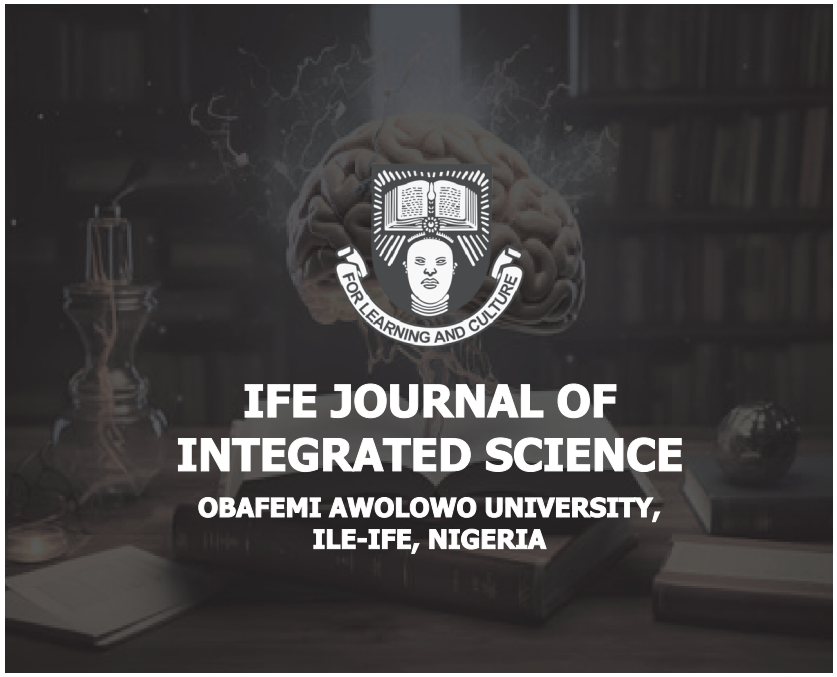

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TABLE OF CONTENTS

TEACHERS' TEACHING METHOD PREFERENCES AND RESOURCES UTILISATION AS PREDICTOR OF SENIOR SECONDARY SCHOOL STUDENTS' ACADEMIC ACHIEVEMENT IN CHEMISTRY IN OSUN STATE, NIGERIA

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Abstract
The study examined the various teaching method preferences used by Chemistry teachers in senior secondary schools in Osun State. It also determined the level of resources utilisation by Chemistry teachers in the study area. Lastly, it determined the relationship among teachers' teaching method preference and resources utilisation and senior secondary school students' academic achievement in Chemistry in the study area. These were with a view to deciding if Teachers' Teaching Method Preferences and Resources Utilisation significantly predict the Academic Achievement of students in Chemistry in Osun State, Nigeria. The study adopted a descriptive survey research design. The population of the study comprised all Chemistry teachers and students in senior secondary schools in Osun State. The sample for the study consisted of thirty Chemistry teachers and three hundred senior secondary school two (SSS II) students in Osun State. Multi-stage sampling procedure was used to select the sample for the study. In each of the three senatorial districts in Osun State,

one Local Government Area (LGA) was selected using simple random sampling technique making a total number of three LGAs. In each LGA, five senior secondary schools were selected using simple random sampling technique totalling fifteen schools. In each school, two Chemistry teachers and twenty students were selected using simple random sampling technique totalling thirty teachers and three hundred students that constitute the sample for the study. Two research instruments tagged, "Teachers' teaching Method Preference and Resources Utilisation Observation checklist" (TTMRUOC) and "Chemistry Achievement Test" (CAT) were used to collect data for the study. TTMPRUOC was used to observe the teachers' teaching preference method and resource utilization in class while the CAT was used to assess students' academic achievement in Chemistry. Data collected were analysed using frequency count, percentage, mean, RSI, ranking and regression analysis were used to analyse the data collected. The finding of the study showed that lecture method was the most referred teaching method adopted by the teachers in teaching Chemistry in the study area. This is followed by demonstration method, laboratory work method, discussion method, flipped classroom, simulation, peer-teaching method, multimedia method, debate method, cooperative method and video assisted teaching method respectively. Furthermore, the study showed that the level of utilisation of instructional resources by Chemistry teachers in teaching the subject in the study area was low (50%). Finally, there is a significant combine influence of teachers' teaching method preferences and resources utilisation on senior secondary school students' academic achievement in Chemistry in Osun State ($F_{(2,298)} = 93.681, p<0.05$). The study concluded that both Teachers' Teaching Method Preferences and Resources Utilisation significantly predict the Academic Achievement of students in Chemistry in the study area.

Keyword: Teaching method, preferences, resources utilisation, academic achievement, chemistry

Introduction

The pursuit of academic excellence in science education, particularly in chemistry, has become a pressing concern in Nigeria. As one of the core science subjects, chemistry plays a vital role in shaping the country's future scientists, engineers, and innovators (Adeyegbe, 2012). However, the performance of Nigerian students in chemistry has been a subject of concern, with many students struggling to achieve satisfactory grades (WAEC, 2020).

Research has shown that teachers' instructional methods and resources utilization are critical factors influencing students' academic achievement in science subjects, including chemistry (Abd-El-Khalick & Lederman, 2000; Adesoji, 2008). The way teachers teach and the resources they utilize can either enhance or hinder students' learning outcomes (Okebukola, 2002). Therefore, it is essential to investigate the relationship between teachers' teaching method preferences, resources utilization, and students' academic achievement in chemistry.

