SCHOOL-BASED FACTORS INFLUENCING IMPLEMENTATION OF CHEMISTRY CURRICULUM IN PUBLIC SECONDARY SCHOOLS IN GARISSA SUB COUNTY, KENYA

Bonface Muse

A Research Project Submitted in Partial Fulfilment of the Requirements for the Award of the Degree of Master of Education in Curriculum Studies.

University of Nairobi

2017

DECLARATION

This research project is my original work and has not been presented for award of a degree in any other university

Bonface Muse

E55/73989/2014

This research project has been submitted for examination with our approval as university supervisors

Dr. Caroline Ndirangu

Lecturer

Department of Educational Administration and Planning,

University of Nairobi

Dr. Rosemary Imonje

Lecturer

Department of Educational Administration and Planning,

University of Nairobi

DEDICATION

This research project is dedicated to my dearest aunt Juliana Mulaa Namada.

ACKNOWLEDGEMENTS

The greatest appreciation goes to my research supervisors Dr. Caroline Ndirangu and Dr. Rosemary Imonje. This is in regard to their steadfast support and the indispensable expert input which they contributed towards this study. I am also grateful to the university's Department of Educational Administration and Planning (DEAP) for the constant guidance offered throughout the study.

I register my gratitude to NACOSTI and the offices of: Garissa County Commissioner, County Director of Education, and Sub County Director of Education for authorizing the research. I also thank all the respondents for the information supplied during the data collection stage.

In a special way I commend my colleagues Mr. Abdirahman Nur and Mr. Lang'at Leonard. This is in recognition of their exceptional assistance at work station. It went as far as consenting to take up some of my obligations on request while I was in pursuit of some matters connected to this study.

Above all, Thanks to the Almighty God.

TABLE OF CONTENTS

Content **page**

CHAPTER ONE

INTRODUCTION

CHAPTER TWO

LITERATURE REVIEW

CHAPTER THREE

RESEARCH METHODOLOGY

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSION

CHAPTER FIVE

SUMMARY, CONCLUSSIONS AND RECOMMENDATIONS

APPENDICES

LIST OF TABLES

LIST OF FIGURES

ABBREVIATIONS AND ACRONYMS

CAT	Continuous Assessment Tests
CDE	County Director of Education
EFA	Education for All
HOD	Head of Department
HOS	Head of Subject
INSET	In Service Training
IT	Information Technology
KSEF	Kenya Science and Engineering Fair
KCSE	Kenya Certificate of Secondary Education
KICD	Kenya Institute of Curriculum Development
KNEC	Kenya National Examinations Council
MOEST	Ministry Of Education Science and Technology
NACOSTI	National Commission of Science Technology and Innovation
SMASE	Strengthening Mathematics and Science in Education
SCDE	Sub County Director of Education
PCK	Pedagogical Content Knowledge
TLMFs	Teaching Learning Materials and Facilities
TSC	Teachers Service Commission
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children’s Fund

ABSTRACT

As a science subject, chemistry occupies a central locus in the contemporary society. Its knowledge underpins almost every aspect of life. Despite this, implementation of the subjects' curriculum still remains below expectations. This is exemplified in the downward performance trend of the subject as compared to fellow science subjects, biology and physics. The purpose of this study was to investigate the school based factors influencing the implementation of chemistry curriculum in public secondary schools in Garissa Sub County, Kenya. The study objectives were; to determine the influence of facilities, materials, teachers' qualifications, assessment methods and lesson allocation on the implementation of chemistry curriculum. The study was guided by constructivist theory which postulates that learning is an active process during which the learner utilizes current or past knowledge to construct new ideas or concepts of content. The study adopted descriptive survey research design. The target population comprised of all the eight public secondary schools in Garissa Sub County, eight principals, 27 chemistry teachers and 940 form four students. The sample size consisted of eight principals, 27 chemistry teachers and 94 form four students selected by simple random sampling. Data was collected by use of questionnaires and observation checklists. Reliability of the instruments was ensured by use of test-retest method. Collected data was analysed by use of descriptive statistics and presented in frequency tables, bar graphs and pie charts. Main findings of the study revealed that all the schools had laboratories, complete with most of the necessary fittings, furniture, instructional materials and safety equipment available and adequate by more than 70.0%. However water supply had the lowest availability and adequacy at 59.6% indicating that some laboratories faced a challenge of water supply. On teacher qualifications and implementation of chemistry curriculum, the study revealed a 94.7% consensus that teachers' qualifications influence curriculum implementation, in particular, teachers with higher academic qualifications and more experience implement the subjects' curriculum more satisfactorily. Regarding assessment methods, it was found that all schools had an examination policy and that 87.2% of the schools administer at least three chemistry tests per term. Additionally, 59.1% of the teachers do not use project work at all in assessment of chemistry learning. Concerning lesson allocation and chemistry curriculum implementation, it was revealed that 86.4% of the teachers had between (21-30) lessons per week. Additionally 68.2% of the teachers held positions of responsibility in addition to chemistry teaching. Most of the students representing 72.1% admitted to being taught during other times in addition to the timetabled lessons indicating an inadequacy of teaching time based on lesson allocation. The study recommended that; the content of chemistry curriculum for secondary schools should be reduced to a manageable size to enable its coverage by use of chemistry lessons allocated on the teaching timetable; Kenya Institute of Curriculum Development and Kenya National Examinations Council should integrate examinable project work content into the formal chemistry curriculum for secondary schools; Boards of Management of public secondary schools should consider hiring additional staff to the science departments in which the practical based science subject teachers are holding other positions of responsibility.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Education is remarkably credited for national growth and development. According to (Otu and Avaa, 2011) scientific knowledge in particular contributes extensively towards economic, industrial and technological prosperity. As such, proper implementation of science subject's curriculum at any educational level is absolutely critical. This is based on its anticipated catalytic impact on attainment of the desired learning outcomes and consequently the global educational goals.

As a science subject, chemistry incontrovertibly occupies a central locus in the contemporary society (ACS, 2017). It underpins almost every aspect of modern life. Essentially, the ultimate goal of studying chemistry is to enhance peoples' understanding of the composition, structure, properties and changes of matter while under varied conditions. Generally, matter is anything that has mass and also takes up space. Matter commonly exists in solid, liquid or gaseous states.

According to Ituma (2012) knowledge of chemistry is required in the provision of services and production of quality goods. The subject is also a prerequisite for enrolment into scientifically inclined careers such as medicine, engineering, pharmacy, biotechnology, agriculture and the like, in postsecondary educational institutions (Njagi and Silas, 2015; Mwangi, 2016). In addition, chemistry knowledge somehow blends compatibly with some content of other science subjects such as biology, agriculture, and physics. As such, it contributes notably towards a better comprehension of those subjects. Despite the apparent significance of the subject and the corresponding need for proper implementation of its curriculum, effective chemistry education is yet to be attained globally.

In Sweden, according to Broman, Ekborg and Johnels (2011) many students are incognizant of the relevance of chemistry subject; this has led to a drastic fall in the number of students pursuing chemistry based courses at higher levels. This arises from their perception of chemistry as a teacher-centred subject. Interestingly, the students pursuing chemistry specialisations appreciate this fact and are still satisfied with chemistry courses. In spite of this both the teachers and students agree that chemistry relevance needs improvement by aligning its content to daily life and placing more emphasis on laboratory work.

