

EFFECT OF STUDENT PERCEPTION TO CHEMISTRY PRACTICALS ON PERFORMANCE IN CHEMISTRY SUBJECT

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ABSTRACT

Experimental practices in Chemistry are vital as an instructional method for better understanding of concepts. The study was done to establish the effect of student perception to chemistry practicals on performance in chemistry in secondary schools. The objective of the study was to evaluate how the perception of students to chemistry subject, teacher and the school affected their performance. The research was done in Narok County of Kenya. The County was chosen for study for the reason that the outcomes in summative evaluation in Chemistry subject was below the standard and variable as from 2012 to 2017. Research philosophy was Pragmatism where both quantitative and qualitative methods were utilized in data handling. A descriptive survey design was used where a sample size of three hundred and seventy-seven respondents were selected in a random manner from teachers who instructed chemistry and Form three students all from public secondary schools. Information was gathered using questionnaire, interview and observation schedule. Documents were also analyzed to get additional data crucial for the study. Analysis of data was done using statistical package for social science (SPSS) and Analysis of Variance (ANOVA). The findings of the study indicated that Students liked chemistry subject and the teacher to a small extent affecting the development of a positive attitude. They perceived chemistry practicals to be difficult to handle and had a negative attitude. Students were not well motivated during practical sessions The ANOVA result indicated that student's perception is significant to performance in chemistry ($P < 0.05$). The study concluded that the way the student perceived the subject, teacher and the school affected the performance on practicals and the entire subject Chemistry. It recommended that teachers should develop a positive attitude towards the subject to enable them to transfer the same to the students for easy learning and motivation to both and this will better the performance. The results obtained will benefit the government, Donors, teachers, students and researchers to realign measures to enhance student change of attitude for better performance.

Keywords: Perception, Chemistry practical, Performance

1.0 INTRODUCTION

Through the learning of chemistry, it is conceivable to procure significant conceptual and procedural information. Moreover, it makes a difference to create understanding and appreciation of improvements in building, pharmaceutical and other related logical and mechanical areas. In addition, concurring to CDC (2007), learning around the contributions, issues and problems related to advancements in chemistry will offer assistance to learners

create an understanding of the relationship between science, innovation, society and the environment.

Practical exams are major contributing factor to poor performance in sciences since students are not exposed to them as required (KNEC, 2009). From investigating it was realised that few students truly felt they would have performed way better in case they had been instructed periodically in practicals in a great time. It is contended that students tend to get it and review what they see more than what they listen to as a result of utilizing research facilities within the instructing of sciences, but most schools need utilitarian research facilities (Edomwonyi-Otu, 2011).

Research on components that influence students' execution in viable chemistry recorded among other teacher's state of mind to chemistry research facility work. Practical activities require appropriate execution amid science lessons to supply relevance for students and enhance understanding of unique, logical concepts. In any case, writing appears, schools with deficient supplies of master science instructors influence student's 'choice and performance' at the pre-university level and bring down their chance of fulfilment (Odum, 2013). According to the study students' achievement depended to a greater extent on the teacher's method of instruction in handling chemistry practical. It was found that they transferred their attitude towards the students. Those who had a negative attitude towards the subject made their students develop a negative attitude and vice versa.

Mutuku (2014) reported that performance of students in chemistry is attributed to background factors of which poor entry behaviour and teacher and students' factors are major causes. It is cited that chemistry teacher's negative perception of their learners' abilities, inadequate instructional resources in teaching and learning and inappropriate learning environment as major causes of repetitive poor performance in chemistry.

Odutuyi (2012) investigated the relationship between Students' Perception of patterns and students' learning outcomes in secondary school chemistry. Specifically, the study examined the relationship between students' perception of interaction patterns and their performance in Chemistry. It also assessed the relationship between students' perception of interaction patterns and attitude towards the learning of chemistry. It showed that there was a significant relationship between students' perception of students' interaction patterns and their attitude towards chemistry. It was also revealed that student participation was the most favourably perceived dimension in terms of attitude to chemistry. This implied that for students to learn effectively they must participate fully in the learning processes. Based on the findings, it was recommended that teachers should give students plenty of opportunities to contribute and elaborate on their own ideas.