This study aims to explore the predictive power of teachers' teaching method preferences and resources utilization on senior secondary school students' academic achievement in chemistry in Osun State, Nigeria. By examining the relationships between these variables, this study seeks to provide insights into the instructional strategies and resources that can enhance students' learning outcomes in chemistry.

Chemistry is a science subject which plays a key role in our modern world. It's important not just on its own, but also because it helps us understand other sciences like Biology, Physics, and Environmental Science. Knowing Chemistry well is crucial for making progress in these areas. In short, a country's success in science and technology depends a lot on how well Chemistry is taught and understood.

Teaching and learning of Chemistry is imperative for societal progress. By nurturing a robust foundation in this fundamental science, individuals are equipped with the analytical tools and conceptual frameworks necessary to navigate the complexities of modern scientific inquiry. Moreover, a proficient

grasp of Chemistry cultivates a mindset of inquiry and problem-solving essential for addressing the multifaceted challenges confronting contemporary societies.

Some researchers have asserted that despite the key role of chemistry as the central science, and it forming the basic foundation to many disciplines and the attempts made to improve pedagogical practices in Chemistry, students' performance in examinations in the subject, especially in Nigeria, remains a source of concern (Pegrum, Bartle, & Longnecker, 2015; van Driel, 2021). There is a notion that the persistent poor performance of students in chemistry is partly caused by factors such as anxiety, perception that Chemistry is difficult, over use of teacher-centered methods, inadequate infrastructures, teaching materials, non-availability of well-trained teachers, lack of technical/laboratory assistants, non-existence of effective problem-solving strategies, poor reasoning skills and poor mathematical background.

Indeed, the teaching of Chemistry holds a paramount responsibility: to impart comprehensive knowledge to learners. However, achieving this objective necessitates a nuanced understanding of the teaching methods employed in the classroom. Educators must be cognizant of the diverse array of pedagogical approaches and teaching methods available and judiciously select those best suited to facilitate effective learning experiences for their students.

Kerimbayev, Umir Zakora, Shebiev & Johsov (2023) provided a thorough description of teaching methods, defining it as the complex range of tools and strategies that teachers use to plan and carry out different teaching activities with the goal of achieving pre-established learning objectives. These methods cover a wide range of techniques, including interactive group discussions, multimedia presentations, hands-on experiments, and conventional lectures. They act as the framework around which well-designed learning experiences are built, accommodating the demands of a wide range of students and encouraging participation, understanding, and retention. In the end, instructional strategies are active channels that facilitate the

transfer, synthesis, and assimilation of knowledge within the classroom.

The choice of method to be used in Chemistry classes is not chosen at random; rather, it has a significant impact on students' comprehension and level of participation. While lectures and rote memorization are hallmarks of traditional pedagogic approaches, they frequently fall short of promoting critical thinking and conceptual mastery, even though they may be useful as fundamental tools. On the other side, inquiry-based learning and practical laboratory experiences enable students to actively investigate chemical phenomena, fostering curiosity and hypothesis testing.

Furthermore, the combination of interactive technologies and multimedia resources presents unmatched chances to improve understanding and recall. Diverse learning styles and preferences can be accommodated through immersive learning experiences offered by educational apps, multimedia presentations, and virtual simulations. Teachers can overcome the constraints of traditional classroom education and create dynamic, interactive learning environments that appeal to today's digitally native pupils by utilizing such cutting-edge tools.

In essence, the teaching of Chemistry must transcend mere content delivery; it must embody a holistic approach that prioritizes active engagement, critical thinking, and inclusivity. By thoughtfully selecting and integrating diverse teaching methods, educators can create dynamic learning experiences that inspire a lifelong passion for Chemistry and equip students with the knowledge and skills necessary to succeed in an ever-evolving world.

Teachers' preference of teaching methods significantly influences the academic achievement of students in chemistry. Research has shown that teachers who adopt student-centered approaches, such as inquiry-based learning and problem-solving, tend to have students who perform better academically. In contrast, teachers who prefer traditional lecture-based methods often have students who struggle to understand and apply chemical concepts (Ganyaupfu, 2023).

Student-centered approaches encourage active learning, critical thinking, and collaboration, leading to deeper understanding and retention of chemistry concepts. On the other hand, lecture-based methods often result in passive learning, memorization, and superficial understanding. A study found that chemistry students taught using inquiry-based learning showed a 25% increase in academic achievement compared to those taught using traditional methods. Another study revealed that teachers who incorporated technology and hands-on activities into their teaching had students who outperformed their peers in chemistry exams (Dushimimana & Mugabo, 2022).

Teachers' preference for student-centered teaching methods is crucial in enhancing academic achievement in chemistry. By adopting innovative and interactive approaches, teachers can foster a deeper understanding of chemistry concepts, leading to better academic outcomes and a more engaging learning experience for students.

Beyond the selection of teaching methods, educators must also prioritize the utilisation of appropriate instructional resources to facilitate effective teaching and learning experiences in Chemistry. The availability and judicious use of instructional resources play a pivotal role in enhancing comprehension, engagement, and retention among students. The diverse array of resources at the disposal of educators offers multifaceted avenues for conveying complex chemical concepts and fostering meaningful learning experiences. The greater potentials that sight can offer must be utilized if the Chemistry learning process is to improve. Educational resources can benefit both teachers and students and greatly aid students in understanding what is being taught in the classroom each day (Maradun, 2023).

