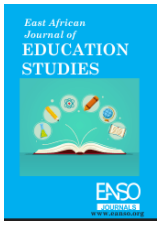
Article DOI: https://doi.org/10.37284/eajes.8.3.3428



East African Journal of Education Studies
eajes.eanso.org
Volume 8, Issue 3, 2025
Print ISSN: 2707-3939 | Online ISSN: 2707-3947
Title DOI: https://doi.org/10.37284/2707-3947

Original Article

Determinants of Academic Performance of Chemistry in Public Secondary Schools in Chesumei Sub-County: A Justification of the Teaching Methods

Evans Kiprono Tarus[1], Dr. Patrick Cheben Simiyu, PhD[1] & Dr. George Morara Ontumbi, PhD[1]*

[1] Koitaleel Samoei University College, P. O. Box 5-30307, Eldoret, Kenya.
[*] Author for Correspondence Email: ontumbi@ksu.ac.ke

Article DOI: https://doi.org/10.37284/eajes.8.3.3428

Date Published: *04 August 2025*

Keywords:

Teaching Methods, Good Grades, Career Progress, High Performance.

ABSTRACT

Chemistry is an important science subject. It determines the overall mean grade of the students and entry into various courses in universities and tertiary colleges. Good grades in Chemistry is considered important in determining the career progress of students seeking to pursue courses in medicine, pharmacology, engineering and dentistry. This study aimed at investigating the contribution of teaching methods to learners' academic performance in chemistry in public secondary schools in Chesumei Sub-County, Nandi County, in Kenya. The research adopted an explanatory sequential design in the study. Questionnaires were administered to chemistry teachers and students to collect data. Qualitative data were obtained through semi-structured interviews with randomly selected teachers and students, allowing for in-depth exploration of their experiences, perspectives, and insights into the relationship between teacher-related factors and academic performance. The results showed that teaching methods had a significant positive influence on student academic performance in chemistry (β=0.141, p=0.001). The study concluded that teaching methods enhanced the learners' academic performance in chemistry in government secondary schools in the Sub-county of Chesumei. The study recommended the adoption of mixed teaching methods in schools to achieve high academic performance in Chemistry. This study was beneficial to policymakers by guiding policy formulation on teacher development.

APA CITATION

Tarus, E., Atibuni, D. Z. & Olema, D. K. (2025). Determinants of Academic Performance of Chemistry in Public Secondary Schools in Chesumei Sub-County: A Justification of the Teaching Methods. *East African Journal of Education Studies*, *8*(3), 132-144. https://doi.org/10.37284/eajes.8.3.3428

CHICAGO CITATION

Tarus, Evans Kiprono, Patrick Cheben Simiyu and George Morara Ontumbi. 2025. "Determinants of Academic Performance of Chemistry in Public Secondary Schools in Chesumei Sub-County: A Justification of the Teaching Methods." *East African Journal of Education Studies* 8 (3), 132-144. https://doi.org/10.37284/eajes.8.3.3428.

HARVARD CITATION

Tarus, E. K., Simiyu, P. C. & Ontumbi, G. M. (2025), "Determinants of Academic Performance of Chemistry in Public Secondary Schools in Chesumei Sub-County: A Justification of the Teaching Methods", *East African Journal of Education Studies*, 8(3), pp. 132-144. doi: 10.37284/eajes.8.3.3428.

Article DOI: https://doi.org/10.37284/eajes.8.3.3428

IEEE CITATION

E. K., Tarus, P. C., Simiyu & G. M., Ontumbi "Determinants of Academic Performance of Chemistry in Public Secondary Schools in Chesumei Sub-County: A Justification of the Teaching Methods", *EAJES*, vol. 8, no. 3, pp. 132-144, Aug. 2025.

MLA CITATION

Tarus, Evans Kiprono, Patrick Cheben Simiyu & George Morara Ontumbi. "Determinants of Academic Performance of Chemistry in Public Secondary Schools in Chesumei Sub-County: A Justification of the Teaching Methods". *East African Journal of Education Studies*, Vol. 8, no. 3, Aug. 2025, pp. 132-144, doi:10.37284/eajes.8.3.3428.

INTRODUCTION

Globally, quality teaching as a booster to students' academic performance is considered and recognised as significant. Studies by the Organization for Economic Co-operation and Development (OECD) observe that teaching quality and student learning outcomes are strongly linked across various countries (OECD, 2019). Effective teaching practices, such as sound pedagogical knowledge, strategic instructional approaches, and strong classroom management skills, have been shown to correlate positively with students' academic achievement (Magoma, 2019). On the other hand, poor teacher preparation has been identified as one of the factors contributing to educational disparities and lower levels of student performance, as observed by Darling-Hammond (2000).