Chepkorir, Marusoi and Chemutai (2014) conducted a diligent inquiry in Bureti Area in Kericho County, Kenya which highlighted issues on the educating strategies utilized by chemistry instructors, their accessibility to handle different student needs pertaining to the subject, their utilize of instructional materials in educating, teachers' individual levels of aptitudes and subject mastery in Chemistry and the effects of students' negative behaviour towards Chemistry on teachers' viability. From the study discoveries, a number of pointers uncovered that there were some variables impacting students' state of mind towards

Chemistry, inadequate experience in Chemistry and destitute instructing. It was prescribed that science instructors ought to energize the improvement of positive self-concept of capacity among learners. It was proposed that direction and advising in schools ought to be empowered to guarantee a positive state of mind towards the subject and full involvement by girls within the subject. Despite the fact that all students take Chemistry in secondary schools, they have continued to register dismal performance in examinations (KNEC, 2013). Practicals are used as a basis for grading and it is suggested that students have problems in handling apparatus, making observations and recording all these weaknesses reveal that they are not well exposed to Chemistry practices (ibid).

Chemistry teaching should be approached by the use of investigatory methods. Experiments ought to be performed and results are carefully analyzed to promote student understanding of concepts (KNEC, 2007). The practical instructional method is a requirement for all teachers to ensure that students are permitted to experiment and develop imaginative thinking skills required in the education system (KNEC, 2009).

In Narok County, performance in Chemistry in summative evaluation has been very poor and lack consistency over the years.

Table 1: Chemistry KCSE Mean grades

Year	2012	2013	2014	2015	2016	2017
Mean Grade	2.783	2.766	2.775	3.887	2.534	2.316

In conclusion, looking at the mean grades above, performance in Chemistry in the county has since been of low quality and lacking consistency. In this Chemistry subject, practical paper determines candidates' overall mean to be awarded and therefore when practical is not performed well then the overall grade of the student drops.

2.0 METHODOLOGY

Pragmatism research philosophy was utilized where both quantitative and qualitative data were used to define relationships between the two variables Saunders, Lewis and Thornhill (2012).

A descriptive survey plan was utilized where a sample of three hundred and seventy- seven respondents was picked in a random manner from chemistry teachers and students of Form three class from one hundred and forty-five public secondary schools. The results were then generalized to the larger population (Best and Khan 1993).

The study was carried out in Narok County. The County is located in the Southern Rift Valley sharing borders with the Republic of Tanzania to the South, Nakuru County to the North, Bomet, Nyamira, Kisii and Migori Counties to the West, Kajiado County to the East. The selection of the area of study was necessitated by its dismal performance in KCSE chemistry subject which lacked internal consistency as from the year 2012 to 2017. The County long-delayed in the provision of excellent education to the learners which is attributed to infrastructure that is not fit for instruction NAYS, (2015)

There were 145 secondary schools in the County during research. The population targeted consisted of 365 chemistry teachers and 6,314 students from Form three class which made a total of 6679 respondents. The class was chosen because in it many topics are practically centred. The population targeted was stratified as shown below

Table 2: Population Targeted

Respondents	Target population
Chemistry teachers	365
Students	6,314
Total Population	6679

Source: County Education Office, (2019)

The sample size was determined by using Yamane’s Taro formula, $n = \frac{N}{1 + N(e)^2}$. Where n= Sample size, N=Population, e= acceptable sampling error of plus or minus 5% (0.05). Hence the results were given by;

$$n = \frac{N}{1 + N(e)^2}$$

Where;

$$\begin{aligned} n &= \text{the sample size, } N = \text{the population size, } e = \text{the acceptance sampling error} \\ &= 6679 / 1 + 6679(0.05)^2 \\ &= 6679 / 1 + 16.6975 \\ &= 6679 / 17.6975 \\ &= 377 \text{ respondents} \end{aligned}$$

Stratified sampling formula was used to calculate the proportion of respondents Neville & Sidney (2013)

Sample size of the strata = size of entire sample / population size * layer size

$$nh = (Nh / N) * n$$

Where;

nh is the sample size for stratum h, Nh is the population size for stratum h, N is total population size, and n is total sample size as given below (Table 3).