Among the many teaching tools available, textbooks are essential because they cover important topics and serve as useful references for students. However, good teaching goes beyond just using textbooks. Interactive resources like videos, virtual simulations, and educational software offer engaging learning experiences that fit different learning styles. These digital tools

not only add to traditional teaching but also allow students to explore and experiment in virtual settings, which helps them understand concepts better and improve their critical thinking skills.

Moreover, traditional instructional aids such as the chalkboard, practical apparatus, charts, and cardboards remain indispensable assets in the Chemistry classroom. The tactile nature of these resources facilitates kinesthetic learning and enables students to visualize abstract concepts in concrete terms. Laboratory experiments, in particular, afford students the opportunity to engage in authentic scientific inquiry, fostering curiosity, experimentation, and problem-solving skills.

Furthermore, the incorporation of real-world examples, case studies, and multimedia content contextualizes abstract chemical concepts and underscores their relevance in everyday life. By bridging the gap between theory and application, these resources enhance student motivation and deepen understanding, thereby fostering a more profound appreciation for the role of Chemistry in addressing real-world challenges.

However, it should be noted that the choice of teaching method that will be employed by the teacher must be complimented by the instructional resources that best suits the teaching of the concept at hand. The teacher should be able to select teaching method and techniques that will make the teaching of each topic to be taught interesting and engage the students in active learning and this should be followed by the use of adequate instructional resources that will bring about the understanding of the topic that the teacher teachers the students at every point in time. This brings to mind the possibility of improving the academic performances of students in the subject as well as improve their interest in the subject. Furthermore, the use of both teaching methods that suits the content of the subject matter and complimenting it with adequate use of instructional resources should bring about inclusion of all students. It should also cater for students with diverse needs and encourage students with academic deficiencies to learn at their own pace.

It is with the aforementioned in mind that the researcher is carrying out a study to investigate the preference of teaching methods employed by the teachers as well as the utilisation of instructional resources in the teaching and learning of Chemistry in Osun state. The researcher will be assessing the various teaching methods preferences used by the teachers in teaching chemistry, determine the level of resources utilisation by the teaching in teaching Chemistry in the state and also to examine the relationship between teachers' teaching method preferences and resources utilisation on senior secondary school students' academic achievement in the state.

Statement of the Problem

Chemistry has been seen to be one of the important subjects taught in secondary schools as it plays a pivotal role in the development of the inquiry skills as well as scientific knowledge of students. In senior secondary schools, Chemistry is a core subject that prepares students for higher education in science, engineering, and technology fields. However, the teaching method adopted by the teacher in the teaching of the subject matters a lot as it determines how much the students are being engaged in the teaching and learning of the subject. Several studies as well as examiners reports have shown that the academic achievement of students in Chemistry is not encouraging. This cannot be separated from the teaching method adopted in the teaching of Chemistry and as well the utilisation of educational resources in the teaching and learning of the subject. In addition, for effective implementation of Chemistry curriculum in senior secondary schools, there is need for teachers to be knowledgeable about the most effective and efficient teaching methods that will best deliver a given content as well as the selection and utilisation of the educational resources that will best drive home the contents of the subject matter. There is therefore the need to carry out a study on the various teaching method preferences of Chemistry teachers in senior secondary schools in Osun State. Also, researchers need to verify the level of resources utilisation by

Chemistry teachers in teaching the subject in senior secondary schools in Osun State. In addition, the study needs to be carried out on relationship of teachers' teaching method preferences and resources utilisation on senior secondary school students' academic achievement in Chemistry in Osun State; hence the study.

Purpose of the Study

The purpose of the study is to investigate Teachers' Teaching Method Preferences and Resources Utilisation as Predictors of Senior Secondary School Students' Academic Achievement in Chemistry in Osun State, Nigeria. however, the specific objectives of the study are to;

a) examine the various teaching method preferences used by Chemistry teachers in senior secondary schools in Osun State;
b) determine the level of resources utilisation by Chemistry teachers in teaching the subject in senior secondary schools in Osun State; and
c) determine the relationship of teachers' teaching method preferences and resources utilisation on senior secondary school students' academic achievement in Chemistry in Osun State.

Research Questions

Based on the objectives of this study, the following research questions were raised to guide the study.

1. What are the various teaching method preferences used by Chemistry teachers in senior secondary schools in Osun State?
2. What is the level of resources utilisation by Chemistry teachers in teaching the subject in senior secondary schools in Osun State?

Hypothesis

There is no significant influence of teachers' teaching method preferences and resources utilisation on senior secondary

school students' academic achievement in Chemistry in Osun State.

Methodology

The study adopted the descriptive survey research design. The population for this study comprised all the Chemistry teachers and students in Senior Secondary Schools in Osun state, Nigeria. However, the target population was the Senior Secondary School Two Students who offer Chemistry in Osun state. The sample for the study consisted of thirty (30) Chemistry teachers and three hundred (300) senior secondary school two (SSS II) students in Osun State. Multi-stage sampling procedure will be used to select the sample for the study. In each of the three senatorial districts in Osun State, one Local Government Area (LGA) was selected using simple random sampling technique making a total number of three LGAs. In each Local Government Area, five secondary schools were selected using simple random sampling technique totalling fifteen (15) schools. In each school, two chemistry teachers and twenty (20) students were selected also using simple random sampling technique totalling thirty teachers and three hundred students that constituted the sample for the study. Two Instruments were developed for collection of data for this study. They are: Teachers' teaching Method Preference and Resources Utilisation Observation Checklist (TTMPRUOC) Chemistry Achievement Test (CAT). Teachers' Teaching Method Preference and Resources Utilisation Observation Checklist (TTMPRUOC). TTMPRUOC is a research instrument that was developed by the researcher for the purpose of eliciting information on the preference of teaching method adopted by the teachers in teaching Chemistry and the use of instructional resources in the teaching of Chemistry. TTMPRUOC contained a list of common teaching methods among Chemistry teachers in Nigeria. It also contained a list of Instructional Resources that are necessary for the teaching and Learning of Chemistry. The instrument will be administered on the teachers while they are carrying out the teaching-learning process. The instrument was administered on the teachers when