In Ireland, according to Childs (2014) effective implementation of chemistry education is threatened by factors such as transition between levels of education, science background of students, diversity of the student body, problem of science language, and cognitive level of students. In addition, scientific misconceptions among students, impact of Information Technology (IT) on instruction, and ignorance of chemistry education research amongst most lecturers also affect the implementation of chemistry curriculum.

In china, chemistry curriculum implementation is faced by the problem of adaptation of curriculum materials by the teachers. In particular, according to Chen and Wei (2015) factors such as a chemistry teacher's pedagogical content knowledge (PCK), external examinations and time constraints have a significant influence on their adaptation of curriculum materials. Others include; instructional resources, size of class, belief concerning science, and peer coaching.

In South Africa, several factors influence the implementation of chemistry curriculum. They include inadequacy of; practical lessons, laboratory facilities and relevant textbooks. Others are; teacher unprofessionalism while on the job, in attendance of teachers to in-service courses, workshops and seminars, lack of laboratory attendants or presence of unqualified ones in schools, and absence of lab safety equipment for first aid in case of accidents (Ijidike and Oyelana, 2015)

In Nigeria, the implementation of chemistry curriculum is yet to meet the expected standards. According to Achimugu (2016), ineffective implementation of the subject's curriculum is as a result of inadequate funding, poor teacher motivation, incomplete curriculum coverage and lack of laboratories. In addition, Neji, Okwetang and Njaa (2014) reported that laboratory facilities in Nigerian secondary schools were inadequate for teaching chemistry.

It is noteworthy that, chemistry subject is considered to be of great importance and its prominence as a branch of knowledge in the school curriculum has a global recognition (Ijidike and Oyelana, 2015). In Kenya, the education system is structured in such a manner that chemistry subject is first presented to learners at the secondary school level of the basic education curriculum (Ituma, 2012). Some aspects of chemistry are taught at the primary school level. However during this stage, those concepts are presented integratedly in science subject.

Despite the highlighted importance of chemistry knowledge in the academic arena, the subject's performance in Kenya's national examinations, Kenya Certificate of Secondary Education (KCSE), over the years has perpetually remained lower in comparison to its fellow science subjects namely biology and physics. The achievement of learners can serve as a crucial insight into the state of implementation of a subject's curriculum. A computation of average student achievement in chemistry (expressed as mean scores and mean grades) for the last five years both countrywide and in Garissa Sub County is shown in Table 1.1

Table 1.1 Comparison of science subject performances (mean scores and grades) from the year 2012 to 2016 for National and Garissa Sub County

Level	National			Garissa Sub County		
Subject	Biology	Physics	Chemistry	Biology	Physics	Chemistry
2012	4.63 C-	5.44 C-	4.28 D+	3.09 D	3.69 D+	2.78 D
2013	4.89 C-	5.47 C-	3.93 D+	3.22 D	4.76 C-	2.47 D-
2014	4.96 C-	5.37 C-	4.38 D+	4.52 C-	4.95 C-	3.69 D+
2015	5.07 C-	5.52 C	4.54 C-	5.60 C	6.01 C	4.29 D+
2016	3.32 D	4.94 C-	2.68 D	3.27 D	6.33 C	2.29 D-
Average	4.57 C-	5.35 C-	3.96 D+	3.94 D+	5.15 C-	3.10 D

Source: Kenya National Examinations Council (2017)

The low performance of chemistry over the years as compared to fellow science subjects signifies presence of hurdles towards effective implementation of the subjects' curriculum. It also calls for launching an investigation into the cause of the low comparative performance followed by initiation of measures to solve it.

According to Mwangi (2016) conducting practicals is an integral part of effective chemistry instruction. The subject consists of many topics whose content demands experimental verification (Ijidike and Oyelana, 2015). This practical nature of chemistry singles it out as a resource intensive subject. Its curriculum implementation demands for the variation of pedagogical approaches and use of subject specific teaching/learning materials and facilities (TLMFs) such as laboratory, chemicals, apparatus, safety equipment and laboratory fittings. It also requires a laboratory assistant. This is in addition to the regular instructional resources used in teaching of other subjects. According to Orado (2009) the implementation of chemistry curriculum consumes a little more revenue.

The laboratory facility continues to remain a key requirement for effective implementation of chemistry curriculum. According to Ijidike and Oyelana (2015) shortage of laboratories contributes to ineffective chemistry teaching in schools. To enhance the conduciveness of the laboratory for teaching and learning, the facility should have adequate water supply, a good power supply system, enough furniture, good ventilation, and a clean environment.

In addition the facility should be supplied with adequate stock of instructional materials such as chemicals, apparatus, operational equipment, charts and models. According to Gatana (2011) inadequacy of chemical materials and apparatus in the laboratory contribute to low performance in chemistry. The laboratory safety measures should also be in place through the supply of first aid kits, lab coats, gloves, and charts showing laboratory rules. According to Mwangi (2016) these chemistry TLMFs should be made available and accessible to teachers for use in carrying out chemistry practicals during the teaching and learning process. Chepkorir, Cheptonui and Chemutai (2014) concur that for students to master chemical reactions, they need to mix the chemicals and observe subsequent reactions. Laboratory stock keeping records for non/consumable items should also be kept and updated regularly for accountability purposes.

Mere provision of materials and facilities alone is insufficient to bring about improvement in student's achievement. This is partly because; the effectiveness of the TLMFs is affected by their adequacy, quality, availability, efficiency and their condition (Makori and Onderi, 2014). Furthermore (Atieno, 2014; Makori & Onderi, 2013; Mucai, 2013) argue that inappropriate utilisation of materials and facilities negate their expected impact on the teaching and learning process. Also the laboratory equipment, apparatus and fittings require proper care, maintenance and repair (Kapting'ei and Rutto, 2014).

Teachers, according to Okecha (2008) in Ijidike and Oyelana (2015) are catalysts for provoking radical behavioural transformation among students. As such they are considered to be occupying a significant position in curriculum practice. They are involved in actual curriculum implementation in their work stations. It is the reason behind schools seeking to recruit best teachers expecting for nothing less than student's success. According to (Ituma, 2012; Kigwilu & Githinji, 2015) a teacher's qualifications and experience influence curriculum implementation. In particular, a chemistry teacher's personal level of skills and knowledge of the subject matter in Chemistry has an impact on both students' attitudes and the teachers' effectiveness (Chepkorir, Cheptonui and Chemutai, 2014). Additionally, Zang (2008) observed that science teachers with higher academic and professional qualifications in scientific disciplines positively influence student's achievement in science. Therefore chemistry teachers should have necessary competencies and skills required for curriculum implementation.

They need to be well trained and manifest high levels of mastery of chemistry subject matter. According to Onyara (2013) most schools hire inadequately trained workers preferably due to their availability and affordable labour.

The dynamic nature of the society and its impact on curriculum keeps creating the need for capacity building among teachers. This is meant to upgrade their skills and match them with current trends in educational practice. However according to Mwagiru (2014) teacher training programmes should be tailor made in such a manner that they address learners' needs. Notable measures installed for raising a chemistry teacher's capacity include in service training workshops such as Strengthening Mathematics and Science Education (SMASE). Others are Kenya Science and Engineering Fair (KSEF), Kenya National Examinations Council (KNEC) examiners training and school-based programmes.

