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Original Research Article

Academic Performance of Chemistry and Wastage Grades in National Examinations in Secondary Education in Kenya

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Abstract: Bondo is among the Sub Counties in Kenya with low academic performance in Chemistry subject. This could be as a result of several factors which in turn could be contributing to wastage grades in national examinations in secondary schools in Kenya. The purpose of this study was to establish the effect of academic performance of Chemistry subject on wastage grades in secondary schools in Bondo Sub County. The main objective of this study was based on the purpose of the study. The study was informed by Jean Piaget's constructivism theory of knowledge and its examination linked to the concept of the study. The study adopted a correlation research design. The population comprised of the 338 teachers and 1 Quality assurance officer in the Sub County. Stratified random sampling was used to identify and place sub groups within the population, purposive random sampling was then applied in each sub group to form the actual sample per school. Instruments of data collection were questionnaires, interviews and document analysis. Reliability of instruments was checked by piloting using test and retest method in 10% of the population that did not participate in the study. Face, content and construct validity was ascertained by experts from the department of Department of Curriculum and Educational Management. Quantitative data was analyzed with aid of Statistical Package for Social Sciences (SPSS), version 25.0. It generated both inferential and descriptive statistics such as correlation coefficients, frequency counts, chi square tests, averages and percentages while qualitative data was analyzed continuously using content and thematic issues and presented by narrations and direct quotes, in line with the study objectives. The findings revealed that the Pearson correlation co-efficient, r = 0.078, a positive correlation between attitude and academic performance in the subject in over 80% of the schools. In cases where responses among the categories varied, A Leven's test was applied to test if the variance in attitude of student towards Chemistry as given by teachers and heads of departments is equal. The p-value is 0.487 and the test was carried out at 95% level of confidence or at an alpha, $\alpha = 0.05$. The test statistics was 0.112 with 76 degrees of freedom and the p-value of the wider hypothesis is 0.911. At alpha level of 0.05, that is if we wanted to be 95% certain before we reject the null hypothesis, then we could not do this with the p-value of 0.911. Findings revealed that teaching methodologies and resources played a role in shaping academic performance of Chemistry subject. The study recommended that education stakeholders including the school principals should endeavor to provide comprehensive development programs for teachers of Chemistry such as workshops for training on current issues and trends emerging in methodology and instruction so that they are up to date with relevant skills and so as to seal the loopholes and insufficiencies that derail performance of the subject both in internal and national exams. The findings of the study might be useful to education policy makers, education planners and education stakeholders as a whole in improving academic achievement so as to minimize wastage grades in national examinations in Bondo Sub County and in Kenya as a whole.

Keywords: Academic Performance, Chemistry, Wastage Grades, National Examinations.

BACKGROUND TO THE STUDY

Chemistry as a practical subject is vital in providing the general knowledge and skills required for industrial applications. It is a practical subject which equips students with concepts, attitude and skills that come in handy in solving day-to-day problems (Nyaga, 2011). As such, the subject should be handled with a lot of care so as to enhance its academic performance and to realize a minimal wastage grades in national examinations in general. However, if

resources in Chemistry subject are not utilized effectively, quality of teaching and learning of the subject might be lowered and might result into loss of opportunity to pursue Science oriented careers in general and low achievement in national examinations in general.

In Germany, learning of Chemistry is typically investigative, inquisitive and interrogative and therefore minimal wastage in national examinations is often realized. Lunetta, Hofstein and Clough (2009) pointed out that in order to minimize on the aspects of learning which might lead to wastage grades, the laboratory has been made the center of discovery in teaching and learning in the subject and this has assisted students to discover and make sense of the natural world from experimental analyses. Students are required to gather experimental data, analyze it and try to establish the relationship within the data gathered which they eventually connect the results with the natural world.

Tatli and Ayas (2011) in a study indicated that in American states like in Florida, the scientific literacy needs of individuals entering careers in Science oriented fields are becoming even more important. This means that Chemistry which is among the practical Science subjects has been given the importance it deserves in terms of the practical approach in teaching. Therefore the entry behavior of such students at secondary schooling level is considered vital and is the basis for which practical concepts are taught.