they were carrying out their teaching and learning process. The teaching method being used by the teacher was noted as well as the relevance of relevance of the teaching method to the topic they are teaching at that moment. CAT was developed by the researcher to elicit information on the performance of students in Chemistry. The instrument contained 20 Chemistry multiple-choice questions which were selected from past Chemistry external Examinations. The questions were selected from the SSII curriculum.

The Instruments were presented for face and content validation to the researcher's supervisor and other lecturers in the Department of Science and Technology Education of Obafemi Awolowo University, Ile-Ife. From the corrections, contributions, additions and other adjustments that were done by the validators, the instruments were re-done and the final draft will be presented for verification. Thereafter, the researcher carried out a pilot testing of the instrument by administering the instrument on 30 students and 5 teachers which will be outside the scope of the study area where the research was carried out. A test-retest was carried out to determine the reliability of the research instruments. That is, after two weeks of carrying out a pilot study, the instruments were administered to the same set of respondents. The data collected was subjected to item analysis and reliability test. The reliability index of TTSRUQ will be done using PPMC. Also, the reliability index of CAT will be done by using Kuder Richardson formula 21 (KR-21). Only items with a difficulty index between 0.25 and 0.75, and a discrimination index between 0.2 and 0.8 were retained for the study. Others were discarded in case too many are discarded. Only twenty questions were retained thereafter. Using Kuder Richardson formula 21 (KR-21), a reliability index of 0.82 was realised, which satisfies the instrument suitable for use. For TTMPRUOC, Cronbach Alpha was used to calculate the reliability index. A score of 0.78 was gotten which proves the instrument was suitable for use for the study. The data collected were analysed using IBM Statistical Package for Social Science 27 (SPSS version 27). The research

questions were analysed using frequency count, percentage, Relative significance Index (RSI), while the hypothesis will be analysed using regression analysis.

Results

Research Question One: What are the various teaching method preferences used by Chemistry teachers in senior secondary schools in Osun State?

To answer this question, frequency counts and percentages was used to assess the more preferred teaching method used by the teachers in teaching Chemistry in senior secondary schools in Osun state. The decision was then made as regards being used or not. Whenever the percentages of 'seldom used' and 'not used' were higher than the percentages of 'very often used' and 'used, it was interpreted that the 'seldom used' and 'not used' categories were not used and also, whenever the percentages of 'very often used' and 'used' were higher than the percentages of 'seldom used' and 'not used' it was interpreted that 'very often used' and 'used' were the most commonly used categories. These were then subjected to descriptive analysis of frequency counts and percentage, and the results are presented in Table 1. The extent of each variable was independently assessed. VOU means Very Often Used, OU means Often Used, SU means Seldom Used, and NU means Not Used. The results are presented in the tables 1

Table1:Teaching method preferences used by Chemistry teachers in senior secondary schools in Osun State

S/N	STATEMENTS	VOU	OU	SU	NU	RSI	RANK
1.	Lecture Method	30 100	0 0.00	0 0.00	0 0.00	1.0	1
2.	Demonstration method	14 46.67	6 20.0	2 6.67	2 6.67	0.72	2
3.	Laboratory work	14 46.67	6 20.0	0 0.0	0 0.0	0.70	3

S/N	STATEMENTS	VOU	OU	SU	NU	RSI	RANK
4.	Debate	6 20.0	6 20.0	2 6.67	16 53.33	0.52	7
5.	Multimedia	6 20.0	4 13.33	6 20.0	14 46.67	0.52	7
6.	Cooperative	6 20.0	4 13.33	4 13.33	16 53.33	0.50	10
7.	Discussion	6 20.0	10 33.33	6 20.0	8 26.67	0.62	4
8.	Flipped classroom	6 20.0	6 20.0	8 26.67	10 33.33	0.57	5
9.	Video assisted	6 20.0	0 0.00	6 20.0	18 60	0.45	11
10.	Simulation	0 0.00	10 33.33	14 46.67	6 20.0	0.53	6
11.	Peer Teaching Method	2 6.67	10 33.33	6 20.0	12 40	0.52	7

To answer this question, frequency counts and percentages was used to assess the more preferred teaching method used by the teachers in teaching Chemistry in senior secondary schools in Osun state. The decision was then made as regards being used or not. Whenever the percentages of 'seldom used' and 'not used' were higher than the percentages of 'very often used' and 'used, it was interpreted that the 'seldom used' and 'not used' categories were not used and also, whenever the percentages of 'very often used' and 'used' were higher than the percentages of 'seldom used' and 'not used' it was interpreted that 'very often used' and 'used' were the most commonly used categories. These were then subjected to descriptive analysis of frequency counts and percentage, and the results are presented in Table 1. The extent of each variable was independently assessed. VOU means Very Often Used, OU means Often Used, SU means Seldom Used, and NU means Not Used. The results are presented in the tables 1

