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EFFECT OF CLASSROOM ENVIRONMENT ON THE PERFORMANCE OF STUDENT IN CHEMISTRY (A CASE STUDY OF SOME SELECTED SENIOR SECONDARY SCHOOL IN IREPODUN LOCAL GOVERNMENT OF KWARA STATE

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Abstract
Secondary School Students in Kwara State's Irepodun Local Government Area had their chemistry test scores analyzed to see if there was a correlation between the classroom environment and their performance. Focusing on how classroom environment affects student engagement and performance was the main goal of the research. Finding out if classroom dynamics have an effect on students' chemistry performance was the primary motivation for the research, but secondary objectives included seeing if the relationship was different for male and female students. The study's methodology was a pre- and post-test quasi-experimental design. All of the students were from the Irepodun Local Government Area in Kwara State; one hundred forty pupils from secondary schools in Kwara State's Irepodun Local Government area were randomly selected to participate in the study. The data for this study was collected using the Chemistry Interest Scale (CIS) and the Chemistry Performance Test (CPT). The reliability of the instruments was checked using a test-retest technique, which produced reliability coefficients of 0.85 and 0.82, respectively. Statistical tests for analysis of variance and analysis of covariance were applied to analyze the data gathered. Results showed that students' chemistry performance and interest were affected by classroom setting, although gender did not play a role in the interaction between the two. The government and notable individuals should foster an encouraging classroom setting for their students so that they can excel in school.
Keywords: Classroom, Learning environment, Students' interest, gender, Chemistry.

Introduction
These days, most news stories revolve on some aspect of science or technology. A liberationist economic policy and the rise of a global village define this new era. As a result, tight oversight of all school activities, especially classroom activities, is necessary (Usman 2016).
Chemistry is a vital branch of science, asserts Knight (2018). It examines the building blocks of matter—the atoms and molecules—and how they behave, as well as their makeup and structure. Many other human endeavors, including those in the home, in agriculture, in health, and in industry, rely on chemistry as an intermediary between many scientific disciplines. Some of the household necessities, for instance, include chemical byproducts. According to Sekhon (2014), chemistry provides the groundwork for agricultural technology that allows for the production, processing, and preservation of crops. Similarly, analytical and industrial chemistry laid the groundwork for the operational production procedures used in engineering, capital goods, manufacturing, and the engineering sector. According to Karch and Sevian (2022), chemistry is a crucial discipline since it interacts with two separate areas of study: biochemistry and physical chemistry and chemical physics. According to Olubu (2015), a chemistry student's course of study consists of both theoretical and practical laboratory work, with a heavy emphasis on concepts, principles, laws, and theories. These lab experiments will test some of the theoretical

ideas discussed in class, demonstrate the characteristics of substances we've talked about, and assess the reliability of different empirical chemical laws. Therefore, to provide a solid groundwork for technological advancement, chemistry education should be a priority in every nation's educational system (Ogbu 2016). Science seems to rely heavily on chemistry since, the amount of chemistry taught in schools is inversely proportional to a country's scientific progress (Etiubon and Benson, 2014). Despite chemistry's intrinsic potential, human value, and researchers' attempts to improve chemistry education, especially at the secondary school level, students' performance on recent public exams in the subject has been discouraging (WAEC Chief Examiner's report, 2010). Our objectives in chemistry education are jeopardized unless we reverse this trend. Low scores in non-science subjects, and Chemistry in particular, on the SSCE, support the assumption that there is ineffective teaching and learning of Chemistry (Ogbo, 2017). It demonstrates that pupils aren't acquiring the necessary knowledge, which may be due to a lack of laboratory practice. It calls attention to an issue that needs fixing: the way chemistry is taught and learned in secondary schools. As chemistry relies so heavily on student investigation, a well-equipped classroom should prioritize hands-on activities while teaching the topic. Research by Akani (2015) indicates that labs can help students develop their scientific interests, curiosity, attitude, creativity, and problem-solving abilities. The scientific method and abstract ideas are both aided by these settings for the benefit of the pupils.

The classroom environment encompasses not only the educational components but also the students' social and emotional well-being (Ambrose, 2015). Good teaching methods, good facilities, a teacher's personality and leadership style that is conducive to the learning environment, student behavior, teacher attitude, and the overall atmosphere are all parts of what Chukwuemeka (2013) calls the classroom environment. According to Ezike (2018), students that are extremely driven tend to put in more efforts when they are learning. In this context, the word "psychological environment" refers to the social quantity of the school and classroom, more specifically, the way in which individuals view and evaluate the relationships between instructors and their pupils. When talking about the ambience of a classroom, academics often use the phrases "classroom psychological environment," "classroom social climate," "classroom social interactions," and "classroom social relationship" interchangeably (Yishak 2017).