Employees in the job market are required to reason, think creatively, make decisions and solve problems that contribute in an essential way to the national development and that of the global academy of Sciences. Students taking Science courses are therefore not expected to have been given a raw deal. As such, there has been need for inclusion of science-based concepts not only in Science subjects but in other disciplines so as to enhance education curriculum as a whole. Therefore in those countries, teaching has basically shifted from the ordinary theoretical methods and emphasis laid on active science (Myers, 2004). As such, performance in the subjects has had very minimal influence on student grades in final course examinations

In Sub Saharan Africa, Bennett, Lubben and Hogarth (2007) cited in a study that there is insufficient practical exposure to students. Therefore, the curriculum and education stakeholders have emphasized most on active learning approaches which should focus much on learner-centered education, participatory teaching, inquiry-based approaches, problem solving and critical thinking. These countries lag behind in scientific literacy needs and this has posed a threat on achievement of quality grades in national examinations and on the number of students pursuing Science oriented courses.

Apart from South Africa where there is some significant practical approach to teaching and learning in the subject, studies have pointed out that in most Sub Saharan countries, there's some evidence of lack of practical aspects in teaching the Science subjects and this situation has resulted into a huge gap between the intended curriculum and what is implemented in the classroom. UNESCO reports are very clear and consistent in their description of the type of pedagogy that actually dominates the Science and Chemistry classes in this region. A study by Wout, Jan and Feiter (2007) has shown that several reasons could have led to this including lack of teaching materials and other resources

In East Africa with reference to Tanzania, teaching of Science subjects is not only concerned with collection of facts by student but it is also a way of thinking about the world at large. As such, teaching of Science is concerned with developing analytical skills, critical observation and creativity of an individual as well as problem solving abilities UNESCO (2013) report points out that availability of practical resources varies from government schools to community schools and this has resulted into inequalities in teaching and learning. Therefore community schools end up performing poorly in Science subjects yet they are treated equally with private schools by the National Examination Council despite the differences in availability of human resources and practical instructional resources. In a way therefore, students from such schools do not often perform well in order to qualify for good Science courses at post-secondary level (SCPSC, 2010).

In Kenya, the Science curriculum has been revised from time to time so as to include more practical aspects of teaching and learning. Therefore, Chemistry subject is required to be taught through experiments, observations, analysis, generalizations and conclusions (Mudulia, 2012). MOE (2015) report indicates that most community schools do not have adequate instructional materials besides classes being overcrowded. Also, most teachers do not have expertise in their subjects. In some cases, untrained form four leavers are employed by the schools to teach the Science subjects just because they passed them at KCSE level. Also, some teachers do not allow their students to experience adequate exposure to laboratory activities. The consequence being that most students do not perform well in these subjects as compared to the Arts, which resulted to realization of wastage grades in general. As a result, only a few of them pursue Science oriented courses, translating to wastage in the field of Science (Mudulia, 2012).

A report from the Ministry of Education, Bondo Sub County (2017) indicates that academic performance in Chemistry subject has been on the decline for the past five years and so this could be a possible indicator of wastage grades in national examinations. This is clearly reflected on the "below quality" scores realized not only in Chemistry but in the three Science subjects as whole in the national exams (table 1.1). Eighty percent of schools indicate that a larger percentage of candidates scored below grade C- in the national examinations in Chemistry, Biology and Physics. This implies that wastage grades in that year of examination were above 60%. This is a clear indicator that a good number of the candidates who sat for the KCSE exam may not have obtained quality grades. In selected Sub Counties in Kenya, wastage grades in general were on the rise.

In 2016, 2017 and 2018 in particular, performance in Chemistry subject in national examination in the Sub Counties including Bondo was dismal following the massive failures registered in individual mean grades (Leftie, 2017). Wastage grades were therefore on the rise. Only 141 candidates registered an overall mean grade of A plain. Only 88,929 out of 577, 253 candidates scored grade C+ and above in KCSE examinations in 2016. This translated to 17.765% of the total candidates who sat the exam. Chemistry subject equally registered massive wastage grades nationally. This could be generalized from the wastage grades realized in Bondo Sub County. The number of candidates that scored D+ and below in the subject constituted 89.092% of the total candidature in Bondo Sub County (MOE, 2017). This among performance in other subjects could have contributed to the massive wastage grades realized in the examination.

Table-1.0: Percentage Wastage Grades (D+ and below) in Chemistry Subject in Bondo Sub County in KCSE (2014 to 2018).

Year	2014	2015	2016	2017	2018
% wastage grades	72.01%	63.05%	56.41%	89.02%	89.71

Source: MOE, Bondo Sub County, (2018).