Table1:Teaching method preferences used by Chemistry teachers in senior secondary schools in Osun State

Table 1 presents the Teaching method preferences adopted by Chemistry teachers in senior secondary schools in the study area. The table shows that the most preferred teaching method for teaching chemistry by the teachers was the lecture method (with RSI = 1.0). this is followed closely by demonstration teaching method (with RSI = 0.72). furthermore, the third most used teaching method by the teachers is the laboratory teaching method (with RSI = 0.72). the fourth most used teaching method by the teachers is the discussion teaching method (with RSI = 0.62). the table further shows that the fifth most preferred teaching method by the teachers is the flipped classroom teaching method (with RSI = 0.57). also, the sixth most used teaching method by the teachers is the simulation teaching method (with RSI = 0.53). However, debate, multimedia and peer teaching methods ranked 7th as the most preferred teaching method for teaching chemistry (with RSI = 0.52). Also, cooperative teaching method was ranked as the 10th most preferred teaching method for teaching Chemistry (with RSI = 0.50). Lastly, the video assisted teaching method was the 11th most preferred teaching method by the teachers in teaching Chemistry in the study area (with RSI = 0.45).

Research Question Two: What is the level of resources utilisation by Chemistry teachers in teaching the subject in senior secondary schools in Osun State.

To provide an answer to this research question, a list of observed teaching resources that are necessary for teaching chemistry was used. The checklist was used to show the resources that are being used and not used in teaching chemistry. The number of used resources was summed up for each teacher in order to determine the level of use of instructional resources by the teachers.

Table 2: Materials used by the teachers for the teaching and learning of Chemistry

	Material Resources	Used	Unused	Decision
1	Textbooks	18 60	12 40	Used
2	Black/White board	30 100	0 0	Used
3	Periodic table chart	17 56.7	13 43.3	Not used
4	Laboratory equipment (beakers, test tubes, balances)	23 76.7	7 23.3	Not used
5	Chemicals	11 36.7	19 63.3	Not used
6	Chemistry practical manual	14 46.7	16 53.3	Not used
7	Videos	5 16.7	25 83.3	Not used
8	Safety equipment (Safety google, lab coats, gloves, e.t.c)	9 30	21 70.0	Not used
9	Preserved specimen	11 36.7	19 63.3	Not used
10	Heating source	7 23.3	23 76.7	Not used
11	Test-tube	8 26.7	22 73.3	Not used
12	Spectroscope	5 16.7	25 83.3	Not used
13	Instructional materials for each topic	10 33.3	20 66.7	Not used
14	Charts	12 40	18 60	Not used

	Material Resources	Used	Unused	Decision
15	Projector	0 0.0	30 30.0	Not used
16	Chemistry games	0 0.0	30 30.0	Not used
17	Quiz and test kits	0 0.0	30 30.0	Not used
18	Chemistry software	3 10	27 90	Not used
19	Thermometer	10 33.3	20 66.7	Not used
20	Stop watch	13 43.3	17 56.7	Not used
21	Spatula	7 23.3	23 76.7	Not used
22	Test tube holder	9 30	21 70.0	Not used
23	Litmus paper	15 50	15 50	Used
24	Rubber corks	9 30	21 70.0	Not used
25	Reagent bottle	0 0.0	30 30.0	Not used
26	Measuring cylinder	10 33.3	20 66.7	Not used
27	Weighing balance	5 16.7	25 83.3	Not used
28	Boiling tube	7 23.3	23 76.7	Not used
29	Separating funnel	10 16	27 90	Not used
30	Retort stand	16 53.3	14 46.7	Used

Table 2 shows the list of resources that are being used for teaching of Chemistry in senior secondary schools in Osun state, Nigeria. From the table, the resources that are being frequently used by the teachers for teaching Chemistry includes; Textbooks (60.0%), Black/White board (100.0%), Periodic table chart (56.7%) and Laboratory equipment (beakers, test tubes, balances) (76.7%). Whereas, some of the resources that were not used for teaching of Chemistry includes;, Chemicals (36.7%), Chemistry practical manual (46.7%), Videos (16.7%), Safety equipment (Safety google, lab coats, gloves, etc.) (30.0%), Preserved specimen (36.7%), Heating source (23.3%), Test-tube (26.7%), Spectroscope (16.7%), Instructional materials for each topic (33.3%), Charts (40.0%), Projector (0.00%), Chemistry games (0.00%), Quiz and test kits (0.00%), Chemistry software (10.0%), Thermometer (10%), Stopwatch (33.3%), Spatula (23.3%), Test tube holder (30%), Rubber corks (30.0%), Reagent bottle (0%), Measuring cylinder (33.3%), Weighing balance (16.7%), Boiling tube (23.3%), Separating funnel (10%).