Assessment is a crucial component of the teaching and learning process (Ituma, 2012). It consumes a considerable amount of time, energy and educational resources. The outcome of learning process assessment unearths gaps in need of sealing by applying appropriate interventions and necessary academic support. Kyalo (2016) observed that some assessment methods are preferably used during implementation of chemistry curriculum in learning institutions than others. The most frequently used assessment methods are written tests, practical tests, and homework/assignments. According to Ituma (2012) these school based chemistry tests are internally designed by teachers. Generally, School based assessment tests serve to provide feedback to learners and stakeholders, determine learners' achievement, prepare them for national examinations, motivates them and gives a means of evaluating the effectiveness of the pedagogical approaches being used.

Makori and Onderi (2015) reported that inadequacy of textbooks affects assessment by limiting a teacher's frequency of testing learners. It also slows down teaching and learning process thus poor syllabus coverage and examination. Seemingly, teachers teach for assessment purposes Kihumba (2007) in Ziganyu (2010) schools overburden learners with continuous assessment at the expense of learning (KICD, 2010). This is blamed on the undue glorification of academic excellence as manifested through high scores in KCSE exams.

Lesson allocation affects curriculum implementation. According to Okono, Sati and Awuor (2015) the number of lessons which a teacher handles affect their preparedness for each class and between classes. This is because teachers have other duties apart from teaching which also require time in order to be accomplished. Such duties include; managing behaviour of students, planning for lessons, assessment of learning, counselling students, marking assignments, resource improvisation etc. High lesson load can affect syllabus coverage and curriculum implementation. The emergence of different brands of tuition programmes such as private tuition, extra tuition, and remedial teaching point out to the challenge presented by insufficient lesson teaching time. Such tuition arrangements are intended to help the teacher cover pending work that could not be completed within the stipulated time.

Okono et al (2015) noted that the recommended lesson allocation for teachers is 27 while that for head teachers is 12. Atieno (2014) observed that most teachers had full lesson load as expected by the employer. A full teaching load is already quite high for a chemistry teacher to adequately prepare for all lessons and also handle other duties. High lesson allocation for a teacher increases their workload and could lead to occupational stress. Bailey, Education and Millburn (as cited in Cross 2013) Chemistry teachers on administrative roles such as principals, their deputies, HOD's shoulder the heaviest burdens which limits their effectiveness in implementation of the subject's curriculum.

It is worth noting that some schools lack a laboratory technician/assistant (Njagi and Silas 2015). The lab assistant(s) plays a significant role in lab management. They assist chemistry teachers to prepare for practical activities by carrying out trials of experiments, preparing and arranging equipment, apparatus and chemicals before lessons, working with individual students during the practical session(s) and supporting the students on projects. This in turn gives the teachers ample time for lesson preparation and assessment of students. In absence of a lab assistant, the chemistry teacher's workload increases thus lowering his/her effectiveness in teaching. According to Mudulia (2012) adequacy of teachers and support staff is very essential.

1.2 Statement of the problem

An intimate scrutiny of science subject's performance statistics for Garissa Sub County in KCSE for the past five years as contemplated within table 1.1 reveals the following twin facts. Firstly, chemistry subject consistently trails fellow science subjects namely biology and physics. Secondly, the subject's mean grade rarely ascends beyond grade D strata. This circumstance prevails oblivious of chemistry knowledge's centrality in the contemporary society. The persisting low performance points out to the overwhelming strength of setbacks facing the implementation of the subject's curriculum. It also undercuts the various efforts put in place by the government to reverse the downward performance trend in the subject. Furthermore, these existing state of affairs attempts to portray the already implemented recommendations by previous researchers as ineffective in uplifting the subject's performance. In this regard, a clear and unmistakable message is being delivered concerning the need of investigating the other school based factors that are likely to be responsible for the outgrowth of the problem. The expectation being to utilise the outcome in seeking for appropriate mitigation strategies for the challenges before chemistry subject plunges into academic uncertainty within the Sub County.

1.3 Purpose of the study

The purpose of the study was to investigate the school-based factors influencing the implementation of chemistry curriculum in public secondary schools within Garissa Sub County in Kenya.

1.4 Objectives of the study

The study was guided by the following objectives:

i) To determine the influence of facilities on the implementation of chemistry curriculum in public secondary schools in Garissa Sub County.

ii) To determine the influence of materials on the implementation of chemistry curriculum in public secondary schools in Garissa Sub County.

iii) To establish the influence of teachers' qualifications on the implementation of chemistry curriculum in public secondary schools in Garissa Sub County.

iv) To determine the influence of assessment methods on the implementation of chemistry curriculum in public secondary schools in Garissa Sub County.

v) To determine the influence of lesson allocation on the implementation of chemistry curriculum in public secondary schools in Garissa Sub County.

1.5 Research questions

The study was guided by the following research questions:

i) What is the influence of facilities on the implementation of chemistry curriculum in public secondary schools in Garissa Sub County?

ii) What is the influence of materials on the implementation of chemistry curriculum in public secondary schools in Garissa Sub County?

iii) How does teachers' qualifications influence of the implementation of chemistry curriculum in public secondary schools in Garissa Sub County?

iv) What is the influence of assessment methods on the implementation of chemistry curriculum in public secondary schools in Garissa Sub County?

v) How does lesson allocation influence the implementation of chemistry curriculum in public secondary schools in Garissa Sub County?

1.6 Significance of the study

The study endeavoured to provide support concerning influence of school based factors on implementation of chemistry curriculum. As such, its outcome may simplify the identification of such factors at the secondary school level by the Ministry of Education Science and Technology (MOEST), Kenya Institute of Curriculum Development (KICD) and other education stakeholders. This may expedite the search for appropriate strategies of mitigating the undesired impact of such factors for the sake of improving chemistry performance. Curriculum developers and implementers are also bound to benefit through obtaining insights required in the formulation and enforcement of appropriate policies for enhancing effective implementation of chemistry curriculum. Besides providing extra knowledge for research, the study may also give hints towards additional aspects of chemistry curriculum implementation that require further investigation.

1.7 Limitations of the study

Even though implementation of chemistry curriculum is under a significant influence of other factors which are not necessarily school-based, the study disregarded the possible impact of such factors. The findings of the study correspond more to arid and semi-arid environmental settings resembling those of Garissa Sub County than the other regions with different geographical and climatic characteristics. The findings of the study were not based on all the laboratory materials and facilities. Only those deemed essential were considered.

1.8 Delimitation of the study

The study was carried out in Garissa Sub County due to its high number of public secondary schools amongst the seven sub counties of Garissa County. All the eight public secondary schools that had been presenting candidates to sit for KCSE up to the year 2016 were targeted because they were registered schools. The respondents were sampled from the eight public secondary schools. In particular, eight principals, 27 chemistry teachers and 94 form four students of the public secondary schools were selected to participate in the study. Despite the existence of other factors which influence implementation of chemistry curriculum, the study only focused on influence of facilities, materials, teacher qualifications and experience, assessment methods, and lesson allocation.

1.9 Basic assumptions of the study

The study was dependent on the following assumptions:

i) All the sampled schools offer chemistry as an examinable subject.

ii) Respondents would cooperate and honestly supply the needed information.

1.10 Definition of significant terms

The following key terms were used in the study:

Assessment method refers to a means of checking, monitoring and evaluating curriculum implementation with the view of correcting emerging anomalies.

Chemistry curriculum refers to all the experiences which a learner goes through when learning chemistry.

Curriculum implementation refers to putting into practice the prescribed course of study or syllabus of subjects.

Facilities refer to specially designed place(s)/equipment used for a certain purpose such as the laboratory and apparatus used in teaching chemistry.