This could be as a result of the inadequate attention given to practical aspects has been given inadequate attention by the teachers and therefore academic performance in Chemistry has been compromised. As such, repetition rates, low graduation rates into Science oriented course at tertiary level and failure to attain minimum university entry grades have been witnessed. Therefore, there is need for educational stakeholders at large to put in place strategies of helping the Science teachers teach more effectively and in ways that can motivate learners to learn.

Statement of the Problem

Poor performance in Chemistry subject in national examinations has continued to be a major concern for the Ministry of Education and other education stakeholders. Bondo Sub County has not been an exception of this trend (MOE 2017). This poor performance has jeopardized the learners' chances of performing well in overall subject grading and could have also been among the causes of wastage grades in national examinations. In an effort to reverse the trend, the Ministry of Education has adopted a number of interventions targeting learners, teachers and overall teaching and learning environment. However, it is not clear on how these factors affect performance of the subject in the Sub Count and how this affects the overall grade attained in a student's academic performance in national examinations. The study sought to examine the effect of performance in Chemistry subject, through examination of the mentioned factors, on wastage grades in national examinations in secondary schools in Bondo Sub County.

Purpose of the Study

The study purposed to establish the effect of academic performance in Chemistry subject on wastage grades realized in national examinations in secondary schools in Bondo Sub County, with a view of improving the practices and effectiveness in teaching and learning of Chemistry subject so as to contribute to its improved academic performance and minimized wastage in national examinations in Kenya.

OBJECTIVES

The study was guided by the following objectives.

i. To find out the learners' attitude towards Chemistry subject secondary schools in Bondo Sub County.

ii. To ascertain the teachers' perception towards the learners' ability in Chemistry subject in secondary schools in Bondo Sub County.

iii. To examine the teaching methodologies used teachers of Chemistry in secondary schools in Bondo Sub County.

iv. To determine the role of teaching and learning resources in Chemistry subject in secondary schools in Bondo Sub County.

Research Hypothesis

The research hypotheses were tested in line with the study objectives. A correlational study was adopted and therefore hypotheses (Oso and Onen (2011).

Theoretical Framework

This study based its theoretical argument on constructivism theory of knowledge by Jean Piaget which argues that humans generate knowledge and meaning from an interaction between knowledge and ideas. This is a major theory on Science teaching and learning, which was postulated to help students build their understanding of Science. It further argues that Science has moved from telling and dispensation of knowledge or what one might term 'absolute truth' to problem solving and rational inquiry into natural phenomena.

Jean Piaget suggested that through accommodation and assimilation, individuals are able to construct new knowledge from their background knowledge and from their experiences. Constructivism theory views learning as a process in which students actively build new ideas and concepts based upon prior knowledge and new information. The teacher is hereby viewed only as a facilitator whose role is to encourage students to discover new knowledge.

LITERATURE REVIEW

Literature review refers to the systematic identification, location, retrieval, analysis and evaluation of documents containing information which is related to the research problem and which helps the researcher to develop and gain a thorough understanding of and insight into previous researches as related to the current research.

This section of the study only reviewed literature relevant to it. The review was based on how the following factors contribute to performance in Chemistry subject as well as how this affects performance and wastage in national examinations.

Academic performance of Chemistry depends on a number of factors of course varying from country to country, but one of the major factors being the learners' attitude towards the subject. In developed countries such as in the USA, the Science of matter carried out in Chemistry is more specialized, and the general student attitude in Science is good due to the fact that they are expected to be scientifically literate at the end of the course (Hoffman, 2011). As such, classroom based teaching has been found to be as efficient in delivery as the laboratory teaching. Chemistry practical classes are designed to balance materials dealt with in lectures and give student's practical experiences which are important in their future careers as chemists. Such classes are conducted in a Chemistry laboratory.

A laboratory is simply defined as a work place for the conduct of scientific research or where science is practiced (LAN, 2006). For higher academic achievement in the subject, instructional resources such as Chemistry laboratory, consumables and non-consumables such as chemicals and reagents, measuring cylinders, retort stands, beakers, Bunsen burners, charts, television, projectors, computers and electricity are fully embraced so as to enhance concrete learning and positive attitude towards Science subjects. Such resources are either commercially produced or produced by individual teachers or by ICT resource centers and voluntary agencies (McDonnell and Connor, 2007). However, in Kenya, students' attitude is mostly influenced by how they perceive Science as a whole thus it's not defined clearly