Also, the number of resources used by each teacher was summed up as a measure of the use of resources by the teachers. On the measure, the maximum number of resources ustilised by the teachers was recorded to be 22 while the minimum was 3. The mean of 9.9 and standard deviation of 4.78 was also recorded. On the measure, those whose use of resources were between 22 to 17 were regarded as high use, those that fell between 16 and 10 were regarded as moderate while those that fell between 9 and 3 were regarded as low utilisation of resources. The summary is presented in table 4.3

Table 3: Level of utilisation of resources for teaching Chemistry

Level	Frequency	Percentage
High	4	13.33
Moderate	11	36.67
Low	15	50.00
Total	30	100.0

Figure 4.1: Level of utilisation of resources for teaching Chemistry

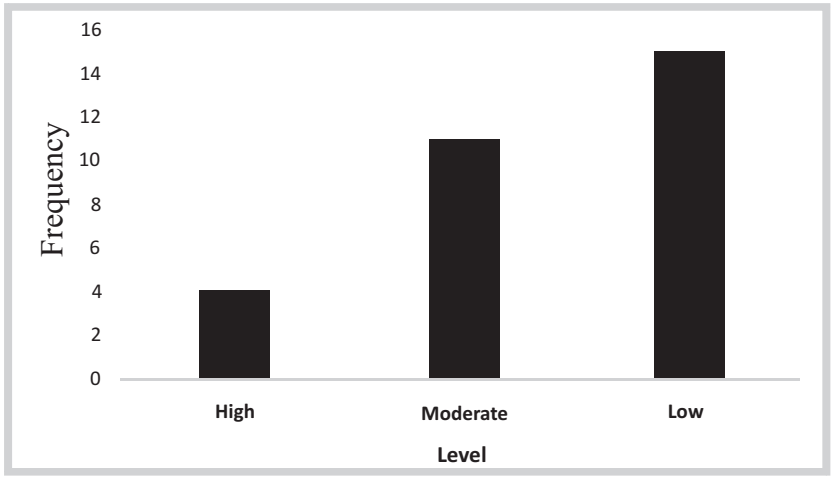

Table 3 shows the level of level of resources utilisation by Chemistry teachers in teaching the subject in senior secondary schools in Osun State. The table shows that only 4 (13.33%) of the teachers uses resources in teacher Chemistry to a high level, 11 (36.67%) uses them to a moderate level while the level of use of resources among 15 (50%) of the respondent teachers was low.

Summarily, the level of utilisation of instructional resources by Chemistry teachers in teaching the subject in the study area was low (50%).

Hypothesis One: There is no significant influence of teachers' teaching method preferences and resources utilisation on senior secondary school students' academic achievement in Chemistry in Osun State.

To test this hypothesis, the combination of the preference of teaching methods adopted by the teachers as well as the utilisation of resources to teach Chemistry was related to the academic performance of the students using multiple linear regression. However, individual influence of the preference of teaching methods adopted by the teachers and the utilisation of resources on the academic performance of the students was analysed using simple linear regression. The result is presented in Tables 4, 5 and 6.

Hypothesis 1a: There is no significant influence of teachers' teaching method preferences on senior secondary school students' academic achievement in Chemistry in Osun state.

The influence of the teacher's teaching methods preference on the academic achievement of the students was tested using simple linear regression, with the teacher's teaching methods preference serving as the independent variable and the academic achievement in Chemistry serving as the dependent variable. The result is presented in Table 4.4.

Table 4: Model Summary of influence of teacher's teaching methods preference on academic achievement of students in Chemistry

	Model	Sum of Squares	df	Mean Square	F	Sig.
R=0.618	Regression	841.077	1	841.077	184.039	.000[b]
R^2 = 0.382	Residual	1361.893	298	4.570		
Adj. R^2= 0.380	Total	2202.970	299			

a. Dependent Variable: Academic Achievement in Chemistry
b. Predictors: (Constant), Teaching Method Preferences

Table.4 presents the summary of the regression analysis of the influence of teacher's teaching methods preference on academic achievement of students in Chemistry in the study area. The result showed that $F_{(1,298)}$ = 184.039, P < 0.05. This shows that the regression model is statistically significant. We hereby reject the null hypothesis that was earlier stated. That it, there is a significant influence of teacher's teaching methods preference on academic achievement of students in Chemistry in the study area. Furthermore, the R- squared = 0.382 and Adjusted R-square = 0.380 suggests that the independent variable predicts about 38.2% to 38.0% variance in the dependent variable. While the R = 0.618 predicts about 61.8% relationship between the dependent and independent variables.

Table 4: Regression Weights in predicting influence of teacher's teaching methods preference on academic achievement of students in Chemistry

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	7.608	0.347	0.618	21.913	.000
	Teachers Teaching	0.166	0.012		13.566	.002
	Method Preferences					.001

a. Dependent Variable: Academic Achievement in Chemistry

The regression weight table provides further details on the influence of teacher's teaching methods preference on academic achievement of students in Chemistry. The unstandardized coefficient (B) for teachers teaching methods preference is 0.166, with a standard error of 0.012. the standardized coefficient (β) is 0.618, $t(298) = 13.566$, $p<0.05$. This indicates a strong positive influence of the independent on the independent variable. It also confirms that the influence of the independent on dependent variables was significant and therefore, we reject the null hypothesis.

Hypothesis 1b. There is no significant influence of teachers' resources utilisation on senior secondary school students' academic achievement in Chemistry in Osun State.

Simple linear Regression Analysis was used to show the influence of resources utilisation on senior secondary school students' academic achievement in Chemistry. Teachers' resources utilisation was used as the independent variable while the academic achievement in Chemistry serving as the dependent variable. The result is presented in Table 4.5.

