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Original Article

Impact of Teacher Qualifications on Learners' Academic Performance in Chemistry in Public Secondary Schools in Chesumei Sub-County

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ABSTRACT

Chemistry is an emerging subject that occupies an important part in societal well-being. Its knowledge forms a foundation of lifelong skills. However, despite its importance, the performance of chemistry in high school has been below expectations. This research aimed to investigate the teacher qualification's influence on educational performance in Chemistry in public secondary schools in the Chesumei sub-county. The research adopted a mixed-methods approach to gather quantitative and qualitative data. Quantitative data was collected through questionnaires administered to chemistry teachers and students, focusing on their perceptions of teaching practices, classroom dynamics, and academic outcomes. Qualitative data was 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 data collected for this study underwent thorough analysis utilizing statistical software, specifically SPSS (Statistical Package for the Social Sciences). This software offered robust abilities for organizing, interpreting, and developing meaningful insights from the data collected. By employing SPSS, the study aimed to conduct comprehensive statistical analyses, including descriptive statistics, inferential tests, and regression analyses, among others. The study revealed that teacher qualifications have a significant positive influence on student academic performance in chemistry (β=0.413, p=0.000). The study concluded that teacher qualifications enhance learners' academic performance in chemistry within public secondary schools in Chesumei Sub-County. The study recommended that teacher qualifications should continue to be considered when employing teachers as it contributes to improvement in learners' academic performance in chemistry within public secondary schools.

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INTRODUCTION

Globally, the importance of quality teaching in enhancing students' academic achievement has been widely acknowledged. Research conducted by the Organization for Economic Co-operation and Development (OECD) highlights the significant impact of teacher quality on student learning outcomes across countries (OECD, 2019). Effective teaching practices, including pedagogical knowledge, instructional strategies, and classroom management skills, have been found to positively correlate with students' academic performance (Hattie, 2009). Conversely, inadequate teacher preparation, lack of professional development opportunities, and high teacher turnover rates have been identified as factors contributing to educational inequities and lower student achievement levels (Darling-Hammond, 2000).

The teacher qualification effect on the learners' performance has been a subject of extensive research globally, with numerous studies exploring various dimensions of this complex relationship (Darling-Hammond, 2000). Education is a central human right and a primary driver of development and progress in societies worldwide (Ampiah & Ofori-Attah, 2017). In the African context, similar trends are observed regarding teacher-related factors' effects on the learners' performance in Chemistry. Ampiah and Ofori-Attah (2017) observed that teacher qualifications, experience, and instructional practices significantly influence students' achievement in science subjects. Similarly, research by Akpan et al. (2018) revealed a positive association between teacher competency and students' performance in chemistry examinations. However, challenges such as teacher shortages, inadequate training, and limited resources pose significant barriers to improving educational quality in many African countries. In Kenya, teacher qualification effects on the learners' performance has been a subject of increasing concern. Despite government efforts to enhance teacher training and support systems, disparities in educational outcomes persist, with rural schools often facing greater challenges related to teacher recruitment, retention, and professional development. Additionally, factors such as large class sizes, inadequate instructional materials, and socio-economic disparities have further compounded the educational challenges faced by students in PPS in Chesumei Sub-County.

Statement of the Problem

The performance of learners in chemistry within public secondary schools in Chesumei Sub-County is influenced by various teacher-related factors. Despite the crucial role of teachers in shaping students' understanding and engagement with the subject, there remains a gap in understanding the specific teacher-related factors that significantly impact learners' academic performance in chemistry. This gap hinders the development of effective strategies and interventions to enhance

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teaching practices and improve student outcomes in chemistry education. Subsequently, this study aimed to examine the effects of teacher qualifications on learners' academic performance in chemistry within public secondary schools. By addressing this gap in the literature, the research's findings provided valuable discernments for teachers, legislators, and stakeholders to formulate evidence-based strategies that promote effective teaching practices and ultimately enhance students' academic achievement in chemistry.

Objective of the Study

This study sought to determine the Impact of Teacher Qualifications on Learners' Academic Performance in Chemistry in Public Secondary Schools in Chesumei Sub-County.