Materials refer to matter or substances for which a thing can be made for example the laboratory chemicals used while conducting chemistry experiments.

Lesson allocation refers to the allotment of a learning/teaching period for a specific subject as usually presented on a school's teaching timetable.

1.11 Organization of the study

The study comprises of five chapters. Chapter one is the introduction consisting of background of the study, statement of the problem, purpose of the study, objectives of the study, research questions, significance of the study, limitations of the study, delimitations of the study, basic assumptions of the study, definitions of significant terms and the organization of the study. Chapter two has literature review, theoretical framework, and the conceptual frame work of the study. Chapter three contains the research methodology which comprises of the introduction, research design, target population, sample size and sampling procedures, research instruments, validity of the research instruments, reliability of the research instruments, data collection procedures, data analysis techniques and ethical considerations. Chapter four covers data analysis, interpretations, and discussions of the findings while chapter five contains conclusions, recommendations and suggestions for further study

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter reviews literature related to implementation of chemistry curriculum globally, regionally and in Kenya. In particular, it covers the concept of chemistry curriculum implementation, influence of materials and facilities, teacher's qualifications, assessment methods, and lesson allocation on chemistry curriculum implementation, the summary of literature review, theoretical framework of the study and, a conceptual framework illustrating the relationship between the study variables.

2.2 The concept of chemistry curriculum implementation

Implementation of chemistry curriculum means putting the prescribed chemistry syllabus into actual practice. According to Kyalo (2016) chemistry carries a wide range of learning experiences. They include content, practical work, project, group discussions, excursions and field work. In this consideration, chemistry curriculum implementation can be regarded as watertight when learners are adequately exposed to the listed experiences in their learning institutions.

Just like the other science subjects, chemistry has both theoretical and practical aspects which complement each other during the teaching and learning process (Mwangi, 2016). Whereas the subject's theoretical aspects can be studied by traditional methods, the study of its practical content entails conducting experiments. According to Okono et al (2015) teaching of chemistry by using experimentation pedagogical approach contributes to effective instruction by the teacher and improves mastery of concepts by the learners. Furthermore, according to Kaptingei and Rutto (2014) teachers are repeatedly urged in KNEC reports to expose learners to more experiments in science so as to realise good performance.

According to Mwangi (2016) experiments can be done in two main ways, that is, class experiments and demonstrations. Whereas class experiments entail students performing practical activities, making and recording observations by themselves either in groups or individually, demonstration experiments are performed by the teacher as the students observe. Essentially, experiments are used ascertain scientific facts, concepts and principles. In addition, they help to nurture in learners' the scientific process skills (Kapting'ei and Rutto, 2014).

2.3 Facilities and implementation of chemistry curriculum

Several past studies concede that, for realisation of quality education, provision of educational materials and facilities is mandatory (Atieno, 2014; Ituma, 2012; Makori & Onderi, 2014; Ogweno, 2015; Onyara, 2013). Ziganyu (2010) investigated factors affecting curriculum implementation in secondary schools within Kakamega South, Kenya. The study revealed that insufficient facilities and infrastructure affect implementation of curricular.

While acknowledging the position given in Mwangi (2016) that some chemistry practicals can as well be performed in classrooms and or just outside, it is important to reiterate that the laboratory remains the most convenient venue for carrying out any chemistry experiment. This is because, the facility has a special design and possesses the appropriate infrastructure for this purpose. Most secondary schools recognise the significant role of laboratory in the teaching and learning process and as such they have attempted to provide the facility. For instance, Gatana (2011) while investigating the factors contributing to girls' performance in secondary schools within Nairobi County determined whether schools had a laboratory and found out that most schools representing 83.3% in Nairobi County had the facility. In the study it was also revealed that some schools had a separate laboratory for each of the science subjects while others had either one or two laboratories for teaching all the science subjects.

However, for the chemistry laboratory to serve its intended purpose well, it should be of the recommended architectural design and have the essential infrastructures put in place. For instance the laboratory should have adequate water supply, reliable power supply, enough furniture, good ventilation etc.

2.4 Materials and implementation of chemistry curriculum

In addition to the essential fittings, the laboratory should be equipped with instructional materials, safety equipment, and stock tracking records. Instructional materials affect implementation of chemistry curriculum. According to Gatana (2011) inadequacy of chemical materials and apparatus for teaching chemistry contribute to low performance in the subject. Similarly, Ijidike and Oyelana (2015) investigated factors affecting implementation of chemistry curriculum in Buffalo City of Eastern Cape Province, South Africa and observed that the existing ineffective implementation of chemistry curriculum in the region was due to inadequacy of relevant textbooks, chemicals, apparatus, and lab safety kits. Furthermore, according to Makori and Onderi (2014) inadequacy of TLMFs influences implementation of the subject's curriculum as it may compel the teacher to depend on text books alone thereby resulting in poor syllabus coverage and assessment. In another but related perspective, Kimeu et al (2015) investigated the influence of resources on academic achievement in Makueni County. The study revealed that teachers use or disuse of TLMFs while teaching affected academic achievement. Therefore, the available chemistry TLMFs should be made use of and proof of utilization should be kept for accountability purposes.

Contrastingly, other past studies dispute the perceived correlation between provision of TLMFs and chemistry curriculum implementation. For example Neji, Okwetang and Nja (2014), investigated whether adequacy of laboratory facilities for chemistry teaching influenced academic performance in secondary schools of Calabar, Cross River State, Nigeria. Surprisingly, the study revealed that adequacy of laboratory facilities does not significantly contribute to improvement in students' academic performance in chemistry. In addition, Njagi and Silas (2015), when investigating the relevance of secondary school chemistry in preparation of students pursuing chemistry-based courses in Kenyan universities observed that some students still defied expectations, excelled in chemistry and qualified for enrolment in chemistry related disciplines in universities despite having hailed from secondary schools in which the laboratories were ill equipped with chemistry TLMFs. This suggests that, there exist other aspects pertaining to chemistry TLMFs which affect their effectiveness and thus need investigation too.

2.5 Teacher qualifications and implementation of chemistry curriculum

Chemistry teachers need to be equipped with appropriate skills, attitudes and competencies necessary for effective implementation of the subject's curriculum. They should also exhibit good mastery of content. This will enable them to demystify the subject's abstractness to students by helping them to link what is learnt in class with real life situations (Chepkorir et al, 2014). This helps the learners to appreciate the subject and see its relevance. Baubeng, Ossei and Ampia (2014) investigated influence of physics teacher's qualifications and experience on learners' achievement in senior high school in Nigeria and confirmed that teacher quality has influence on students' achievement. In addition, according to Njagi and Silas (2015) wrong handling of practicals by underqualified teachers lowers performance in chemistry.

Despite recommendations by researchers that, teachers existing skills be enhanced through in service training, this is yet to be satisfactorily put into practice. According to Ziganyu (2010) while researching on factors affecting curriculum implementation in secondary schools found in Kakamega South observed that there was absence of in service training for teachers. In addition, Idijike and Oyelana (2015) reported that only a few qualified and experienced teachers in Eastern Cape Province, South Africa attend in service training courses, workshops and seminars. Chemistry teachers need to be regularly in serviced in order to sharpen their pedagogical capacities in conformity with the current trends in curriculum implementation.