On teachers' perception towards learner ability in Chemistry, Myers and Dyers (2006) pointed that the major goal of teaching is to prepare students to be able to adapt knowledge to various problems and settings using multiple contexts. As such it should translate to meaningful academic achievement. Clough (2002) found out that the teaching through laboratory experiments often does engage students in a mental struggle since these activities pre-determine the outcome. These activities therefore need to be true experiments and not just cookbook activities that suppress student thinking. This can well be achieved through the use of laboratory exercises in which the students develop the questions to investigate, procedures to follow, and means to report findings of their investigation, of course with the guidance and advice of the teacher. This largely depends on the teachers' competency, levels of Science process skills and attitudes toward Chemistry (SEIA, 2007). As a result, students who adequately participate in laboratory activities will display higher Science process skills and achievement scores in Chemistry.

In developed countries, focus on teaching and learning of Chemistry is not only based on adopting laboratory manual for students but also students are trained to acquire inquisitive approach whereby they are required to create, inquire and solve a given scientific problem (Taber, 2012). As such, this improves student engagement and motivation. They are thus encouraged to pursue Science oriented courses beyond secondary level (Laredo 2013). In such countries, teaching of the subject requires regular inquiry-oriented hands-on practical and activity work for all students so that they can develop inquiry skills and an appreciation of the nature of Chemistry. Studies have pointed out that in an ideal situation, more than two-thirds of the 80-minute double lesson should be devoted to teacher-centered activities such as explanation, demonstration, whole-class discussion and giving notes.

However, only about one-third of the lesson time is devoted by the teacher to student-centered activities including individual work and small-group practical work. In such lessons therefore, students rarely plan their own

experiments, learners do not engage in hands-on practical work every week to provide concrete experiences of the concepts being taught and to investigate their own questions, and that discussion between students is discouraged by teachers so that teachers can cover more content. Consequently, there is not enough time after experiments for teachers to discuss the main findings with students so that students reach the correct conclusions (Bell, Blair, Crawford, and Lederman, 2003).

Teaching and learning of Chemistry by use of practical activities should help students to develop a broad range of basic skills in experimental observation and data analysis. As such, the Science laboratory should be maximally utilized by the teachers in teaching Chemistry (Kohlstedt, 2010). This is because it is vital in helping students to understand and distinguish between inferences based on theory and the outcomes of experiments. While it is essential that students have a broad experience with techniques using laboratory equipment, it is not easy to allow students to make the use of the limited laboratory apparatus in most secondary schools. Studies have indicated that a majority of students have difficulty in learning basic concepts in Chemistry due to sometimes inappropriate teaching methods, textbook problems, and inability to interpret and verify experiments on their own (Shi, Power and Klymkowsky, 2011).

In overall review, if the learner is engaged in observing or manipulating real or virtual objects, then it enhances his/her experience, understanding and skills. Practical work therefore enables the students to think and act in a scientific manner in that it induces scientific attitudes, develops problem solving skills and improves conceptual understanding. As such, content mastery is enhanced and this translates to perfect transition from secondary school into Science oriented courses at the university which is a height of training manpower needed for industrial development (Ayodele, Oludipe and Olusola, 2014). This is due to role played by teaching and learning resources yet this is still among the major drawback in Kenya and so it was the major focus of this study.

RESEARCH METHODOLOGY

Research methodology refers to the detailed procedure followed by the researcher in order to realize the research objectives (Kombo and Delno, 2006). This chapter presented the methodology, which was used to carry out the study. It further described the type and source of data, the target population and sampling methods and the techniques that were used to select the sample size. It also described how data was collected and analyzed.

RESEARCH DESIGN

This study adopted a correlation research design. Correlation research design is defined as a research design which allows a determination of whether or not an association exists between two or more quantifiable variables, and the extent to which the two variables correlate (Oso and Onen, 2011). This research design was used to compare two or more characteristics from a group and to explain how those characteristics vary so as to be able to predict one variable from the other.

Correlation research design was used to establish the relationship that exists between academic performance in Chemistry subject and the wastage grades that are realized in the national examinations in secondary schools in Kenya. It was justified for use in this study since it provided replicable procedure for understanding the conditions or relationships that exist between performance in Chemistry and wastage grades in national examinations (Ogochukwu, Elom and Inyiangu, 2014). It also enabled the researcher to deduce the correlation between how teaching resources and materials contribute to performance of the subject and wastage grades realized.