LITERATURE REVIEW

Teacher Qualifications and Learners' Academic Performance

Globally, teacher qualifications are recognized as a critical determinant of student success. Research by Darling-Hammond (2000) in the United States highlights that students taught by well-qualified teachers, particularly those with advanced degrees in their subject areas, consistently outperform peers taught by less qualified instructors. This trend was evident in numerous countries, where the level of teacher education and training directly correlates with student achievement (OECD, 2019). Regionally, in sub-Saharan Africa, a study by Mupa and Chinooneka (2015) revealed that teacher qualifications significantly impact student performance, especially in subjects like chemistry that require specialized knowledge. In Kenya, a study by Wambugu and Changeiywo (2008) found that students performed better in physics when taught by teachers with higher qualifications and extensive training, a finding that is likely applicable to chemistry education in Chesumei Sub-County.

Chokera (2018) researched the influence of teacher characteristics on pupils' academic performance in Public Primary Schools in Kenya. The study was conducted at the Akithi Division in Meru County in Kenya. The study was conducted among 29 primary schools in the division and targeted teachers and pupils drawn in classes seven and eight. The research adopted a descriptive research design. The data collected in the study was analyzed using both descriptive and inferential statistical techniques. Teacher qualifications were among the teacher characteristics adopted in the study. Findings revealed that teacher qualifications enhance pupils' academic performance in Public Primary Schools in Kenya. Kilaha (2020) researched teachers' characteristics and their effects on students' achievements in chemistry. The study was conducted in the Bungoma North district. The sample size was 42 secondary schools. Stratified random sampling was used to select 13 schools according to their categories which included; National, Extra County, County and Sub-County public secondary schools. The data that was collected in the study was analyzed using descriptive statistics and inferential statistics. Findings revealed that teachers' qualifications have a positive effect on students' achievements in chemistry.

METHODOLOGY

The study adopted a descriptive approach research design. This approach allowed the researcher to draw on the strengths of both methods: quantitative research provides the ability to measure and analyze data statistically, offering objectivity and generalizability, while qualitative research offers deeper insights into participants' experiences, emotions, and social contexts. By integrating these methods, a mixed approach can address research questions from multiple angles, corroborate findings, and offer a richer, more nuanced interpretation of the data. This design is particularly valuable when exploring complex issues where neither qualitative nor quantitative methods alone would be sufficient to capture the full scope of the phenomenon being studied. Researchers may use

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various strategies to combine these methods, such as conducting qualitative interviews to explain or expand on quantitative survey results or using quantitative data to test hypotheses generated from qualitative observations. The target population was 18694 respondents who comprised 46 heads of departments, 102 chemistry teachers in public secondary schools within the sub-county and 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, would also be involved, given their role in shaping the teaching environment and influencing educational practices. The total sample size was 586. The study adopted stratified random sampling to group the respondents, therefore the respondents were selected using a simple random sampling technique. The principals who were interviewed were selected using a purposive sampling technique.

The research instruments included a structured survey questionnaire for teachers, a student questionnaire and semi-structured interview guides for teachers and students. These instruments were designed to gather comprehensive data on teacher characteristics, instructional practices, student-teacher relationships, and student achievement in chemistry. Test-retest reliability was utilized to assess the validity of the research instruments and data collection procedures. The test-retest approach entails administering a similar survey to a common group of respondents in two different periods to ascertain the responses' consistency (Sullivan & Artino, 2013). Further, the researcher engaged faculty members from the School of Education to request interview questions to ensure they generate the expected responses. In the study investigating the teacher qualification effect on the learners' performance in chemistry in public secondary schools in Chesumei Sub-County, data analysis was quantitative and was obtained from surveys, descriptive statistics were used to summarize the responses of teachers and students regarding various teacher-related factors and academic performance in chemistry. Additionally, inferential statistical technique was used to explore the link between teacher qualification and academic outcomes. By employing a rigorous data analysis approach that integrates quantitative methods, along with test-retest reliability analysis, this study aimed to provide robust insights into teacher qualification effect on the learners' performance in chemistry in public secondary schools in Chesumei Sub-County.

Ethical Consideration

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

RESULTS AND DISCUSSION

Questionnaire Response rate

The results of the response rate are presented in Table 1.