Controversy still exists as to whether teaching experience affects curriculum implementation or otherwise. Whereas some researchers for example Kigwilu and Githinji, (2015) positively associated learner achievement with teaching experience, others are indifference with that observation. For instance Zhang (2008) investigated the influence of both teacher's education level and experience on learners' achievement in middle schools of Logan, Utah District in the United states and observed that whereas a teacher's level of education had a positive influence on learner's achievement, teaching experience did not directly improve learner's achievement. The study further revealed that, better teaching behaviours such as; teacher engagement, classroom management and teaching strategies directly contributed to improved performance of students in science. Ijidike and Oyelana (2015) investigated the factors influencing effective teaching of chemistry in Buffalo City High schools in Eastern Cape Province of South Africa and found that most of the teachers who were handling the subject were unprofessional on the job despite being graduates. Furthermore the study revealed that some chemistry teachers fell short of effectiveness expected of them due to due to lack of the appropriate qualifications needed for chemistry teaching.

2.6 Assessment methods and implementation of chemistry curriculum

Based on the assessment by KICD (2010) regarding summative evaluation, 92.3% of respondents were of the view that testing adds value to the teaching and learning process. It also became apparent that written tests were frequently used in schools to assess students. Observation and projects were rarely used. In addition, Kyalo (2016) investigated the extent to which assessment methods influence chemistry performance in Makueni County and revealed that (58.3%) of principals were of the view that the projects and field work were rarely being used in assessment of chemistry. Half of the chemistry teachers who participated in the study agreed to the observation.

Adan (2011) investigated the challenges of implementing FDSE in Wajir County and cited inadequacy of classrooms, laboratories, desks, chairs as a challenge. The inadequacy of this TLMFs does not only affect implementation of FDSE but also influences implementation of chemistry curriculum since some of the TLMFs are obvious prerequisites in some assessment methods that are advocated for use in chemistry such as practicals, projects and field work.

2.7 Lesson allocation and implementation of chemistry curriculum

The steady rise in population of students in secondary schools as a result of FPE and subsidised secondary education in part has piled pressure on schools to add more classrooms so as to accommodate more students. Addition of more classrooms without corresponding recruitment of more teachers has led to a rise in the number of lessons which a teacher is allocated. According to Ziganyu (2010) and Njagi and Silas (2015) there is a shortage of chemistry teachers. In addition, Achimugu (2016) reported that lack of adequate time for syllabus coverage was amongst the factors negating effective implementation of secondary education chemistry curriculum in Kogi state, Nigeria.

According to Okono et al (2015) the number of lessons which a teacher handles affects their preparedness for each class and between classes daily. Teachers with more lessons were shown to perform few experiments as compared to their colleagues who had fewer lessons. In principle, both teaching and assessment by experimentation approach demands prior preparation and even trial of the experiment before the actual activity. High number of lessons amounts to heavy workload and may make the teacher resort to using lecture method and written tests alone while implementing chemistry curriculum. Length of lesson, time between lessons, teacher's second subject and position of responsibility may impact on chemistry curriculum implementation.

Atieno (2014) while investigating influence of adequacy of human resources on student performance in Embakasi, Nairobi revealed that 94.4% of teachers had between 25 and 30 lessons per week and that majority in this proportion had maximum teaching loads. This being the case, it then implies that they lack capacity to take up more lessons.

Mudulia (2012) reported that more high performing schools had laboratory assistants compared to the low performing schools. This creates an implication that, in highly performing schools, the frequency of carrying out laboratory practical experiments is higher than in low performing schools. This can be pegged on the support which the teachers receive from the laboratory technical assistant. In incidences where a laboratory assistant is lacking, the chemistry teacher may abandon the use of experimentation pedagogical approach.

2.8 Summary of literature review

In the light of the reviewed literature that is related to the study, it is apparent that school based factors influence the implementation of chemistry curriculum in public secondary schools. According to Chepkorir et al (2014) chemistry is a practical oriented subject. Its curriculum implementation is influenced in various ways by the TLMFs. Negative influence of the materials and facilities is manifested through poor performance of learners in the subject in national examinations (Gatana, 2011). However, According to Njagi and Silas (2014) inadequacy of chemistry TLMFs does not necessarily deter academic excellence in the subject amongst some students.

The reviewed literature is contradictory regarding the influence of teacher qualification on improvement of learner achievement. Whereas some studies suggest that high teacher quality contributes to high learner achievement, others are in contrast. The studies are not in any dispute regarding the importance of in service training programmes to already employed teachers noting that it needs to be strengthened and supported (Ziganyu, 2010).

The reviewed literature supports the vital role of assessment component of curriculum practice (KICD, 2010). However, it decries the disuse of some assessment methods. For instance, it shows that assessment methods such as field trips, observation and projects are underused (Kyalo, 2016). The few studies conducted to investigate the influence of lesson allocation on teaching revealed that most teachers have full lesson load (Atieno, 2014). They also have other duties to undertake. This adds more weight to their already heavy workload and could frustrate their commitment to use of experimentation pedagogical approach. Mudulia (2012) recommends adequate staffing in schools.

The various studies carried out on curriculum implementation reveal that factors such as materials and facilities, teacher qualifications and experience, assessment methods, and lesson allocation influence implementation of curriculum. However, no single study has been conducted in Kenya at the moment to specifically investigate the influence of school based factors on the implementation chemistry curriculum.

2.9 Theoretical framework

The study was guided by the constructivist theory that was postulated by Jerome Brunner in 1966. According to the theory, learning as an active process during which the learners construct new ideas based on their current or past knowledge. In this context, the learner selects and transforms information, constructs hypothesis and makes meaning from the information and experiences while relying on a cognitive structure to do so (Bruner, 1960).

The theory assumes that learners bring their experience and understanding to the classroom; they do not encounter new knowledge out of context but rather apply what they know in order to assimilate this information, accommodate or reframe what they know so as to match the new understandings gained. Therefore, the process of knowing is an interactive one. The theory advocates for active participation of learners in the learning process rather than being passive receivers of knowledge, learners should be involved in physical action, hands-on experience that that engages their mind as well as their brain (Bruner, 1966).

This research adopted the theory because, teaching of chemistry by experimentation makes learning an interactive process. The Learners are actively involved in utilization of apparatus, chemicals and other instructional materials during the practical lesson. They also make observations, discuss the results and draw logical conclusions with the help of the teacher, laboratory assistant and sometimes fellow students.

Experiment based teaching in chemistry also acknowledges usefulness of previous knowledge and experiences. When making an instructional design for the lesson, the teacher puts into consideration learners past knowledge and experiences on related topics in order to use it for building new concepts of the content scheduled for learning. During discussion, the teacher is required eradicate emerging misconceptions by clarifying the scientific facts to learners.

This theory has limitations in that some concepts require direct instruction rather than construction from past experiences. Learners may also misrelate new knowledge to unrelated past experience thereby misunderstanding the content.