Area of the Study

The study was carried out in secondary schools in Bondo Sub County of Siaya County.
Therefore, it was chosen because among other Sub Counties, academic performance in Chemistry subject was wanting as illustrated by the high percentages in wastage grades.

Study Population and Sampling

Population of the study comprised of Chemistry subject teachers and Quality assurance officer, Bondo Sub County. Stratified sampling was done to group the population onto homogeneous sub groups which share similar characteristics, so as to ensure equitable representation of each set in the population. To arrive at the actual number of respondents (teachers) in each stratum of schools, the study employed purposive sampling which is a non-probability sampling to pick on the Chemistry subject teachers in the Sub County. KIM (2013) points out that purposive sampling allow the researcher to use the cases which have the required characteristics and information (Kothari, 2004). A total sample size of 292 teachers (which includes 41 HODs and 41 HOSs) were selected for the study as per the Morgan's table of sample size selection (Kasomo, 2006).

However, 1 HOD and 1 HOS (Chemistry) was picked from the national school by means of saturated sampling technique. One head of Science department and 1 head of Chemistry subject were picked from the national school while six HODs and 6 HOS (Chemistry) were picked from the County schools using saturated sampling technique, due to their low population. Similarly, saturated sampling was used to pick the 34 HODs and HOSs from the 34 sub county schools to participate in the study.

Instruments of Data Collection

Instruments refer to the tools which were used in collecting data (Orodho, 2009). The study used questionnaires, interview schedule and document analysis guide as data collection tools instruments.

Validity and Reliability of Instruments

Content and face validity was verified by experts (the two university supervisors) from the department of Curriculum and Educational Management of Jaramogi Oginga Odinga University of Science and Technology who examined the content of the instruments and advised on its face validity. Reliability of the instruments was done through test and retest in a pilot study. The pilot study population was the teachers in secondary schools in the neighboring Sub County of Rarieda. Oso and Onen (2011) indicate that pilot population should be sourced out of the study population, so as to ensure reliability of the test results. More items were added to the data collection instruments until an acceptable level of reliability was achieved. The instruments were administered twice within four weeks. Whereby the reliability was to be calculated and if the reliability coefficient was at least +0.70, it showed a strong positive correlation between the variables and so the instruments were considered to be appropriate (Kothari, 2004). Any inconsistencies and weaknesses noted in the responses from the pilot study were corrected in the final instrument.

Data Collection Procedure

The researcher first sought for a written permission from the Board of Post Graduate Studies of Jaramogi Oginga Odinga University of Science and Technology, with which a permit from the National Council of Science, Technology and Innovation (NACOSTI) was applied for. The researcher also sought permission from the Country Director of Education of Siaya County through Bondo Sub County Director of education seeking permission to conduct research within their areas of education jurisdiction.

The researcher then made the following visits to the schools: on the first visit, the researcher went to introduce him/herself and to issue an introductory letter and to seek permission from the respective school Principals and the consent of the teachers and to explain to them the nature and purpose of his/her study. The researcher issued the questionnaires to the respondents as well. He/she then booked appointment/appointments for the interview exercise. On the second visit, on the date agreed upon, the researcher went to conduct the interviews, allowing about 40-45 minutes for each respondent to be interviewed (Mugenda and Mugenda, 2009). The respondents were interviewed at their places of choice and convenience. Either in their offices or under a tree for as long as the confidentiality of the conversation was ensured. Note taking was done by the researcher for future reference. Also, conversation was tape recorded for future reference purposes in cases where the respondents consented. (Mugenda and Mugenda 2009).

DATA ANALYSIS

The analyses were done separately for both quantitative and qualitative data. This enabled comparison of the results from the quantitative and qualitative studies so as to determine if the two data bases yielded similar or contrasting results.

DISCUSSIONS OF FINDINGS

This chapter presents the analysis, interpretation and discussions of the quantitative and qualitative data/findings of the study. The chapter is divided into the following sections; demographic information such as the category of the respondents, type and category of the schools in which they are in and so on.

In overall, out of the 164 questionnaires administered to the respondents, 144 of them were collected back for analysis, translating to 87.80 %. The response rate was considered adequate because according to Oso and Onen (2011) in a study pointed out that for any questionnaire return rate above 80%, then the response rate is acceptable and especially if the questionnaires were administered by the researcher to the respondents as was the case of this study.