Table.6: Model Summary of influence of resources utilisation and academic achievement of students in Chemistry

	Model	Sum of Squares	df	Mean Square	F	Sig.
R=0.483	Regression	513.866	1	513.866	90.354	.000[b]
R^2 = 0.233	Residual	1689.104	298	5.687		
Adj. R^2= 0.231	Total	2202.970	299			

a. Dependent Variable: Academic Achievement in Chemistry
b. Predictors: (Constant), Use of Resources

Table 5 presents the summary of the regression analysis of the influence of teachers' resources utilisation on academic achievement of students in Chemistry in the study area. The result showed that $F_{(1,298)}$ = 90.354, P < 0.05. This shows that the regression model is statistically significant. We hereby reject the null hypothesis that was earlier stated. That it, there is a significant relationship between teacher's resources utilisation and academic achievement of students in Chemistry in the study area. Furthermore, the R- squared = 0.233 and Adjusted R-square = 0.231 suggests that the independent variable predicts about 23.3% to 23.1% variance in the dependent variable. While the R = 0.483 predicts about 48.3% relationship between the dependent and independent variables.

Table 7: Regression Weights in predicting influence of teacher's utilisation of resources and academic achievement of students in Chemistry

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	9.272	.319	.483	29.035	.000
	Resources utilisation	.279	.029		9.505	.000

a. Dependent Variable: Academic Achievement in Chemistry

The regression weight table provides further details on the influence of teacher's resources utilisation and academic achievement of students in Chemistry. The unstandardized coefficient (B) for teachers teaching resources utilisation is 0.279, with a standard error of 0.029. The standardized coefficient (β) is 0.483, $t(298) = 9.505$, $p<0.05$. This indicates a strong positive relationship between the dependent and independent variables. It also confirms that the relationship between the dependent and independent variables was significant and therefore, we reject the null hypothesis.

Hypothesis 1c: There is no significant combined influence ofteachers' teaching method preferences on resources utilisation and senior secondary school students' academic achievement in Chemistry in Osun State.

Multiple linear regression analysis was used to analyse the relationship between the combination of teachers' teaching method preferences and resources utilisation and senior secondary school students' academic achievement in Chemistry in the study area. The of teachers' teaching method preferences and resources utilisation were used as the independent variables while the academic achievement of the students in Chemistry served as the dependent variables. The result is presented in Tables 6a and 6b.

Table 8: Model Summary of combined influence of teachers' teaching method preference and resources utilisation on academic achievement of students in Chemistry

	Model	Sum of Squares	df	Mean Square	F	Sig.
R=0.623	Regression	853.923	2	426.961	93.681	0.000[b]
$R^2 = 0.388$	Residual	1349.07	296	4.558		
Adj. $R^2 = 0.383$	Total	2202.970	298			

a. Dependent Variable: Academic Achievement in Chemistry

b. Predictors: (Constant), Teaching Method Preferences, Use of Resources,

Table 6 presents the summary of the regression analysis of the relationship between combination of teachers' teaching methods preferences and resources utilisation and academic achievement of students in Chemistry in the study area. The result showed that $F_{(2,298)} = 93.681$, $P < 0.05$. This shows that the regression model is statistically significant. We hereby reject the null hypothesis that was earlier stated. That is, there is a significant combine influence of teachers' teaching methods preferences and teacher's resources utilisation on the academic achievement of students in Chemistry in the study area. Furthermore, the R- squared = 0.388 and Adjusted R-square = 0.383 suggests that the independent variable predicts about 38.3% to 38.8% variance in the dependent variable. While the R = 0.623 predicts about 62.3% relationship between the dependent and independent variables.

Table 9: Regression Weights in predicting combined influence of teacher's teaching method preference, utilisation of resources and academic achievement of students in Chemistry

	Unstandardized Coefficients		**Standardized Coefficients**		
Model	B	Std. Error	Beta	t	Sig.
(Constant)	7.525	0.350		21.491	.000
Teaching Method Preferences	0.150	0.017	0.557	8.638	.000
Resources utilisation	0.051	0.037	0.088	1.368	.172

a. Dependent Variable: Academic Achievement in Chemistry

The regression weight table showed that teachers' teaching method preference ($B = 0.150$, $p < 0.05$) significantly predicted the academic achievement of students in Chemistry of and teachers' utilisation of resources ($B = 0.051$, $p > 0.05$) did not significantly predict the academic performance when the combination of both teachers' teaching method preferences and resources utilisation was related to the academic achievement of students in the study area. However, standardized coefficient (β)

of 0.557 and 0.088 shows that there is a positive relationship between the independent variables and dependent variables.

Discussion of Findings

The findings of the study showed that lecture method was the most referred teaching method adopted by the teachers in teaching Chemistry in the study area. This is followed by demonstration method, laboratory work method, discussion method, flipped classroom, simulation, peer-teaching method, multimedia method, debate method, cooperative method and video assisted teaching method respectively. According to the study's findings, chemistry instruction in the study area is dominated by traditional methods of teaching like lecture. This dependence might restrict opportunities for student-centered and interactive instruction, which could affect students' engagement and comprehension of difficult ideas (Javed, 2023 Martin-Alguacil et al, 2024). Mhlongo & Sedumedi, (2024) asserted that Science education classrooms frequently use traditional direct teaching methods (DTMs) and practical work activities (PWAs).Although methods like laboratory work, flipped classrooms, and demonstration are also employed, their decreased usage indicates the need for more varied, experiential teaching strategies that encourage active learning (Wang et al, 2022). More technological integration, peer teaching, and cooperative learning techniques could help teachers encourage teamwork and critical thinking, which would improve learning results overall and increase students' interest in chemistry.