2.10 Conceptual framework of the study

According to Orodho (2004) a conceptual framework is a model of representation where the researcher conceptualises or represents relationship between variables in the study and shows the relationship graphically or diagrammatically. The conceptual framework of this study illustrates the interaction between the variables influencing the implementation chemistry curriculum. The conceptual framework of this study is as shown in Figure 2.1

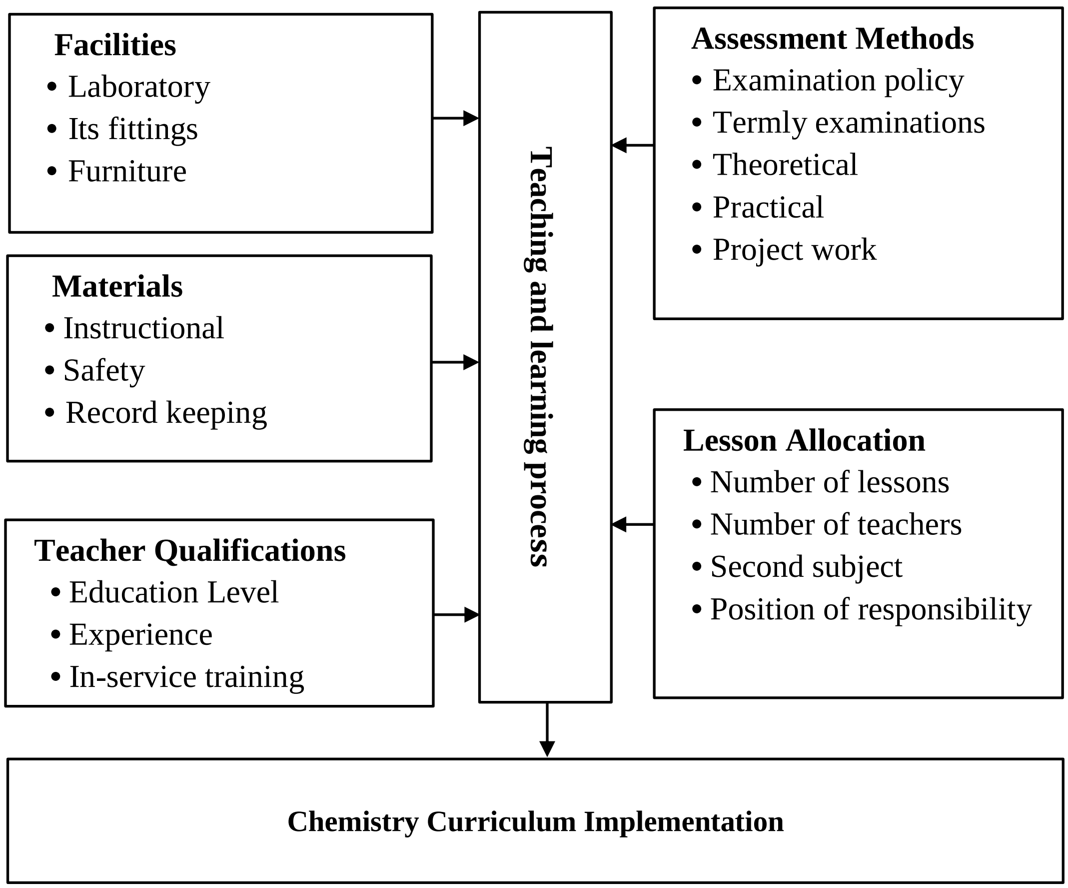

Figure 2.1: Conceptual framework showing the relationship between school - based factors and the implementation of chemistry curriculum

In this context, the school based factors are the independent variables while chemistry curriculum implementation is the dependent variable. Based on the conceptual framework facilities, materials, teacher qualifications, assessment methods, and lesson allocation influence chemistry curriculum implementation. Chemistry curriculum implementation also depends on the way the factors under investigation are applied in the teaching and learning process.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology which was used in carrying out the study. It encompasses research design, target population, sampling size and sampling procedures, research instruments, validity and reliability of the instruments, data collection procedures, data analysis techniques and the ethical considerations.

3.2 Research design

In the study, descriptive survey design was used. According to Mugenda & Mugenda (2003), a survey entails collecting data from members of a population for the purpose of establishing the prevailing status of that population with regard to one or more variables. This design was the most suitable as it would facilitate collection of specific data from the target population for the purpose of utilising it to determine and also describe the emerging ways in which the factors being investigated influence implementation of chemistry curriculum.

3.3 Target population

The study targeted all the eight public secondary schools in Garissa Sub County. The target population consisted of eight principals, 27 chemistry teachers, and a total of 940 form four students. The principals were targeted primarily because of their curriculum implementation supervisory role within schools while the choice of chemistry teachers was informed by the role which they play in actual curriculum implementation of the subject. The selection of form four students was hinged on the presumption that they had interacted with more chemistry topics compared to students of other classes.

3.4 Sampling size and Sampling procedure

A sample is a small portion of a target population which is carefully selected to represent all the main traits of the population. Sampling procedure means selecting a given number of respondents from a representative of a defined population (Orodho, 2004). According to Mugenda and Mugenda (2003) for descriptive studies a sample of 10% of the accessible population is enough. For this case 10% was used to sample the form four students.

Table 3.1: Sampling frame

Category of respondents	Population	Sample	Percentage (%)
Principals	8	8	100.0
Chemistry teachers	27	27	100.0
Form four students	940	94	10.0
Total	975	129	

All the principals and chemistry teachers were purposively selected because of their role in curriculum implementation in secondary schools. One out of every ten form four students was randomly selected in the sampled schools.

3.5 Research instruments

The data for the study was collected using questionnaires and observation checklists. Questionnaires consisted of open-ended and closed-ended items. Three sets of questionnaires were used to collect information from the principals, chemistry teachers, and form four chemistry students.

The questionnaires were structured. Each of them comprised of five parts which were organised as follows; the first part was used to collect background information of respondents. The other four parts were used to collect specific information from the respondents pertaining to school based factors influencing the implementation of chemistry curriculum. The factors were materials and facilities, teacher qualifications, assessment methods, and lesson allocation.

The observation checklist was also structured. It comprised of four parts. The first part was used for collecting background information of the schools. Each of the other three parts was used by the researcher to collect specific information available in the school in relation to the school based factors influencing the implementation of chemistry curriculum such as materials and facilities, teachers' qualifications, assessment methods, and lesson allocation.

3.6 Validity of research instruments

Validity refers to the extent to which a research instrument can measure what it ought to measure. An instrument demonstrates content validity when it fairly and comprehensively covers the domain or items that it purports to cover. Piloting was done on respondents who were not involved in the actual study.

Content validity of the instruments was determined by the researcher through seeking expert judgement from supervisors. The corrections, suggestions, and other inputs obtained were then incorporated in the research instruments.

3.7 Reliability of research instruments

Reliability is a measure of the degree to which a research instrument yields consistent results (Mugenda and Mugenda, 2003). Test-retest method was used to establish the reliability of the research instruments. Two principals, four chemistry teachers and 20 students were involved in the pilot study. The instruments were administered to the same respondents twice at an interval of one week. The results of the first and the second test were scored and then compared in order to give a reliability coefficient. The coefficient of reliability between the two sets of results was determined by using Pearson's Product Moment Correlation Coefficient formula given below.

$$r = \frac{N\Sigma xy - (\Sigma x)(\Sigma y)}{\sqrt{[N\Sigma x^2 - (\Sigma x)^2][N\Sigma y^2 - (\Sigma y)^2]}}$$

Where:

r = Pearson's Product Moment Correlation Coefficient

X = Results from the first test

Y = Results from the second test

N = Number of observations

The obtained correlation coefficient for the principals' questionnaire was 0.8639 (0.9), that of the chemistry teachers' questionnaire was 0.8731 (0.9) while that of the students' questionnaire was 0.9106 (0.9). The coefficient of reliability values obtained were significant implying that the instruments were reliable. According to Mugenda & Mugenda (2003) a reliability coefficient value of 0.7 or more indicates that the instruments are reliable for use in a study.