Effective teaching methods incorporate practical lessons and activities, integration of student-centred approaches, and strategies that involve problem-solving strategies. The approaches are important in improving the understanding of the subject content, which subsequently translates to higher achievement in the subject. Several factors influence a teacher's ability to enhance students' academic outcomes, including qualifications, teaching experience, and the level of administrative support available (Tehseen & Hadi, 2015). Successful teaching and learning processes are affected by human and physical facilities and resources, the adequacy of teaching staff, and the existence of a supportive academic environment (Kilonzo, 2017). Additionally, factors such as classroom size and the relevance of the curriculum play important roles.

In Africa, parallel patterns are evident regarding the aftermath of factors related to teachers on Chemistry performance. Ampiah and Ofori-Attah (2017) found that teacher qualifications, experience, and instructional methods significantly impact students' success in science subjects. Similarly, research by Akpan et al. (2018) identified a positive relationship between teacher competence and students' chemistry examination outcomes. Nevertheless, persistent challenges, including shortages of qualified teachers, insufficient training, and limited educational resources, remain major obstacles to improving education quality in many African nations.

In Kenya, concerns regarding the impact of teaching methods on students' performance have continued to raise concerns about the overall performance in academics. Despite efforts by the government to strengthen teacher training and support systems, educational disparities endure, particularly in rural schools, where issues such as difficulties in teacher recruitment, retention, and professional development are more pronounced. Moreover, factors associated with overcrowded classrooms, scarcity of instructional materials, and socio-economic inequalities have worsened the challenges faced by students in post-primary schools in the country and in Chesumei Sub-County in Nandi County.

Objective of the Study

This study sought to evaluate the contribution of teaching methods on learners' academic performance in chemistry in public secondary schools in Chesumei Sub-County, Nandi County, in Kenya.

Article DOI: https://doi.org/10.37284/eajes.8.3.3428

Significance of the Study

The study produced valuable insights that enhanced understanding of the problem under investigation. This understanding supported the researcher's efforts to provide relevant recommendations to stakeholders, grounded in the collected data, thereby addressing curriculum-related challenges faced by teachers. Additionally, the findings would be important to assist policymakers in shaping policy development concerning teaching methods in secondary schools, improving teacher training, and addressing institutional challenges.

LITERATURE REVIEW

Teaching Methods and Learners' Academic Performance

The teaching methods employed by educators play a significant role in shaping student outcomes. Globally, research by Hattie (2008) identified that active and student-centred learning approaches significantly enhance academic performance across various subjects, including chemistry. In Africa, a study by Oloyede (2010) in Nigeria emphasised the effectiveness of interactive teaching methods, such as inquiry-based learning, in improving students' understanding of scientific concepts. In Kenya, Kinyua, Kithinji, and Muchiri (2015) demonstrated that the use of cooperative learning strategies in teaching chemistry led to improved student engagement and better performance in secondary schools, highlighting the importance of adopting effective teaching methods in Chesumei Sub-County.

Teaching methods that teachers adopt have an impact on teaching outcomes. It is important for teachers to adopt teaching methods that are appropriate (Ganyaupfu, 2023). According to Rowan et al. (2017), poor academic performance is attributed to poor teaching methods. In all academic setups, the teaching methods adopted by instructors should be subject-dependent and should be custom-designed in a manner that helps to bring out the best in the students. In Chesumei Sub-county, few studies exist that have been conducted on teaching methods and students' academic performance, which is the focus of the current study.

Bitok (2019) asserted that chemistry teachers need to motivate girls in developing a positive attitude towards chemistry. Further, Bitok (2019) observed that the chemistry teachers should be aware of the best methods of teaching that motivate girls to develop a positive attitude in chemistry. Other scholars have also advised the government and stakeholders in education to ensure access to sufficient and relevant teaching and learning materials so as to encourage students to perform better in Chemistry (Jepketer et al., 2015). Finally, the literature review showed that, among other gaps, a methodological gap on teaching methods existed, which advocates for the adoption of different teaching methods in the science subjects.

Theoretical Framework

The research adopted the pedagogical content knowledge theory (Shulman, 1987). According to Shulman, the teacher's knowledge is a combination of content that is not only specific but also pedagogical. Teachers are supposed to know and be able to transform their basic knowledge into pedagogical content knowledge. The theory presents teacher-related factors that affect students' academic performance. These factors include classroom management knowledge, teaching principles and possessing knowledge about students. In this study, the theoretical framework integrates these theories to examine how teaching methods affect students' academic performance in chemistry. By applying this theory, the researchers gained a comprehensive understanding of the ways in which teaching methods influence student outcomes in the subject of chemistry.