On attitude, the researcher tested the correlation between the attitude of students towards Chemistry and the performance that they exhibited in the national examinations in the same subject. The test was carried out by help of Pearson Co-efficient correlation. The results were as follows;

Table-2.0: Correlation Analysis on Performance and Student Attitude

Pearson Correlation Coefficient			
		Student attitude towards Chemistry	School Performance has increased
Poor student attitude towards Chemistry	Pearson Correlation	1	.078
	Sig. (2-tailed)		.633
	N	40	40
School Performance has increased	Pearson Correlation	.078	1
	Sig. (2-tailed)	.633	
	N	38	38

It was found that the Pearson correlation co-efficient was 0.078. This is a positive correlation co-efficient. It implies that as one variable increase, the corresponding response variable increase with the same margin. This implies that as attitude of students towards chemistry becomes positive, there will improve their chemistry performance. The Pearson correlation co-efficient is slightly above zero. The correlation co-efficient of this small magnitude means that although attitude of students. The correlation co-efficient always lies between +1 and -1. Where the positive extreme in this case means that as students changes their attitudes towards positive, the performance also increases while as the correlation co-efficient moves to the negative side, it means inverse relationship between the variables.

The second objective of the study was to ascertain the teachers' perception towards the learners' ability in Chemistry subject in secondary schools in Bondo Sub County. It was therefore necessary to establish if the performance in different schools has got an effect on how the teachers view their students' ability. Teachers are sometimes affected with the performance of their students. Low performance can either make a teacher to work hard in order to boost the performance or it can sometimes demoralize a teacher. It was important that this test be carried out in the case of Chemistry subject.

The table below is a summary of the results from the SPSS Chi-Square test

Table-3.0: Chi Square Test on Correlation between Teachers' Perception and Academic

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	5.946[a]	4	.203
Likelihood Ratio	6.233	4	.182
Linear-by-Linear Association	5.423	1	.020
N of Valid Cases	36		
a. 7 cells (70.0%) have expected count less than 5. The minimum expected count is .33.			

From the above table, the P-Value is 0.203. This figure is more than 0.05 significant levels. Since P = 0.203 > 0.05. This means that the null hypothesis, H_0 is rejected in favor of the alternative hypothesis. Therefore it means that teacher's perception of their learners is independent of their performance. Teachers are not easily demoralized by the performance of their students in chemistry. Even if performance is low, they still bank on the potential of their students with hopes that they will excel in future. It also implies that there are other factors that might affect perception of the teachers on the learners' ability in the subject other than performance.

On teaching and learning resources, a chi square was carried out to establish the association between the two variables.

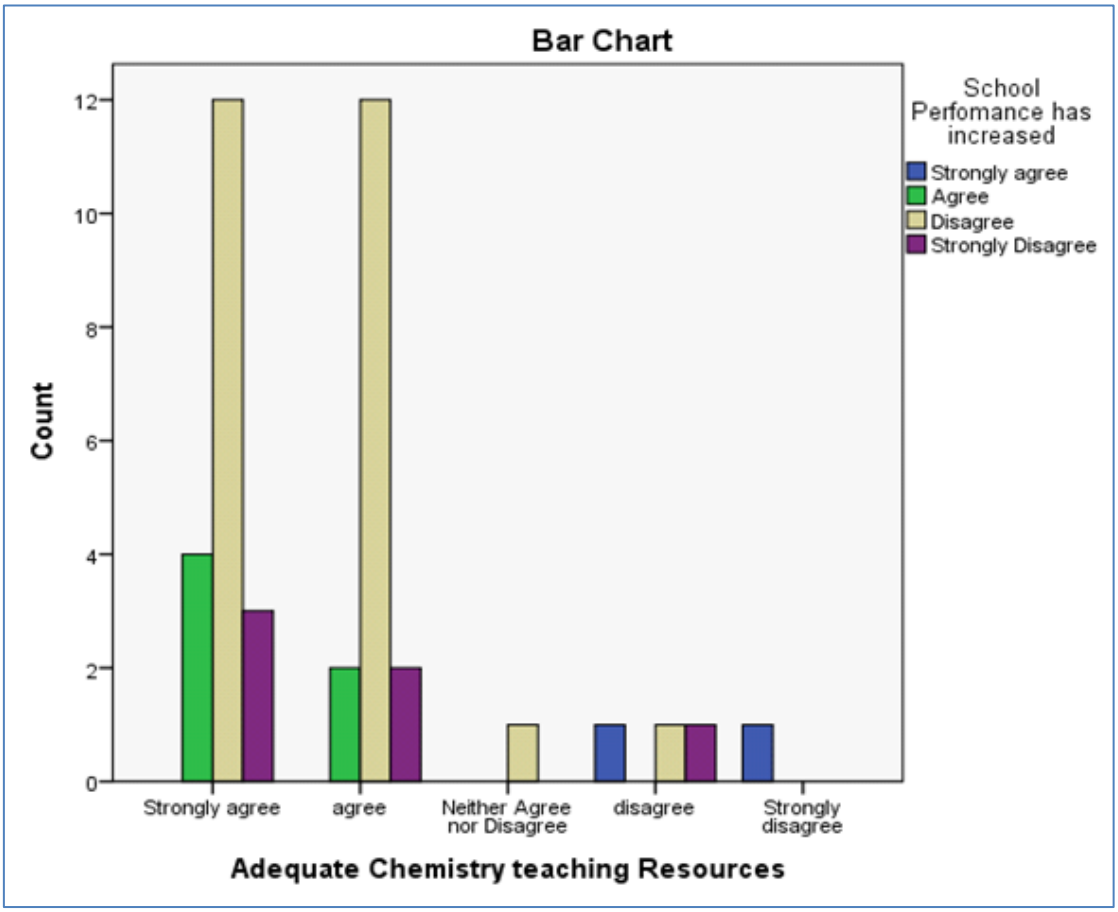
The table below shows the results that were used to establish if there was any statistical relationship between the two variables (teaching and learning resources and academic performance in Chemistry).