Table 3: Sample Frame

Respondents	Target population	Sample distribution
Chemistry Subject	365	21
Students	6,314	356
Total	6679	377

Different sampling techniques were used i.e Cluster sampling technique, simple random sampling and Purposive sampling all to achieve the required sample. Lottery was also used to avoid bias during selection. Research tools used were questionnaire, Interview and observation schedules. Data were analyzed using SPSS and Analysis of variance (ANOVA). Data were then presented using tables.

Students’ Perception and Chemistry Performance

The questionnaire, interview and observation results were presented and discussed below.

Questionnaire Results

It was evaluated using frequencies and percentages. Mean value was used in interpretation. Likert scale was coded as 1= strongly disagree, 2 = disagree, 3 = neutral, 4 = agree and 5 = strongly agree.

Table 4: Students’ Perception and Chemistry Performance

Questions	5(SA)	4(A)	3(N)	2 (D)	1 (SD)	Mean
Students like chemistry practical developing positive attitude towards the subject	21(6.4%)	108(33.1%)	111(34.0%)	60(18.4%)	26(8.0%)	3.12
There is positive perception towards chemistry practical in the school	20(6.1%)	120(36.8%)	128(39.3%)	26(8.0%)	32(9.8%)	3.21
Students like chemistry teachers especially in practical lessons	29(8.9%)	119(36.5%)	94(28.8%)	60(18.4%)	24(7.4%)	3.21
Perception towards the school and its performance affect chemistry practical.	10(3.1%)	71(21.8%)	86(26.4%)	79(24.2%)	80(24.5%)	2.55
Chemistry is easy	15(4.6%)	89(27.3%)	117(35.9%)	53(16.3%)	52(16.0%)	2.88

subject to be understood						
Chemistry practicals are easy to be done than other subjects	17(5.2%)	88(27.0%)	103(31.6%)	69(21.2%)	49(15.0%)	2.86
Positivity in chemistry practical contribute on the performance of the subject	80(24.5%)	129(39.6%)	64(19.5%)	17(5.2%)	36(11.0%)	3.61

Source: Research Data (2019)

Table 4 revealed the effect of students’ perception of chemistry practical performance. Students were asked if they liked chemistry developing a positive attitude towards the subject. The findings indicated that 21(6.4%) strongly agreed, 108(33.1%) agreed, 111(34.0%) neutral, 60(18.4%) disagreed and 26(8.0%) strongly disagreed. This implied that students liked the subject to a smaller extent affecting the development of positive attitude (mean of 3.12).

Response on whether there was a positive perception towards chemistry practical in school. 20(6.1%) strongly agreed, 120(36.8%) agreed, 128(39.3%) neutral, 26(8.0%) disagreed and 32(9.8%) strongly disagreed. There was a slightly low positive perception towards chemistry practicals in public secondary schools (mean of 3.21).

The response on whether the students liked chemistry teachers especially during practical lessons showed 29(8.9%) strongly agreed, 119(36.5%) agreed, 94(28.8%) neutral, 60(18.4%) disagreed and 24(7.4%) strongly disagreed. The results revealed that students moderately liked chemistry teachers (mean of 3.21). The right attitude towards the teacher contributed to good performance to some extent and vice versa.

Perception towards the school was also investigated in relation to performance it had in chemistry practicals. The findings indicated 10(3.1%) strongly agreed, 71(21.8%) agreed, 86(26.4%) neutral, 79(24.2%) disagreed and 80(24.5%) strongly disagreed. Perception towards the school and its performance affected chemistry practical a mean of 2.55.