RESEARCH DESIGN

The study adopted an explanatory sequential design (ESD), which allows the collection and analysis of quantitative and qualitative data as observed by Gupta and Gupta (2022). When quantitative and

Article DOI: https://doi.org/10.37284/eajes.8.3.3428

qualitative data is collected, it is able to allow the exploration of a research question in a manner that is thorough (Patel & Patel, 2019). Explanatory sequential design in this study was adopted because it helped the researchers to answer research questions that are complex, which cannot be solved using either qualitative or quantitative research (Saharan *et al*., 2020).

Target Population

The target population was 18694 respondents who comprised of 46 head of departments, 102 chemistry teachers, 18500 secondary school students enrolled in chemistry classes, as their academic outcomes, perceptions of their teachers, and motivation are critical to understanding the study's focus, 46 principals, were also involved, given their role in shaping the teaching environment and influencing educational practices as shown in Table 1.

Table 1: Target Population

	Category	Target population
1.	Principals	46
2.	Heads of department	46
3.	Chemistry Teachers	102
4.	Students	18500
Total		**18694**

Sample Size and Sampling Procedure

Utilising probability sampling methods, such as stratified random sampling, the study aimed to select representative samples of teachers and students from the target population. By employing appropriate sampling techniques and calculating sample sizes based on statistical formulas, researchers can ensure valid and generalizable findings (Krejcie & Morgan, 1970). The determination of sample size involves estimating the number of participants needed to achieve sufficient statistical power and representativeness in the study. There are several determinants of sample size, including the desired confidence level, error margin, dynamics of the population, and objectives (Israel, 1992). The Yamane formula was used to arrive at the sample size.

$$n = \frac{N}{1+N(e)2} \qquad \text{(i)}$$

n = required sample size

N = population size

e= margin of sampling error (0.05)

In this study, the calculated sample size was $n=\frac{18500}{1+18500(0.05)2}$ =392 respondents as shown below;

Table 2: Sample Size

S/NO	Category	Sample size	
1.	Principals	46	Census
2.	Heads of Department	46	Census
3.	Chemistry Teachers	102	Census
4.	Students	18500	392
Total		**18694**	**586**

Instruments

The research instruments included a structured survey questionnaire for teachers, semi-structured interview guides for teachers and classroom observation guides. These instruments were designed to gather comprehensive data on teacher characteristics, instructional practices, student-teacher relationships, and student achievement in chemistry. The structured survey questionnaire for

Article DOI: https://doi.org/10.37284/eajes.8.3.3428

Principals, Heads of Department, teachers and students was designed to collect quantitative data on various aspects of determinants of academic performance of chemistry, which included teachers' characteristics, instructional practices, and students' perceptions. The students' and teachers' questionnaires focused on suggestions on how to improve teaching of chemistry, teaching styles and students' performance and teaching methods that students found most effective in the teaching of chemistry.

Further, the Principals and Heads of Departments' questionnaires sought responses on how teaching methods impacted the learners, performance exhibited in the results scored. The survey integrated a Likert scale, as well as open-ended questions covering the following domains: questions about teachers' age, gender, teaching experience, educational qualifications, and teachers' professional development activities. Items assessing teachers' pedagogical approaches, use of instructional resources, classroom management techniques, and assessment methods in teaching chemistry; Questions exploring teachers' perceptions of their relationships with students, including communication, supportiveness, and rapport.

Data Analysis Techniques

Descriptive statistics was used for quantitative data collected in summarising findings on the subject matter. Additionally, inferential statistical techniques helped to show associations between study variables. For qualitative data, the thematic analysis technique was used to analyse it, and it was used to identify patterns, themes, and insights related to the subject matter. Transcripts were coded, categorised, and organised into themes, allowing for a deeper understanding of participants' experiences and perspectives. By employing a rigorous data analysis approach that integrates quantitative and qualitative methods, along with test-retest reliability analysis, this study aimed to provide robust insights into the teacher-related factors' effect on the learners' performance in chemistry.