Practical lab work is an integral part of chemistry courses. The Chemistry lab provides students with a wealth of specialized equipment that is essential for their work, for the pupils to get the most modern technology, they must be adequately prepared. Educators are more motivated than ever to implement innovative instructional strategies that capture students' interest and boost their academic performance. Researchers have identified a lack of adequate laboratory facilities, inadequate teaching methods that put the teacher first, and students' unfavorable attitudes towards the subject as the root causes of this poor performance (Kyakuwa, 2017; Ogbu, 2018; Obiakor, 2023). According to Adeyegbe, pupils' poor performance in practical chemistry stemmed from teachers' ineffective guidance during laboratory sessions (1997). According to Ikeobi (1999), there were several cases where examiners couldn't mark applicants' volumetric analysis titres. This was either because there were large discrepancies between the titres of teachers and students, or because the titre values of teachers were so absurd that they were completely disregarded. Akomolafe and Adesua (2016) also noted that many secondary schools did not have enough science resources. To develop solutions, we need to reassess the situations where students perform poorly and when chemistry instruction is subpar. The present focus of such a re-examination should be to determine the effects of the laboratory environment on

students' learning outcomes. When given the opportunity and supported by an engaging classroom environment, students can take responsibility of their own education and improve their performance. Low scores in Chemistry and related subjects could be an indication of how badly equipped school laboratories are for teaching the subject; the lack of research on the effects of laboratory instruction on the learning outcomes of chemistry students in Nigerian secondary schools has also been ascertained (Olubu 2015).

Interest, an educational concept that governs aspects of the affective domain, is essential to the learning and instruction process, in contrast to performance, which is part of the cognitive domain (Adeleye & Omotayo, 2020). One indicator of a student's knowledge value system is the areas in which they show the most interest (Okoro, 2022). What this means is that students' interest in an activity or piece of information is affected by the value they assign to it. Things that really fascinate a student help shape their thoughts, encourage them to keep going till they achieve their goals, and drive their critical thinking skills. Students' engagement and success in the classroom go hand in hand; when students are interested, they work more, and when they work well, they work harder still. The inverse is also true: when people aren't enthusiastic, they don't learn as much and end up performing poorly.

Gender refers to the socially and culturally constructed roles and traits associated with men and women. Gender stereotypes and biases affect particular professions and vocations in Nigeria, as stated by Oludipe (2012). In Nigeria, men are often associated with the medical, engineering, and architectural professions, while women are more commonly associated with the service industries, such as catering, nursing, and typing. Many studies have shown conflicting results and fervent disagreement in the field of science education about the pervasive gender prejudice that science is mostly a male-dominated endeavor; previous research (Ogunojemite, Omotayo & Jegede, 2009; Oludipe, 2012 and Nwagbo & Chukelu, 2014) suggests that girls and boys do not significantly differ in their interest in or performance in chemistry. Numerous studies have shown that male and female students' interest and performance in Chemistry varies considerably. These studies include Nasr and Asghar (2011), Okoro (2011), and Omotayo, Adedayo, and Ayeni (2014), among others. The paucity of literature on learning settings makes the necessity of doing a scientific investigation on the subject all the more apparent. The goal of this study was to compare the effects of a laboratory setting with that of a conventional classroom on students' chemical knowledge acquisition.

Statement of the Problem

The quality of science students produced by secondary schools in Nigeria is very disappointing, despite the government's efforts to promote science education in the country and its recommendations for innovative methods of teaching and learning science subjects, including biology. The results of the West African Secondary School Certificate Examination (WASSCE) and the National Examinations Councils' Secondary School Certificate Examination (NECOSSCE) demonstrate that students are performing poorly in this subject. This poor performance could be due to several factors, including ineffective teaching methods, outdated instructional materials, students' lack of interest, and even gender and location as influences.

It is important to examine how students' learning environments impact their success in chemistry classes.

Purpose of the Study

The primary goal of this research is to investigate how the physical classroom setting influences chemistry students' achievement in the Irepodun Local Government Area. This study set out to

answer two main questions: (a) how do students' interest in and performance in chemistry classes compare across two different types of classrooms (chemistry lab and conventional class)? and (b) how do these two types of classes compare across students' performance in chemistry.
(c) look into how gender interacts with the classroom setting to affect students' chemistry grades.
(d) look into how gender interacts with the classroom climate and chemical interest among students.