3.8 Data collection procedures

A permit to conduct the research was obtained from the National Commission for Science Technology and Innovation (NACOSTI). The researcher then visited the offices of Garissa; County Commissioner, County Director of Education (CDE) and the Sub County director of Education (SCDE) in order to notify them about the research and also to receive additional authorizations to conduct the study within the Sub County as per the terms and conditions which were stipulated in the received permit.

Thereafter the researcher contacted the principals of selected schools in writing seeking permission for data collection. This was followed by actual visits to the schools for the purpose of administering the instruments. Prior to data collection in each if the visited schools, the researcher issued out instructions for filling the questionnaires and observation checklists to the respondents. The completed questionnaires and observation checklists were collected immediately after the exercise in some schools or later on during the same day.

3.9 Data analysis techniques

Both the quantitative and qualitative data obtained from the study were analysed using descriptive statistics. All the data from the questionnaires was first sorted, edited and recorded. This was followed by summarising, coding and arranging it according to the corresponding themes as drawn from the research objectives. Descriptive statistics emerging from the data sets such as frequencies, percentages and mean were calculated and tabulated separately.

While retaining some sets of data in table formats, other sets of data were entered into the computer program Microsoft office excel 2010 (Ms office excel 2010). Thereafter the statistical features of the program were manipulated so as to generate bar graphs, and pie charts of various dimensions. The relationship which emerged between the independent and dependent variables was discussed narratively as per the logical conclusions made.

3.10 Ethical considerations

The researcher ensured a fair distribution of respondents where applicable, sought consent from respondents prior to their participation in the study, explained to the respondents the purpose of the study and also created a good rapport with the respondents.

The researcher also dealt honestly with respondents; ensured that their participation was purely voluntary and that their confidentiality and anonymity was kept in line with acceptable research ethics.

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION AND DISCUSSION

4.1 Introduction

This chapter presents the analysed research findings and discussions based on the objectives of the study. It contains; introduction, questionnaire return rate, demographic information of the respondents, influence of materials and facilities, teachers' qualifications, assessment methods and lesson allocation on chemistry curriculum implementation. The collected data is presented by use of frequency tables, pie charts, bar graphs and percentages.

4.2 Questionnaire return rate

The questionnaire return rate for the study is as illustrated in Table 4.1

Table 4.1 Questionnaire return rate

Category of Respondents	Issued questionnaires	Returned questionnaires	Percentage (%)
Principals	8	6	75.0
Chemistry teachers	27	22	81.0
Form four chemistry students	94	86	91.0
Total	129	114	88.0

The sampled population for the study was eight principals, 27 chemistry teachers and 94 form four chemistry students from all the eight public secondary schools in Garissa Sub County. The findings in Table 4.1 show that out of the 129 questionnaires issued to the respondents 114 representing 88.0% were filled and returned. The questionnaire return rate was above 70.0% hence attained the requirement for analysis. According to Mugenda and Mugenda (2003) response rate of above 70.0% is sufficient for analysis in social sciences.

4.3 Demographic information of the respondents

The demographic information of the respondents based on the common characteristics of each category as guided by interests of the study was collected. This was meant to establish the background information of the respondents in relationship to their perspective concerning the influence of school based factors under investigation on the implementation of chemistry curriculum.

4.3.1 Demographic information of the principals

Principals' information such as gender, age, highest education level attained, and lengths of service as a principal in the current school were gathered. The principals were asked to indicate their gender, and the results obtained were as shown in Figure 4.1

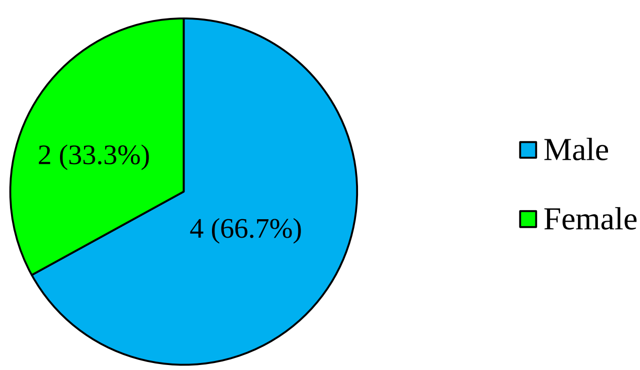

Figure 4.1 Distribution of principals by gender

From the findings in Figure 4.1 it is clearly shown that 4 (66.7%) of the principals were male while 2 (33.3%) were female. Therefore most of the principals of public secondary schools in Garissa Sub County were male. These results are not dissimilar to the observation by Ziganyu, (2010) that most of the public secondary schools in Kakamega south had more male principals compared to the female ones. The absence of an alarming gender imbalance amongst the principals eradicates gender based prejudice in the study findings.

In order to determine the age of the principals, the researcher asked them to indicate it on the questionnaire. The results were as shown in Table 4.2

Table 4.2 Principals' age

Age bracket	Frequency (f)	Percentage (%)
31 – 40 years	1	16.7
41 – 50 years	2	33.3
51 – 60 years	3	50.0
Total	6	100.0

The findings in Table 4.2 reveal that 3 (50.0%) of the principals were between 51 - 60 years old, 2 (33.3%) were between 41 - 50 years old and the remaining 1 (16.7%) had between 31 - 40 years old. From these results most of the principals heading the public secondary schools in the Sub County as represented by 5 (83.3%) of were more than 41 years old. Since most of the school heads were advanced in age, it means they had worked for a while to be in a better position to understand school based factors which have influence on the implementation of chemistry curriculum (Kyalo, 2016).

To establish the professional qualifications of the principals, the researcher asked them to indicate their highest level of education on the questionnaire. The results obtained were as shown in Table 4.3

Table 4.3 Principals' education level

Principals' education level	Frequency (f)	Percentage (%)
M Ed.	3	50.0
B Ed.	3	50.0
Total	6	100.0

The data in Table 4.3 show that 3 (50.0%) of the principals held Master's degree while the other 3 (50.0%) held Bachelor's degree. This implies that all the principals of the public secondary schools had at least university education thus possessed requisite competencies for supervising implementation of curriculum. This is because; according to Kigwilu & Githinji (2015) to guarantee effective implementation of curricular, hiring of highly qualified teachers is imperative.

To determine the principals' experience the researcher asked them to indicate it on the questionnaire. The results obtained were as shown in Figure 4.2

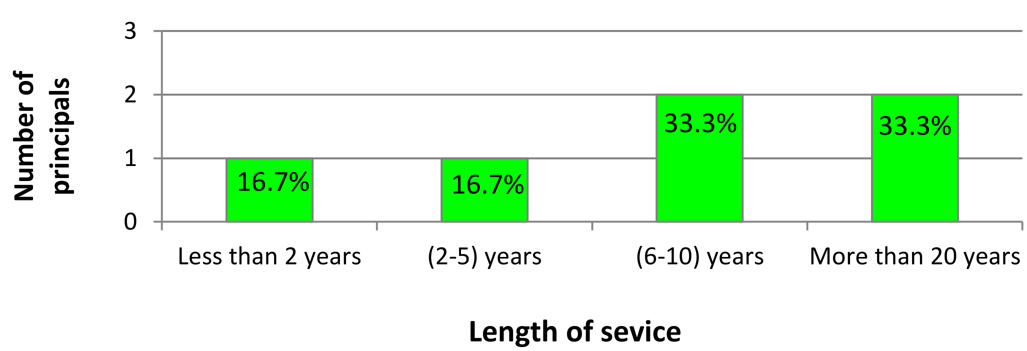

Figure 4.2 Principals' work experience

The results in Figure 4.2 show that 2 (33.3%) of the principals had more than 20 years' experience, 2 (33.3%) had between 6 – 10 years' experience 1 (16.7%) had between 2 – 5 years' experience while 1 (16.7%) had less than two years' experience. This means that most of the principals representing 4 (66.7%) had been in the office for more than five years. This implies adequate experience with various administrative aspects of a school setting and thus a better position to divulge useful information pertaining to various aspects of curriculum implementation (Atieno, 2014).