Ethical Considerations

Ethical considerations are central in conducting research, especially those with human participants. Several ethical principles guided the research process, where the researcher sought relevant permits to conduct the research from NACOSTI. Additionally, clearance and authorisation from the County Commissioner's Office (Nandi County) and the County Education Office were sought. Respondents were required to agree before participating in the study. The researcher maintained confidentiality strictly to protect the privacy of participants. The data gathered was kept confidential and only accessible to authorised researchers. Personal identifiers were removed or obscured to ensure that individual participants cannot be identified in any research outputs or publications.

RESULTS AND DISCUSSION

Background of Respondents

The study used two sets of questionnaires, questionnaires for teachers and students. Using the first set of questionnaires, the study sought to determine the age category of all chemistry teachers and heads of department, Chemistry gender of chemistry teachers, the highest level of academic qualification, current position in the school, duration in the school and category of the school. Findings on the distribution of respondents by age category are presented in Table 3.

Article DOI: https://doi.org/10.37284/eajes.8.3.3428

Table 3: Distribution of Respondents by Age Category and Gender

Item (Age)	Frequency	Percent
Less than or equal to 30	11	8.3
31-40	32	24.2
41-50	80	60.6
50 and above	9	6.8
Gender		
Male	86	65.2
Female	46	34.8

The majority of the respondents, 60.6% were aged between 41 and 50 years, 24.2% between 31 and 40 years, 8.3% less than or equal to 30, while 6.8% were 50 years and above, as shown in Table 3. The study further sought to determine the distribution of the respondents based on gender, and the findings are presented in Table 3. Findings revealed that 65.2% of the respondents were male, while 34.8% were female. This implied that the respondents of both genders participated in the study, and hence diversity of opinions was enhanced, which contributed to the improvement in the quality of the study.

Table 4: Teaching Methods the Students Found Most Effective for Learning Chemistry

Statements	Frequency	Percent
Lectures	117	35.2
Group activities	152	45.8
Laboratory experiments	45	13.6
Multimedia presentations	18	5.4
Others (please specify)	0	0.0
Total	332	100.0

Out of the total respondents, 45.8% stated that group activities were the most effective for learning chemistry, 35.2% lectures, 13.6% laboratory experiments and 5.4% multimedia presentation. The study wanted to know which teaching style affected students' academic performance in chemistry, and the results are presented in Table 5.

Table 5: Teaching Style and Students' Academic Performance in Chemistry

Statements	Frequency	Percent
Teaching style improves performance in chemistry	219	66.0
Teaching style does not improve performance in chemistry	113	34.0
Teacher supportiveness and its influence on performance in chemistry		
It improves performance in chemistry	293	88.3
It does not improve performance in chemistry	39	11.7
Total	**332**	**100.0**

The majority of the respondents (66.0%) revealed that teaching style improved performance in chemistry, while 34.0% were of the contrary opinion that it did not contribute to improvement in performance in chemistry. On teacher supportiveness, the findings were presented in Table 5. The majority of the respondents, 88.3% revealed that teacher supportiveness improved performance in chemistry, while 11.7% revealed that it didn't enhance performance in chemistry.

Article DOI: https://doi.org/10.37284/eajes.8.3.3428

The study further sought to determine whether suggestions from students existed on how the teaching of chemistry could be improved in the school, and the results are in Table 6.

Table 6: Suggestions on How to Improve the Teaching of Chemistry in the School

Statements	Frequency	Percent
Yes	296	89.2
No	36	10.8
Students' suggestions on how the teaching of chemistry could be improved in the school		
Use of interactive visuals	104	31.3
Help students develop chemical imagination	92	27.7
Use the 5 E approach	95	28.6
Relate chemistry to everyday life	41	12.3

A total of 89.2% revealed that there existed suggestions on how the teaching of chemistry could be improved in the school, while 10.8% said no. There existed suggestions on how the teaching of chemistry could be improved in the schools. The respondents were asked to enumerate ways that students' academic performance in chemistry can be enhanced, and the results are presented in Table 6. Out of the total respondents, 31.3% revealed that academic performance in chemistry can be enhanced by the use of interactive visuals, 27.7% through helping students develop chemical imagination, 28.6% through the use of the 5E approach, and 12.3% through relating chemistry to everyday life. The majority of the respondents revealed that the academic performance in chemistry can be enhanced by the use of interactive visuals. The study by Bourner (2017) also established that academic performance in chemistry can be enhanced by the use of interactive visuals.

Teaching Methods on Learners' Academic Performance in Chemistry from the Principals and Heads of Department

Findings were presented in Table 7.