Research Hypotheses

The following hypotheses were tested at p<.05 level of significance:

1. Students' performance is not significantly different when exposed to the two types of learning environments (traditional classroom and laboratory).
2. The two aspects of the chemistry classroom (Laboratory and Conventional class) do not significantly affect the students' interest.
3. Gender has no significant interactive effect on the performance of students exposed to the two dimensions of teaching chemistry
4. Gender has no significant interactive effect on the interest of students exposed to the two dimensions of teaching chemistry

Method

The population for the study consisted of all senior secondary school students offering Chemistry in public secondary schools in Irepodun Local Government Area of Kwara State. The sample for the study comprised 140 senior secondary school II Chemistry students in their intact classes from six schools randomly selected from the schools in the Local Government Area. Three of the six schools were randomly assigned to the experimental groups (Laboratory) and the other three schools were assigned to the control group. Two research instruments were used for the study. They are: Chemistry Performance Test (CPT) was used to determine students' Performance in Chemistry, and it consisted of a 4-option multiple choice of 20 items for which a table of specification was constructed to ensure content validity. Chemistry Interest Scale (CIS) was used to measure students' Interest in the learning of Chemistry. The instruments were validated by consultation with experts in science education, Chemistry, tests and measurements, the reliability of the instruments was determined using Kuder Richardson formula 21 (KR – 21), Chronbach Alpha which yielded the reliability co-efficient of 0.82 and 0.85for CPT and CIS respectively.

Results

Hypotheses Testing

Hypothesis 1: Students' performance is not significantly different when exposed to the two types of learning environments (traditional classroom and laboratory)

Students' post-treatment performance was analyzed using t-test for statistical significance at the 0.05 level of significance to test the hypothesis. Table 1 shows the final result.

Table 1: t-test analysis for post-test performance mean scores of students exposed to the two dimensions of learning environment (laboratory and conventional classroom).

Variations	N	Mean	SD	df	t_{cal}	P (Sig)	Rem.
Chemistry Laboratory	74	83.29	4.52	138	57.20	0.000*	Significant
Conventional classroom	66	48.12	2.26				

*P>0.05

The t-cal value of 57.20 is considered significant according to Table 1, as the P value (0.000) is less than 0.05 at the 0.05 threshold of significance. It follows that the null hypothesis cannot be

true. Therefore, students exposed to the two types of learning environments (traditional classroom and laboratory) perform significantly differently. Students who had prior experience in a chemistry lab had a far higher mean score (35.17) compared to those who did not have prior lab experience.

Hypothesis 2: The two types of the chemistry classroom (Laboratory and Lecture method) do not significantly affect the students' interest.

Students' post-treatment interest was analyzed using t-test for statistical significance at the 0.05 level of significance to test the hypothesis. Table 2 shows the final result.

Table 2: t-test analysis for difference in the interest of students exposed the two dimensions of Chemistry learning environment (Chemistry laboratory and conventional classroom) in Chemistry.

Variations	**N**	**Mean**	**SD**	**Df**	**t_{cal}**	**P (Sig)**	**Rem.**
Chemistry Laboratory	74	75.62	4.70	138	17.632	0.000*	Significant
Conventional Classroom	59	62.58	3.96				

*P>0.05

According to Table 2, the t-cal value of 17.632 is considered significant at the 0.05 level of significance because the P value (0.000) is less than 0.05. It follows that the null hypothesis is rejected. Therefore, students exposed to the two aspects of the chemistry learning environment the chemistry lab and the traditional classroom show quite different levels of interest in the subject. There was disparity in interest between students who had access to Chemistry Laboratory and those who did not, suggesting that the former was more engaged.

Hypothesis 3: Gender has no significant interactive effect on the performance of students exposed to the two dimensions of teaching chemistry.

Hypothesis testing involves using Two-way Analysis of variance (ANOVA)to test whether or not there is a significant interactive effect on the performance of students exposed to the two dimensions of teaching chemistry. Table 3 displays the final results.

Table 3: Two-way Analysis of Variance (ANOVA) for treatments of male and female students' performance in chemistry.