Table 1: Response Rate

Questionnaires issued	Questionnaires returned	Response rate
540	464	85.9

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In this research, 540 questionnaires were administered to the respondents. 464 questionnaires were filled and returned which is a response rate of 85.9% which was excellent and adequate for further analysis. According to Mugenda and Mugenda (2003), the response rate which is good for data analysis and making references is the one that is above 60%.

Descriptive Statistics

In the Likert scale, (strongly disagree and disagree) are grouped together as disagree, while (strongly agree and agree) are grouped as agree while neutral is not grouped. The mean and standard deviation for each statement are presented in this section. Findings are presented in Table 2.

Table 2: Descriptive Statistics on Teacher Qualifications

Statements		S. D	D	N	A	S. A	Mean	Std. Deviation
Teacher qualification is an integral determiner of students' performance in chemistry in this school since the depth of subject delivery is wide.	F	17	21	8	36	50	2.3864	1.44965
	%	12.9	15.9	6.1	27.3	37.9		
The mastery of subject content depends on the level of qualification of the teacher.	F	21	11	9	48	43	2.3864	1.42308
	%	15.9	8.3	6.8	36.4	32.6		
Teachers' qualification in chemistry influences the capacity of undertaking practicals which are key components of the performance in this subject.	F	11	21	15	41	44	2.3485	1.31338
	%	8.3	15.9	11.4	31.1	33.3		
Teachers' level of qualification has no influence on academic performance in chemistry since diploma teachers have always excelled in teaching chemistry compared to those with higher qualifications.	F	57	39	9	11	16	2.1667	1.38237
	%	43.2	29.5	6.8	8.3	12.1		
The performance of chemistry is more student-determined than dependent on teacher qualifications.	F	36	46	12	23	18	2.5758	1.40404
	%	27.3	32.6	9.1	17.4	13.6		
Chemistry performance is more related to teacher lesson preparation than qualification since mastery content and delivery are not solely dependent on the latter.	F	53	37	13	16	13	2.2348	1.35275
	%	40.2	28.0	9.8	12.1	9.8		
The performance of chemistry in this school has always been influenced by team teaching, strategic revision and teacher motivation without much consideration of individual teacher qualifications.	F	63	49	10	7	3	1.7727	.96180

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Statements		S. D	D	N	A	S. A	Mean	Std. Deviation
	%	47.7	37.1	7.6	5.3	2.3		
Parental involvement has been a major boost to chemistry performance in this school coupled with high teacher qualifications enhanced by regular training, seminars and workshops.	F	9	9	16	49	49	2.0909	1.17515
	%	6.8	6.8	12.1	37.1	37.1		
It is important to acknowledge the fact that chemistry performance has been on an upward trajectory in this school based on teachers' dedication, qualifications and intrinsic motivation of learners.	F	23	51	16	19	23	2.7576	1.37103
	%	17.4	38.6	12.1	14.4	17.4		
Chemistry performance in our school is owed to the school culture that is keen on student discipline, weekend practicals, inter-class contests and chemistry week.	F	29	28	15	31	29	3.0227	1.49025
	%	22.0	21.1	11.4	23.5	22.0		
Composite Mean							**2.3743**	

As per Table 3, results reveal that 63.6% of the respondents agreed that teachers' experience is key in determining performance in Chemistry since teachers are able to apply from previous performances, 28.1% disagreed with the statement while 8.3% were neutral. This implies that the majority of the respondents agreed that teachers' experience is key in determining performance in Chemistry since teachers are able to apply from previous performances, as supported by a mean score of 2.4621 and a standard deviation of 1.36703. Findings resemble that of Hattie (2008) that teachers' experience is key in determining performance in Chemistry since teachers are able to apply from previous performances. In regard to whether chemistry performance in the school is a factor of the long experiences held by teachers teaching it, 63.6% agreed while 28.8% disagreed with the statement and 7.6% were neutral. This implies that the majority of the respondents agreed that chemistry performance in the school is a factor of the long experiences held by teachers teaching it, as supported by a mean score of 2.4545 and a standard deviation of 1.31558. Findings resemble that of Oloyede (2010) that chemistry performance in the school is a factor of the long experiences held by teachers teaching it.