Table 7: Descriptive Statistics on Teaching Methods

Statements		S.D	D	N	A	S.A	Mean	Std. Deviation
The lecture method alone is not sufficient to achieve high academic performance in Chemistry; a variety of teaching methods is necessary.	F	23	35	13	27	34	2.4545	1.29216
	%	17.4	26.5	9.8	20.5	25.8		
Regular use of problem-solving exercises in Chemistry lessons improves students' critical thinking and academic performance.	F	19	24	17	36	36	2.8939	1.48405
	%	14.4	18.2	12.9	27.3	27.3		
Incorporating real-life examples in Chemistry teaching makes the subject more relatable and improves academic outcomes.	F	16	20	14	36	46	2.6515	1.41952
	%	12.1	15.2	10.6	27.3	34.8		
Differentiated instruction that caters to students' varying abilities leads to	F	20	15	16	43	38	2.4242	1.40946

Article DOI: https://doi.org/10.37284/eajes.8.3.3428

Statements		S.D	D	N	A	S.A	Mean	Std. Deviation
better academic performance in Chemistry.								
	%	15.2	11.4	12.1	32.6	28.8		
The use of practical/laboratory sessions in teaching Chemistry significantly improves students' academic performance.	F	19	23	9	47	34	2.5152	1.40601
	%	14.4	17.4	6.8	35.6	25.8		
Group discussions during Chemistry lessons enhance students' understanding and positively impact their academic performance.	F	19	20	13	44	36	2.9545	1.46649
	%	14.4	15.2	9.8	33.3	27.3		
ICT/multimedia tools used in teaching Chemistry contribute to better academic performance among students.	F	16	16	18	36	46	2.5000	1.44887
	%	12.1	12.1	13.6	27.3	34.8		
The frequency of assessments and feedback in Chemistry influences students' performance by keeping them engaged and aware of their progress.	F	12	15	8	43	54	2.3939	1.38563
	%	9.1	11.4	6.1	32.6	40.9		
The use of strategic revision techniques, such as summary notes and past paper reviews, has a positive effect on students' performance in Chemistry.	F	19	15	23	36	39	2.1515	1.31628
	%	14.4	11.4	17.4	27.3	29.5		
A teacher's preparedness and lesson planning are more critical to students' academic performance in Chemistry than the specific teaching method used.	F	10	19	12	37	54	2.3258	1.23867
	%	7.6	14.4	9.1	28.0	40.9		
Composite mean							**2.5265**	

As per Table 7, 46.3% of the respondents agreed that the lecture method alone was not sufficient to achieve high academic performance in Chemistry. However, a variety of teaching methods were necessary, while 43.9% disagreed and 9.8% were neutral. The lecture method alone was not sufficient to achieve high academic performance in Chemistry. A variety of teaching methods were necessary, as supported by a mean score of 2.4545 and a standard deviation of 1.29216. These findings have a resemblance to Kini and Podolsky (2016), who assert that the lecture method alone is not sufficient to achieve high academic performance in Chemistry, but instead a variety of teaching methods are necessary.

Article DOI: https://doi.org/10.37284/eajes.8.3.3428

On whether regular use of problem-solving exercises in Chemistry lessons improves students' critical thinking and academic performance, 54.6% agreed while 32.6% disagreed, and 12.9% were neutral. Regular use of problem-solving exercises in Chemistry lessons improves students' critical thinking and academic performance, as supported by a mean score of 2.8989 and a standard deviation of 1.48405. The study is in agreement with that of Osei-Owusu (2022) that regular use of problem-solving exercises in Chemistry lessons improves students' critical thinking and academic performance. On whether incorporating real-life examples in Chemistry teaching made the subject more relatable and improved academic outcomes, 62.1% agreed while 27.3% disagreed, and 10.6% were neutral.

Incorporating real-life examples in Chemistry teaching makes the subject more relatable and improves academic outcomes, as supported by a mean score of 2.6515 and a standard deviation of 1.41952. Findings of this study are similar to those of Ladd and Sorensen (2017) that incorporating real-life examples in Chemistry teaching makes the subject more relatable and improves academic outcomes. In regards to whether differentiated instruction that caters to students' varying abilities leads to better academic performance in Chemistry, 61.4% agreed while 26.6% disagreed, and 12.1% were neutral. Differentiated instruction that caters to students' varying abilities leads to better academic performance in Chemistry, as supported by a mean score of 2.4242 and a standard deviation of 1.40946. Findings resemble those of Mulholland and Berliner (2022), who differentiated instruction that caters to students' varying abilities leads to better academic performance in Chemistry.