The students were asked if chemistry practicals were easy to be understood. Those who strongly agreed were 15(4.6%), 89(27.3%) agreed, 117(35.9%) neutral, 53(16.3%) disagreed

and 52(16.0%) strongly disagreed. The students somehow disagreed that chemistry practicals were easy to understand (mean of 2.88). There were slightly more students who found chemistry practicals to be difficult than those who found to be easy. This made the students perform poorly in practicals and eventually the entire subject.

On response to the ease of doing chemistry practicals the results revealed that 15(4.6%) strongly agreed, 89(27.3%) agreed, 117(35.9%) neutral, 53(16.3%) disagreed and 52(16.0%) strongly disagreed. Chemistry practicals were not easy to be done than other subjects (mean of 2.88). Therefore, it was found to be somehow difficult to the majority of students.

Finally, the findings on the positivity of students on chemistry practicals revealed that 80(24.5%) strongly agreed, 129(39.6%) agreed, 64(19.5%) neutral, 17(5.2%) disagreed and 36(11.0%) strongly disagreed a mean of 3.61. Hence it implied that positivity in practical subject assisted the students to perform well in the subject but this was contrary to the study where most students had the preconceived attitude of difficulty in handling practicals hence affecting their performance negatively.

2.1 Interview Results

Interview results from chemistry teachers indicated that the majority of students had a negative attitude towards chemistry subject. They have been trying to develop a positive attitude by encouraging and inviting motivational speakers. According to chemistry teacher 1, "students liked chemistry since the school has science and mathematics as the best-performed subjects." Chemistry teacher 2 mentioned that "there is a poor attitude based on lack of sufficient resources which affect the teaching technique and practical lessons." Majority of chemistry teachers' indicated that negative student's attitude was related to the environment which includes the chemistry teacher, school and chemistry subject. On the contrary, Chemistry teacher 13 argued that "the majority of students disliked chemistry subject because of continuous poor performance in the previous years".

Majority of teachers reported that students perceived chemistry practicals as tasking, difficult and needed continuous practices. According to Chemistry teacher 14, "students perceived practicals negatively and required continuous activities to develop skills necessary for evaluation". There were 13 chemistry teachers who pointed out that students perceived chemistry practicals as difficult representing 61.9% and 9 chemistry teachers representing 38.1% perceived it as an easy subject.

Another investigation on whether students had a positive perception of the chemistry teachers. Some teachers indicated that some students had negative perception towards their teachers due to the way they perceived the subject as difficult. Those teachers who argued that their students had a negative attitude towards them were 11 representing 52% but those who had a positive attitude were 10 representing 48%. Chemistry teacher 3 alluded that "the teachers related to students' in class, despite others who have developed a negative stand on the subject".

Further, chemistry teachers argued that students with a positive attitude towards their schools performed better than those who had a negative attitude. However, Chemistry teacher 14 commented that "students have a positive attitude towards their teachers as well as their

schools which has contributed to better performance of the subject”. On the contrary Chemistry teacher, 20 alluded that, “the poor performance of students is based on poor management and lack of resources which has made students develop a negative attitude towards the school.”

2.2 Observation Results

Observation on practicals was analyzed, mean and standard deviation were obtained

Table 5: Observation of students’ perception

	N	Mean	Std. Deviation
Students participates actively in practical session	21	3.0476	.66904
Students are motivated in chemistry practical sessions	21	2.3333	.48305
Students enjoy chemistry practical	21	2.7619	.53896

Source: Research Data (2019)

Table 5 showed that students participated actively in practicals to small extent (mean of 3.0476). It had low variation (standard deviation of .66904). The students’ motivation was low (mean of 2.3333). Dispersion was low (standard deviation of .48305). Student somewhat to small extent enjoyed chemistry practicals (mean of 2.7619). Variation was low (standard deviation of .53896).

2.3 ANOVA results

Analysis of variance (ANOVA) was used to test the significance of each variable on chemistry performance to support descriptive statistics and come up with conclusions on the research hypotheses.