Source	**Sum of Squar**	**Df**	**Mean Square**	**F**	**Sig.**
Corrected Model	43207.251[a]	3	14402.417	1100.830	.000
Intercept	563729.646	1	563729.646	43087.936	.000
Treatment	40647.173	1	40647.173	3106.813	.000
Gender	22.674	1	22.674	1.733	.190
Treatment * Gender	15.846	1	15.846	1.211	.273
Error	1779.320	136	13.083		
Total	668098.000	140			
Corrected Total	44986.571	139			

a. R Squared = .960 (Adjusted R Squared = .960) p>0.05

Table 3 reveals that the F-cal value of 1.211 is not statistically significant because the P-value (0.273) is more than 0.05. Accordingly, we do not reject the null hypothesis. Students' performance when exposed to the two modalities of teaching chemistry is not significantly affected by gender. This suggests that the gender of the students exposed to the two methods of chemistry teaching does not interact in a way that significantly impacts their performance.

Hypothesis 4: Gender has no significant interactive effect on the interest of students exposed to the two methods of teaching chemistry. Two-way Analysis of variance (ANOVA) was performed to calculate the significant interactive effect on the interest of students exposed to the two dimensions of teaching chemistry. The final table is shown in Table 4.

Table 4: Two-way Analysis of Variance (ANOVA) of interest towards Chemistry of male and female students in experimental and control groups

Source	**Sum of Squar**	**Df**	**Mean Square**	**F**	**Sig**
Corrected Model	5964.174[a]	3	1988.058	103.643	.000
Intercept	623167.595	1	623167.595	32487.604	.000
Treatment	5395.357	1	5395.357	281.276	.000
Gender	16.243	1	16.243	.847	.359
Treatment * Gender	12.303	1	12.303	.641	.425
Error	2608.712	136	19.182		
Total	684252.000	140			
Corrected Total	8572.886	139			

a. R Squared = .696 (Adjusted R Squared = .689) p>0.05

As indicated by table 4; showed that the F-cal value of 0.641 is not statistically significant because the P-value (0.197) > 0.05. Accordingly, we do not reject the null hypothesis. This finding disproves the hypothesis that students' interest in either of the two facets of chemistry instruction is significantly affected by their gender. Students' interest in both aspects of chemistry instruction is unaffected by gender, suggesting that the two do not interact significantly.

Discussion

The research looked into how students' interest in and performance in chemistry were affected by the two types of the classroom learning environment that students encountered: the chemistry laboratory and the lecture method. We also found out how students' performance in chemistry was affected by these two types of learning environment, and how gender interacted with both. The results of this study demonstrate that the two types of learning environments; a chemistry lab and a traditional classroom have a notable impact on students' performance. Students who spent more time in the lab outperform those in a traditional classroom setting. The results show that students in the experimental group performed better than those in the lecture method group when taught chemistry through a laboratory setting, and that students in the experimental group were more engaged when taught chemistry through a laboratory setting than when taught using the lecture method. Students' curiosity, motivation, and performance in chemistry were clearly

enhanced by using resources that caught their attention, inspired their interest, and appealed to both their sight, hearing, feeling, and participation. Consistent with previous research, this study confirms that students' performance and interest in Chemistry are improved when teachers employ effective teaching approaches during the teaching-learning process (Olubu, 2015; Audu, 2018; Adeleye and Omotayo, 2020). Results from testing the hypothesis that the two groups differed in terms of gender were inconclusive. This suggests that the employment of either the conventional technique of teaching chemistry or the laboratory approach has no bearing on students' reactions based on their gender. According to these results, gender does not influence students' interest in or performance in Chemistry, which is in line with what Oludipe (2012) and Nwagbo & Chukelu (2014) found. Findings by Benson (2011), Olatunbosun (2011), and Omotayo, Adedayo, and Ayeni (2014) revealed that male and female students' interest and performance in chemistry differ significantly, but the results obtained is contrary.

Conclusion

The results show that before the experiment started, there was no difference between the two groups (Conventional and Chemistry Laboratory teaching). Students' chemistry scores were positively affected by the utilisation of both lecture method and laboratory instruction, regardless of their gender.

Recommendations

The following recommendation are made that;

1. In order to improve students' academic performance and interest in Chemistry, secondary schools should promote the employment of the Chemistry Laboratory teaching strategy and the Conventional Method in Chemistry classes.
2. Workshops, seminars, and training for the different stakeholders in the educational system will be necessary to sensitise them to the idea of a chemistry laboratory teaching strategy.
3. For improved teaching and learning of Chemistry, the government should provide secondary school laboratories with sufficient and up-to-date equipment.

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