On whether the use of practical/laboratory sessions in teaching Chemistry significantly improves students' academic performance, 61.4% agreed while 31.8% disagreed, and 6.8% were neutral. The use of practical/laboratory sessions in teaching Chemistry significantly improves students' academic performance, by a mean score of 2.5152 and a standard deviation of 1.40601. The study sought to determine whether group discussions during Chemistry lessons enhance students' understanding by positively impacting their academic performance. 60.6% agreed while 29.6% disagreed and 9.8% were undecided.

This implies that the majority of the respondents agreed that group discussions during Chemistry lessons enhance students' understanding and positively impact their academic performance, as supported by a mean score of 2.9545 and a standard deviation of 1.46649. Findings resemble those of Podolsky et al. (2019) that group discussions during Chemistry lessons enhance students' understanding and positively impact their academic performance. As to whether ICT/multimedia tools used in teaching the study, observed that these tools contributed to better academic performance among students, 62.1% agreed while 24.2% disagreed, and 13.6% were neutral. ICT/multimedia tools were used in teaching Chemistry, contributing to better academic performance among students, as supported by a mean score of 2.5000 and a standard deviation of 1.44887. Out of the total respondents, 73.5% agreed that the frequency of assessments and feedback in Chemistry influences students' performance by keeping them engaged and aware of their progress, while 20.5% disagreed, and 6.1% were neutral. Frequency of assessments and feedback in Chemistry influences students' performance by keeping them engaged and aware of their progress, as supported by a mean score of 2.3939 and a standard deviation of 1.38563. Findings resemble those of Kheirzadeh and Sistani (2018) that the frequency of assessments and feedback in Chemistry influences students' performance by keeping them engaged and aware of their progress.

On whether the use of strategic revision techniques, such as summary notes and past paper reviews, has a positive effect on students' performance in Chemistry, 56.8% agreed while 25.8% disagreed,

Article DOI: https://doi.org/10.37284/eajes.8.3.3428

and 17.4% were neutral. The use of strategic revision techniques, such as summary notes and past paper reviews, had a positive effect on students' performance in Chemistry, as supported by a mean score of 2.1515 and a standard deviation of 1.31628. Findings resemble those of Wolters and Daugherty (2017) that the use of strategic revision techniques, such as summary notes and past paper reviews, has a positive effect on students' performance in Chemistry. On whether teachers' preparedness and lesson planning are more critical to students' academic performance in Chemistry than the specific teaching method used, 68.9% agreed while 22% disagreed, and 9.1% were neutral. Teachers' preparedness and lesson planning were more critical to students' academic performance in Chemistry than the specific teaching method used, as supported by a mean score of 2.3258 and a standard deviation of 1.23867. The study agrees with that of Kini and Podolsky (2016) that teachers' preparedness and lesson planning are more critical to students' academic performance in Chemistry than the specific teaching method used. The composite mean was 2.5265, which implies that teacher experience has an influence on learners' academic performance in chemistry within public secondary schools in Chesumei Sub-County. The majority of the respondents interviewed revealed that;

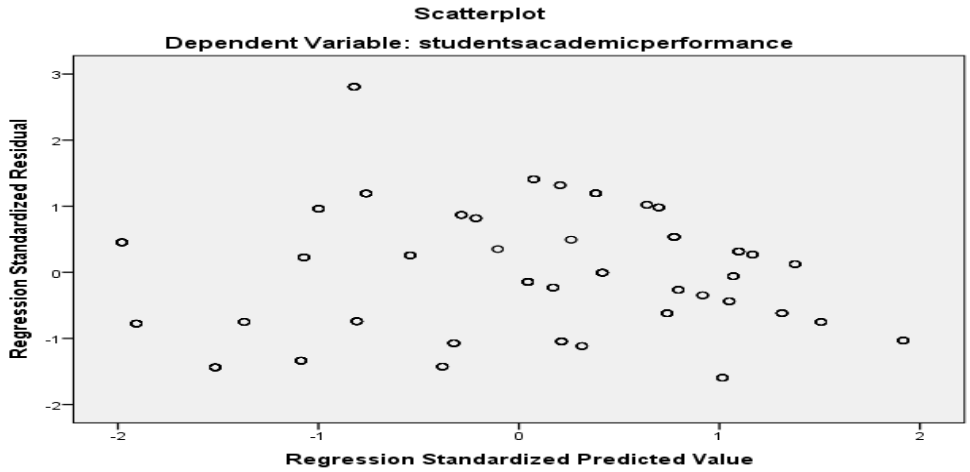
> *"Chemistry teachers had great experience, as the majority of the teachers had more than three years of teaching experience with remarkable students' performance in chemistry. In most of the schools, all the chemistry teachers had the experience required for better students' performance in the chemistry subject."*

Table 8: Test of Multi-collinearity

Model	Collinearity statistics	
	Tolerance	VIF
(Constant)		
Teaching methods	.697	1.435

The test of multi-collinearity is presented in Table 8, where the VIF was 1.435. If the VIF is more than 10, it means that no multi-collinearity problems exist in a study. In this study, the VIF value was less than 10, and therefore, there were no serious multi-collinearity problems that were detected in the study. In order to test the homoscedasticity assumption, a scatter plot was adopted, and the results were presented in Figure 1.