Table-4.0: Chi Square Test on Correlation between T/L Resources and Performance

Chi-Square Tests			
	Value	Df	Asymp. Sig. (2-sided)
Pearson Chi-Square	28.552[a]	12	.005
Likelihood Ratio	15.214	12	.230
Linear-by-Linear Association	2.580	1	.108
N of Valid Cases	40		
a. 18 cells (90.0%) have expected count less than 5. The minimum expected count is .05.			

The chi-square value for the above table is 28.552. The p-value that is associated with the above Chi-square value is 0.005. The p-value is less than 0.05.

The p-value = 0.005 < 0.05. The null hypothesis was rejected since the p value was less than level of significance. Based on this, the null hypothesis was rejected. This means that available teaching and learning resources has insignificant influence on the academic performance in most schools. This data was also presented in the bar graphs as illustrated below.



Even though a good percentage of respondents argued that the resources availability did not have much significance on the academic performance, they disagreed that the performance increased significantly.

In summary, the study established that attitude was a making of some students who could do better in Biology and Physics as compared to Chemistry. Some of the students interviewed said they are into sciences because their parents insisted that they must be Science students since their siblings were in other field s as those of Arts or in some cases they are already successful in Science oriented fields.

Also, the study established that there are a number of factors that limited or directed the teaching methods. In schools, where the student population is large, with the limited time of 40 minutes per lesson, it was not possible for them to cover the syllabus if the required practical approaches were employed in teaching and learning. It was established that if that was to be the case then, some topics would be skipped and others to be brushed over. Also, large classes had negative effect on teaching efficiency because, large class management was a problem in that teachers had a hard time ensuring that each student was participating and following the learning process. With limited time allocated therefore it meant that the affected teachers spent a lot of time controlling the class and this affected the student's performances in their final examinations".

The study made the following recommendations based on its findings and conclusions:

i. Teachers of Chemistry subject should adopt and utilize appropriate techniques in teaching so as to assist the learners to develop a liking and a positive attitude towards the subject. This will also help the learners to cope with abstract concepts of the subject. This because the study findings reported that, learners in some

schools had difficulties in coping up with some scientific concepts in Chemistry subject and so they had a negative attitude towards the subject, which in turn lowered their academic performance.

ii. School principals should endeavor to provide comprehensive development programs for Science subject teachers in general, such as workshops for training on emerging issues in various areas of instruction so that they are up to date with relevant skills and knowledge that they impart in learners. This is because the study pointed out some loopholes in insufficiencies in the competency of Chemistry teachers in some schools.

From the study findings, conclusions and recommendations, the following areas were suggested for further research.

i. Effect of academic performance in Biology and Physics on wastage grades in national examinations in Bondo Sub County or other sub counties in Kenya.
ii. Factors affecting learner attitude in Science Subjects in given sub counties in Kenya.
iii. The role of wastage grades in Chemistry subject on academic performance in national examinations in Kenya

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