standards. This includes not only providing adequate equipment and materials but also ensuring that facilities are maintained in good working condition. Schools should receive regular assessments to identify specific needs and gaps in their laboratory provisions.
3. Continuous professional development programs should be instituted for teachers, focusing on the effective use of laboratory facilities in their teaching. Training workshops can be organized to enhance teachers' skills in integrating laboratory work into their curriculum, thereby increasing the frequency of utilisation of these facilities.
4. The local government should engage with educational stakeholders, including Parent-Teacher Associations (PTAs), non-governmental organizations (NGOs), and community leaders, to advocate for improved laboratory facilities. Collaborative efforts can mobilize resources and support for enhancing laboratory services in schools.

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