Figure 1: Homoscedasticity Assumption Test



Article DOI: https://doi.org/10.37284/eajes.8.3.3428

As depicted in Figure 1, the residuals were distributed without any pattern and therefore they were not distributed in a triangular form. This meant that the assumption was upheld. After testing the assumptions, regression analysis was done and the results presented in Table 9, which captures the model summary, ANOVA and regression coefficients results. The adjusted R-squared value was 0.504, which implied that teaching methods contributed to a 50.4% change in students' academic performance in chemistry.

Table 9: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.643	0.518	0.504	2.48617

a. Predictor: (Constant), Teaching methods

CONCLUSION

The findings of the study indicated that most respondents believed that the lecture method alone was inadequate in achieving high academic performance in Chemistry, and a diverse range of teaching methods was important. Regular inclusion of problem-solving exercises in Chemistry lessons enhanced students' critical thinking and academic performance. A majority of respondents felt that incorporating real-life examples into Chemistry teaching made the subject more relevant and improved academic results. Differentiated instruction, which addresses students' different learning abilities, leads to better academic outcomes in Chemistry. The integration of practical and laboratory sessions in Chemistry teaching notably boosted students' academic performance.

Additionally, the use of ICT and multimedia tools in Chemistry instruction contributed to improved academic performance among students. The frequency of assessments and feedback in Chemistry influences students' performance by keeping them engaged and aware of their progress. The use of strategic revision techniques, such as summary notes and past paper reviews, has a positive effect on students' performance in Chemistry. Teachers' preparedness and lesson planning are more critical to students' academic performance in Chemistry than the specific teaching method used. Regression results revealed that teacher experience significantly positively influences students' academic performance in chemistry (β=0.190, p=0.022).

On teaching methods, it was concluded that teaching methods had a great influence on the academic performance of the learners in chemistry in public secondary schools in the study area. The study further concluded that the lecture method alone was not sufficient to achieve high academic performance in Chemistry; a variety of teaching methods is necessary. Regular use of problem-solving exercises in Chemistry lessons improved the students' critical thinking and academic performance. Incorporating real-life examples in Chemistry teaching makes the subject more relatable and improves academic outcomes. Differentiated instruction that catered to students' varying abilities led to better academic performance in Chemistry.

The use of practical/laboratory sessions in teaching Chemistry significantly improved students' academic performance. ICT/multimedia tools used in teaching Chemistry contributed to better academic performance among students. The frequency of assessments and feedback in Chemistry influences students' performance by keeping them engaged and aware of their progress. The use of strategic revision techniques, such as summary notes and past paper reviews, had a positive effect on students' performance in Chemistry.

Article DOI: https://doi.org/10.37284/eajes.8.3.3428

RECOMMENDATIONS

The majority of the Chemistry teachers are well qualified. Moreover, there was a need for most of them to attend workshops and improve in service training. This would enhance staff development and further improve the performance of Chemistry teachers. Further, Chemistry teachers should engage symposium to sensitise students on the practical aspects of chemistry. This would enhance understanding of chemistry amongst students and enable them to compete adequately in choosing careers which are chemistry-oriented. Finally, schools aiming to improve their chemistry performance should focus on team teaching, strategic revision, teacher motivation, and the experience of individual teachers.

REFERENCES

Akpan, S. M., Essien, A. U., & Nsit, A. (2018). Motivational teaching strategies and availability of laboratory facilities as correlates of academic performance of students in chemistry in Akwa Ibom State.

Ampiah, J. G., & Ofori-Attah, K. (2017). Factors influencing students' academic performance in science subjects at the senior high school level: A case study of some selected schools in the central region of Ghana. *Journal of Education and Practic*e, *8*(14), 131-139.

Bitok, N. J. (2019). An investigation of factors contributing to poor performance in chemistry among girls in secondary schools in Nandi North sub-county, Kenya (Doctoral dissertation, University of Eldoret).