In relation to whether teacher's experience in handling candidate classes has seen this school do well in chemistry over the years, 68.2% agreed while 21.2% disagreed with the statement and 10.6% were neutral. This implies that the majority of the respondents agreed that teacher's experience in handling candidate classes has seen this school do well in chemistry over the years, as supported by a mean score of 2.2121 and a standard deviation of 1.24808. The study agrees with that of Kinyua et al. (2015) that teachers' experience in handling candidate classes has seen this school do well in chemistry over the years. On whether other schools come to benchmark us on teaching chemistry since our school has been consistently doing well for many years as a result of the experienced teachers that we have in the department, 51.5% disagreed,

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36.1% agreed and 12.9% were neutral. This implies that the majority of the respondents disagreed that other schools come to benchmark from them on teaching chemistry since their school has been consistently doing well for many years as a result of the experienced teachers that they have in the department, as supported by a mean score of 2.9167 and a standard deviation of 1.37058. Findings resemble that of Ganyaupfu (2013) that other schools do not come to benchmark them on teaching chemistry since their school has been consistently doing well for many years as a result of the experienced teachers that they have in the department.

The study also sought to determine whether the performance of chemistry is more student-determined than dependent on teacher's experience since many schools with more experienced teachers have been poorly performing in the subject, 70.4% disagreed while 19.7% agreed and 9.8% were neutral. This implies that the majority of the respondents disagreed that the performance of chemistry is more student-determined than dependent on teacher's experience since many schools with more experienced teachers have been poorly performing in the subject, as supported by a mean score of 2.1894 and a standard deviation of 1.34296. The study results resemble that of Carpenter (2016) that the performance of chemistry is not more student-determined than dependent on teachers' experience since many schools with more experienced teachers have performed poorly in the subject. In relation to whether chemistry performance is more related to teacher lesson preparation than experience since a poorly prepared teacher may not deliver well during the lessons, 62.1% disagreed, 26.5% agreed and 11.4% were neutral. This implies that the majority of the respondents disagreed that chemistry performance is more related to teacher lesson preparation than experience since a poorly prepared teacher may not deliver well during the lessons, as supported by a mean score of 2.4773 and a standard deviation of 1.32772. Findings resemble that of Yakovleva and Yakovlev (2014) that chemistry performance is not more related to teacher lesson preparation than experience since a poorly prepared teacher may not deliver well during the lessons.

On whether the performance of chemistry in this school has always been influenced by team teaching, strategic revision and teacher motivation without much consideration of individual teacher experience, 56.8% agreed while 31.1% disagreed and 12.1% were neutral. This implies that the majority of the respondents agreed that the performance of chemistry in this school has always been influenced by team teaching, strategic revision and teacher motivation without much consideration of individual teacher experience, as supported by a mean score of 2.4773 and a standard deviation of 1.30452. The study agrees with that of Bourner (2017) that the performance of chemistry in this school has always been influenced by team teaching, strategic revision and teacher motivation without much consideration of individual teacher experience. In relation to whether parental involvement has been a major boost to chemistry performance in this school coupled with long teaching experience of teachers enhanced by regular training, seminars and workshops, 61.4% agreed while 23.5% disagreed and 15.2% were neutral. This implies that the majority of the respondents agreed that parental involvement has been a major boost to chemistry performance in this school coupled with the long teaching experience of teachers enhanced by regular training, seminars and workshops, as supported by a mean score of 2.5833 and a standard deviation of 1.37058. Findings are in tandem with that of Samwel-Mwasalwiba (2020) that parental involvement has been a major boost to chemistry performance in this school coupled with the long teaching experience of teachers enhanced by regular training, seminars and workshops.