This finding agrees with the findings of Nja (2021) whose findings showed that practical (laboratory) was most preferred for the teaching and learning of Chemistry. She further noted that conducting frequent practical was to arouse the interest of the students in Chemistry. However, the findings of the study conducted by Kousa, et al, (2018) showed that The low-achieving group's top three favorite methods of teaching were (i) visiting businesses, organizations, museums, and exhibitions; (ii) studying online, through videos, magazines, and books; and (iii)

working in small groups. Also, the findings of Mhlongo &Sedumedi, (2024) revealed that pre-service teachers were used to more of practical works activities and also the traditional teaching method. Furthermore, the study by Byusa, et al, (2020) revealed that the most frequently used teaching technique for teaching Chemistry in Rwanda was group work. The noted from their findings that Since it is necessary to implement CBC, all of the teachers from the chosen schools stated that they were utilizing active learning strategies when instructing S2 chemistry classes. They stated that the strategies they most frequently employed included think-pair-share, group activities, group discussions, group work, group work and presentations, and other learner-centered approaches. But in reality, teachers dominated classroom instruction, employing techniques like lecturing, writing on the board, and then attempting to incorporate a brief group activity that did not engage all students, did not aid in knowledge construction, and occasionally amounted only to a Q&A session. Also, the study of Unal (2017) showed a similar result when he found out that teachers selected methods that were relatively simple to employ, such question and answer and demonstration. Because they needed more planning and the use of instructional materials, techniques like Scenario and Case Study have become less popular.

The finding of the study further showed that the level of utilisation of instructional resources by Chemistry teachers in teaching the subject in the study area was low. A possible gap in teaching effectiveness is indicated by the observation that chemistry teachers in the research area use instructional materials at a low level. Insufficient utilisation of resources like lab apparatus, multimedia tools, and visual aids may make it more difficult for students to completely understand difficult scientific ideas (Shunkov et al, 2022). A more passive learning environment could arise from this underutilization, which would limit opportunities for participation, critical thinking, and hands-on exploration (Goshu & Ridwan, 2024). Teachers must use a greater

variety of instructional materials to enhance the teaching process and create a more dynamic and engaging learning environment if they want to increase student learning results (Munna & Kalam, 2021).

This finding agrees with the findings of Obiyo and Inyama (2019) who found out an underutilisation of instructional resources. They noted from the findings of the study that the inability of teachers to improvise and their lack of manipulative skills, among others, are factors militating against the utilization of instructional materials. Also, the findings of Akani (2016) showed a similar result when they found out that teachers are not utilizing effectively the available instructional materials in their teaching, the chemistry teachers are not making enough efforts in improvisation of those instructional materials that are not available and that the teachers faced obstacles such as lack of fund and skill for the improvisation of instructional materials. The findings of Kamji and Agu (2022) also showed that instructional materials such as periodic tables, pipette, beaker, retort stand, test tube, spatula, conical flask, funnel, bench reagent indicator, measuring cylinder, litmus paper, filter paper, weighing scale, are available and utilized across the schools. However, some resources were still missing and most were not utilised.

Furthermore, the findings of the study showed that both teachers' teaching method preference and resources utilisation significantly influenced the academic achievement of students in Chemistry in the study area. The findings of the research demonstrate how important it is for teachers to use resources and their chosen teaching strategies in order to improve their students' academic performance in chemistry. This implies that in order to create a more stimulating and productive learning environment, teachers should receive training on how to implement successful teaching techniques and make use of the resources at their disposal, including hands-on experiments, multimedia tools, and interactive learning materials. Professional development programs that give teachers a variety of pedagogical skills and resource management strategies should be given top priority by

educational institutions and legislators. Students' performance in Chemistry and other disciplines might be greatly enhanced by this strategy.

This finding agrees with the findings of Effiong and Igiri (2015) who found out that students that were taught using instructional resources achieved greatly. They noted that the academic achievement of students increased greatly when they were taught using relevant instructional materials. The study of Oladejo et al (2011) also showed that use of improved instructional resources was effective in improving the academic achievement of students in Physics. Also, the findings of Bara and Xhomara (2020) showed that the use of student-centered teaching methods had significant correlation with the academic achievement of students. The findings of Adalikwu and Iorkpilgh (2013) also showed that students taught with instructional materials performed significantly better than those taught without instructional materials and also that the use of instructional materials generally improved students' understanding of concepts and led to high academic achievements.

Conclusion

The study concluded that both teachers' teaching method preference and resources utilisation were significant predictors of academic achievement of students in Chemistry in Osun state senior secondary schools. However, from the study, it showed that many of the schools lack the adequate supply of resources that is needed for use by the teachers to teach Chemistry in the state. Furthermore, the study was able to revealed that the teachers were much more fixed on the use of lecture method (traditional teaching method) which has been found to limit the acquisition of knowledge by the students.

Recommendations

From the findings of the study, the following recommendations are made:

1. The curriculum should be made available to teachers to understand the teaching methods that are peculiar to each

topic in Chemistry. This will enable the teachers to know the right instructional strategies to use at the right time

2. School administrators and the government should provide enough teaching resources which are necessary for the teaching of Chemistry. More importantly, up-to-date laboratory and laboratory equipment should be provided for the schools so that they can carry out practical works from time to time
3. Teachers should be made to attend conferences, trainings and other in-service development programmes which should increase the understanding of teachers on the importance of the use of instructional resources in teaching Chemistry and also the implications of their choice of teaching methods.
4. Most teachers are not aware of many of the available teaching methods that can be used to improve the learning outcomes of students. Teachers should be provided with research articles, journals, conference proceedings and others that contain studies made by researchers from which teachers can improve their practice
5. Also, teachers should be encouraged to make research in education, publish their research proceedings and attend conferences where they can present their researched works.

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