Bourner, T. (2017). Teaching methods for learning outcomes. *Education+ training*, *39*(9), 344-348.

Ganyaupfu, E. M. (2023). Teaching methods and students' academic performance. *International Journal of Humanities and Social Science Invention*, *2*(9), 29-35.

Gupta, A., & Gupta, N. (2022). *Research methodology*. New Delhi: SBPD Publications.

Hattie, J. (2008). *Visible learning: A synthesis of over 800 meta-analyses relating to achievemen*t. New York: Routledge.

Darling-Hammond, L. (2000). How teacher education matters. *Journal of teacher education*, *51*(3), 166-173.

Israel, G.D. (1992). *Determining sample size. University of Florida Cooperative Extension Service. Florida:* Institute of Food and Agriculture Sciences.

Jepketer, A., Kombo, K., & Kyalo, D. (2015). Teachers' classroom strategy for enhancing students' performance in public secondary schools in Nandi County, Kenya. *IOSR Journal of Humanities and Social Science (IOSR-JHSS)*, *20*(7), 2279-0845.

Kinyua, R., Kithinji, M., & Muchiri, J. (2015). Influence of cooperative learning strategy on students' performance in chemistry in public secondary schools in Imenti South Sub-County, Kenya. *Journal of Education and Practice, 6*(5), 181-187.

Kheirzadeh, S., & Sistani, N. (2018). The effect of reflective teaching on Iranian EFL students' achievement: The case of teaching experience and level of education. *Australian Journal of Teacher Education (Online)*, *43*(2), 143-156.

Krejcie, R.V., & Morgan, D.W., (1970). *Determining sample size for research activities.* Thousand Oaks, California: Educational and Psychological Measurement.

Kilonzo, P. M. (2017). An investigation of head-teachers' related factors affecting the implementation of the free primary education in Yathui division in Machakos district. *Global Journal of Advanced Research Studies, 3*(4), 55-62.

Article DOI: https://doi.org/10.37284/eajes.8.3.3428

Kini, T., & Podolsky, A. (2016). Does teaching experience increase teacher effectiveness. *A Review of the Research*, *1*(1), 72-80.

Ladd, H. F., & Sorensen, L. C. (2017). Returns to teacher experience: Student achievement and motivation in middle school. *Education Finance and Policy*, *12*(2), 241-279.

Magoma, C. M. (2019). Teacher related factors which influence the implementation of integrated English course in secondary schools: a case study of Ibacho Division, Kisii Central District. *International Journal of Multidiscipliary Studies, 3*(3), 114-121.

Mulholland, L. A., & Berliner, D. C. (2022). Teacher experience and the estimation of student achievement. *International Journal of Management Studies, 3*(1), 33-40.

OECD. (2019). TALIS 2018 Results (Volume II): *Teachers and school leaders as valued professionals*. Paris: OECD Publishing.

Osei-Owusu, B. (2022). Impact of professional development programmes on teachers' knowledge and academic performance of senior high school students in Ghana. *European Journal of Education and Pedagogy*, *3*(2), 60-69.

Oloyede, O. I. (2010). Integrating peer tutoring, concept mapping, and cooperative learning strategy in enhancing achievement in chemistry. *International Journal of Science Education*, *32*(3), 293-313.

Patel, M., & Patel, N. (2019). Exploring research methodology. *International Journal of Research and Review*, *6*(3), 48-55.

Podolsky, A., Kini, T., & Darling-Hammond, L. (2019). Does teaching experience increase teacher effectiveness? A review of US research. *Journal of Professional Capital and Community*, *4*(4), 286-308.

Rowan, B., Chiang, F. S., & Miller, R. J. (2017). Using research on employees' performance to study the effects of teachers on students' achievement. *Sociology of Education, 2*(1), 256-284.

Saharan, V. A., Kulhari, H., Jadhav, H., Pooja, D., Banerjee, S., & Singh, A. (2020). Introduction to research methodology. In *Principles of Research Methodology and Ethics in Pharmaceutical Sciences* (pp. 1-46). New Delhi: CRC Press.

Shulman, L. S. (1987). Knowledge and teaching: foundations of the new reform. *Harvard Educational Review, 57*(1) 1-21.

Tehseen, S., & Hadi, N. U. (2015). Factors influencing teachers' performance and retention. *Mediterranean Journal of Social Sciences*, *6*(1), 233-244.

Wolters, C. A., & Daugherty, S. G. (2017). Goal structures and teachers' sense of efficacy: Their relation and association to teaching experience and academic level. *Journal of Educational Psychology*, *99*(1), 181-190.