On whether it is important to acknowledge the fact that chemistry performance has been on an upward trajectory in this school based on teachers' dedication, experience and intrinsic motivation of

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learners, 65.9% disagreed, 25.0% agreed and 9.1% were neutral. This implies that the majority of the respondents disagreed with the statement that chemistry performance had been on an upward trajectory in this school based on teachers' dedication, experience and intrinsic motivation of learners, as supported by a mean score of 2.4545 and a standard deviation of 1.29216. Findings resemble that of Dorgu (2015) that chemistry performance had been on an upward trajectory in this school based on teachers' dedication, experience and intrinsic motivation of learners. In relation to whether chemistry performance in the school was owed to the school culture that is keen on student discipline, weekend practicals, inter-class contests and chemistry week without much ado on teachers' experience, 60.6% disagreed while 31.1% agreed and 8.3% were neutral. This implies that the majority of the respondents disagreed with the statement that chemistry performance in the school is owed to the school culture that is keen on student discipline, weekend practicals, inter-class contests and chemistry week without much ado on teachers' experience, as supported by a mean score of 2.6288 and a standard deviation of 1.40558. Findings resemble that of Bonner (2019) that chemistry performance in the school is owed to the school culture that is keen on student discipline, weekend practicals, inter-class contests and chemistry week with much ado on teachers' experience. The composite mean was 2.2379 which implies that teaching methods have an influence on learners' academic performance in chemistry within public secondary schools in Chesumei Sub-County.

Regression Analysis

The regression analysis results presented in this section include model summary, ANOVA and regression co-efficient.

Table 3: Model Summary

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

a. Predictors: (Constant), Teacher qualifications

In Table 3, the adjusted r-square value was 0.504 which implies that Teacher qualifications explain a 50.4% change in students' academic performance in chemistry. The model fitness was tested using ANOVA and the results are presented in Table 4.

Table 4: ANOVA

Model		Sum of Squares	df	Mean Square	F	Sig.
	Regression	736.760	1	252.254	23.520	.000[b]
1	Residual	752.650	144	117.414		
	Total	1589.411	145			

a. Dependent Variable: Students' Academic Performance

b. Predictors: (Constant), Teacher qualifications

The value of the F test is F (1, 144) = 23.520, $p<0.05$. This implies that the model was fit to predict students' academic performance in chemistry. The results further implied that teacher qualifications can significantly predict students' academic performance in chemistry. The study sought to determine the regression co-efficient which was used to determine the extent to which teacher qualifications affect student academic performance in chemistry and results were presented in Table 5.

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Table 5: Regression Co-efficient

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
			Std. Error	Beta		
1	(Constant)	4.056	2.120		1.813	.000
	Teacher qualifications	.413	.051	.607	7.336	.000

Results presented in Table 5 reveal that teacher qualifications have a significant positive influence on student academic performance in chemistry (β=0.413, p=0.000). This implies that an improvement in teacher qualifications by one unit improves students' academic performance in chemistry by 0.413 units when all the other factors are held constant. The results are similar to that of Darling-Hammond (2000) that teacher qualifications have a significant positive influence on student academic performance in chemistry.

CONCLUSION AND RECOMMENDATIONS

The study concluded that teacher qualifications enhance learners' academic performance in chemistry within public secondary schools in Chesumei Sub-County. Teacher qualification is an integral determiner of students' performance in chemistry in schools since the depth of subject delivery is wide. Mastery of subject content depends on the level of qualification of the teacher. Teachers' qualification in chemistry influences the capacity of undertaking practicals which are key components of performance in chemistry subject.

The Teachers' level of qualification has an influence on academic performance in chemistry. The performance of chemistry is student-determined and it is also dependent on teacher qualifications. Performance of chemistry is influenced by team teaching, strategic revision, teacher motivation and consideration of individual teacher qualifications. Parental involvement has been a major boost to chemistry performance coupled with high teacher qualifications enhanced by regular training, seminars and workshops. Chemistry performance upward trajectory is based on teachers' dedication, qualification and intrinsic motivation of learners. Teacher qualification is an integral determiner of students' performance in chemistry since the depth of subject delivery is wide.

Recommendations

The study recommended that:

- Teacher qualifications should continue to be considered when employing teachers as it contributes to improvement in learners' academic performance in chemistry within public secondary schools.
- Teachers should master chemistry subject content if they have to enhance students' academic performance in the subject. Team teaching, strategic revision, teacher motivation and consideration of individual teacher qualifications should be considered when the intention of the school is to record improvement in academic performance.
- Parental involvement and high teacher qualifications enhanced by regular training, seminars and workshops should be adopted to boost chemistry performance.
- Teachers should be dedicated and should motivate the learners for there to be an improvement in performance in chemistry.

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