Table 6: ANOVA Students Perception and Chemistry Performance

		Sum Squares	ofdf	Mean Square	F	Sig.
Perform chemistry practical *Students perception	Between inGroups (Combined)	92.300	4	23.075	52.132	.000
	Within Groups	142.083	321	.443		
	Total	234.383	325			

Source: Research Data (2019)

Table 6 ANOVA results indicated that students’ perception on chemistry practicals was a significant determinant on chemistry performance (F(P=5%, 4,321) =53.132, P = 0.000 <0.05). F- ratio is 53.132 shows greater dispersion. P< 0.05% value is below 5% shows that

there is a significant relationship between variables. Null hypothesis is rejected and the alternative hypothesis is accepted. It implied that students with a negative perception of chemistry practicals and the teacher performed poorly and the contrary is true. Therefore, a student's perception affected significantly the performance in chemistry practical.

2.4 Discussion of student's perception and chemistry performance results

Students liked chemistry to a small extent mean of 3.12. It was also indicated that there were slightly more students who had positive perception than negative perception towards chemistry in the schools (mean of 3.21) but chemistry teachers indicated that majority of the students had a negative attitude towards chemistry subject because they perceived the subject to be difficult to handle which affected their outcomes in summative evaluation. This concurred with results from students where chemistry was seen as a difficult subject (mean of 2.88). Students to a smaller extent liked chemistry teachers a mean of 3.21. The students who had a positive attitude towards the subject teacher and the school had the subject performed better in the school to a small extent. Some students had a negative attitude towards the subject and the teacher and performed poorly in examinations.

Perception towards the school and its performance affected chemistry practicals a mean of 2.55. Chemistry practicals were somehow difficult to be done mean of 2.88. Positivity in chemistry contributed to the good performance a mean of 3.61. Therefore, positive perception and attitude towards the subject, school or teacher had a significant impact on overall performance. However, perception and attitude towards chemistry, school or teacher were found to be more of negative in the study which affected students' performance in summative evaluation.

Further results from ANOVA indicated that student's perception is significant to the performance in chemistry ($P < 0.05$). Perception aspect that affected students was negative perception towards chemistry, school and chemistry teachers which was associated with poor performance in the region. From an observation point of view students' participated passively with low enjoyment as well as motivation in chemistry practicals. Therefore, the current study found that student's perception had a significant effect on the performance of chemistry practicals. Mahdi (2014) concurred that the perception of students had a significant role in performance in chemistry. The results associated students' perception of chemistry knowledge, understanding of concepts and career selection to chemistry-related fields. Perception of chemistry in the current research was related to a negative attitude towards the teacher, school and subject which affected performance in Chemistry negatively.

This was further echoed by Odutuyi (2012) who was in line with the current research that attitude affected the performance of students' in secondary school education. The study revealed similar findings in a teacher-student relationship as one of the factors that affected student perception but the current research found that student attitude towards school and subject also contributed to performance in chemistry.

Chepkorir et al (2014) found that there were other factors that affected the performance of students which included lack of experiences in Chemistry and poor teaching. The current study concurs with Chepkorir on the student attitude towards the teacher contributed by

experience and teaching method used by the teacher is a significant factor that caused a negative attitude.

Therefore, the negative attitude of the teacher from majority of research which was in line with the current research was the major cause of students' negative attitude towards the subject. This meant that the teachers can affect the performance of the subject directly through the attitude passed to the students. Furthermore, attitude towards the school and subject are then highly correlated with that of a chemistry teacher. There is a need for teachers to develop and improve the attitude towards the subject through encouraging and developing positive environment.

3.0 CONCLUSION

Students liked chemistry subject as well as the subject teacher to a small extent, affecting the development of a positive attitude. Students perceived chemistry practicals to be difficult to handle developing a negative attitude towards the subject. Students were not well motivated and this was seen from their passive participation during practical sessions. Students' perception affected significantly the performance in chemistry practicals.

4.0 RECOMMENDATION

It recommended that teachers should develop a positive attitude towards the subject to enable them to transfer the same to the students for easy learning. Both teachers and students should be motivated for better performance.

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