4.4.2 Demographic information of the chemistry teachers

The information gathered was based on chemistry teachers' background information such as gender, age, and highest academic qualification. In order to determine the chemistry teachers' gender, the researcher asked them to indicate their response on the questionnaire. The results were as shown in Figure 4.3

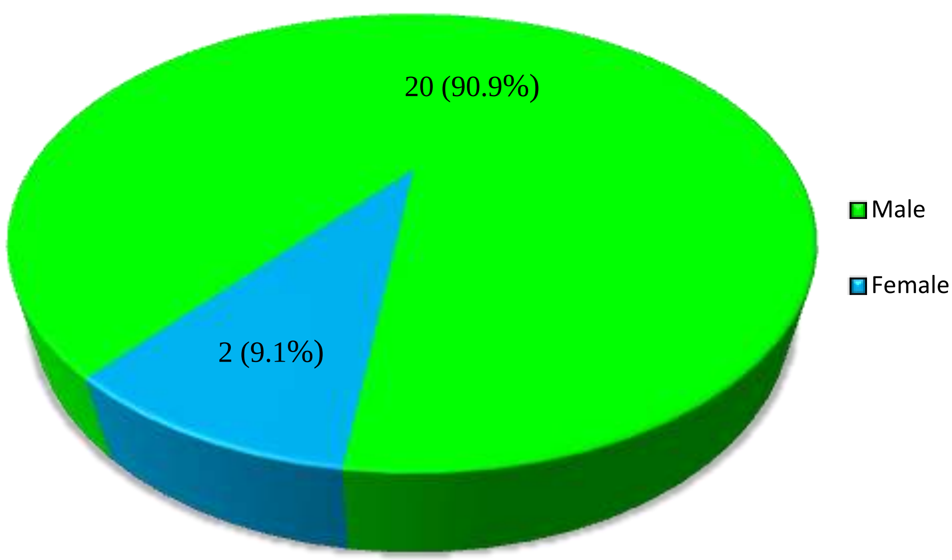

Figure 4.3 Distribution of chemistry teachers by gender

The findings in Figure 4.3 reveal that 20 (90.9%) of the chemistry teachers were male while 2 (9.1%) were female. This indicates that the sub county's chemistry teaching force was male dominated in that for every ten chemistry teachers, only one is female. This disputes observation by Gatana (2011) that minority of the chemistry teachers represented by 15.4% in Nairobi County, were male while the rest were female. Nevertheless, the prevailing male dominance in chemistry teaching staff needs deconstruction as it portrays the subject as masculine. This may silently promote emergence and rise of disaffection towards the subject by some female learners due the shortage of role models. However according to Adedayo and Owolaye (2012) teacher's gender has no impact on their ability to impart knowledge to students provided s/he is knowledgeable and skilful in the subject area.

In order to determine the age of the chemistry teachers, the researcher asked them to indicate their age bracket. The results were as shown in Table 4.4

Table 4.4 Chemistry teachers' age

Age bracket	Frequency (f)	Percentage (%)
Below 25 years	2	9.1
26 – 35 years	17	77.3
36 – 45 years	3	13.6
Total	22	100.0

The data in Table 4.4 reveals that 17 (77.3%) of the chemistry teachers were below the age bracket of 26 – 35 years, 3 (13.6%) were aged between 36 – 45 years while 2 (9.1%) were below 25 years of age. This implies that most of the chemistry teachers representing 20 (90.9%) were between 26-35 years old. Despite being young, these teachers had worked for a while and as a result they had some experience in implementing chemistry curriculum. This is because Okono et al (2015) regard physics teachers with at least two years of teaching the subject as experienced. In addition, according to Tuwei (2013) although young teachers they may lack enough experience, they are energetic and filled with enthusiasm about their work. Based on these arguments, it can be concluded that the chemistry teachers in the Sub County had enough experience required for them to provide reliable information being sought for in the study.

In order to determine the professional qualifications of the chemistry teachers, the researcher asked them to indicate on the questionnaire their highest level of education. The results obtained were as shown in the Figure 4.4

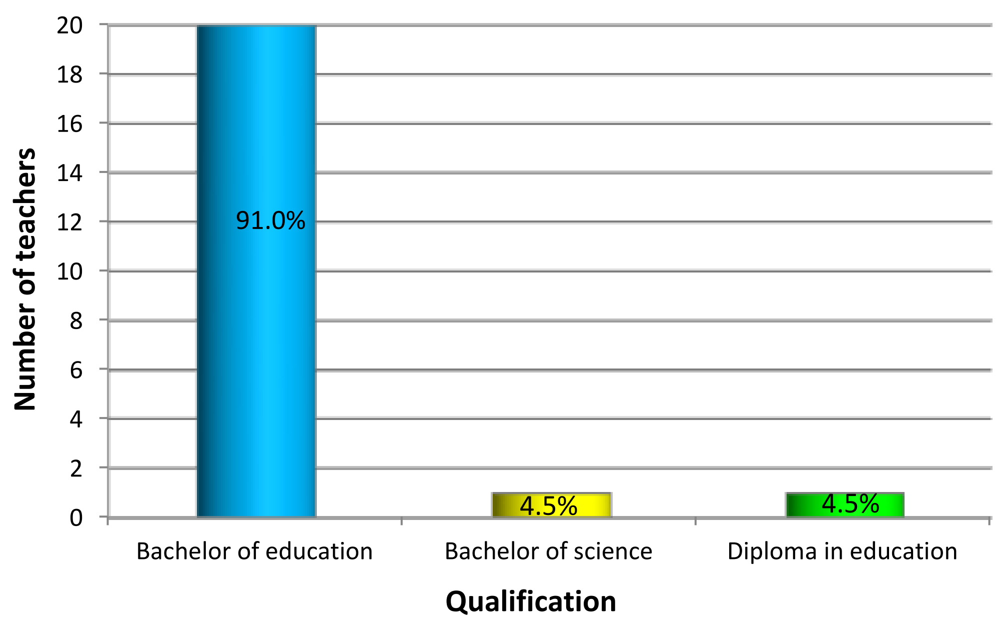

Figure 4.4 Chemistry teachers' educational level

The findings in Figure 4.4 reveal that 20 (91.0%) of the chemistry teachers were holders of a Bachelor of education degree 1 (4.5%) had a Bachelor of science degree while 1 (4.5%) had a Diploma in education. As such there is no doubt that all the chemistry teachers satisfied the required professional competence for teaching the subject. According to Orado (2009) qualified chemistry teachers possess an in depth understanding of subject matter. This is required for a clear and convincing explanation of chemistry facts, concepts, principle and theories to the learners.

4.4.3 Demographic information of the students

The information gathered was based on the form four students' gender, class in which they joined current school, Percentage marks frequently attained in chemistry examinations and the extent to which they attend chemistry lessons.

In order to obtain information concerning the gender of the form four students, the researcher asked them to indicate their gender on the questionnaire. The results were as shown in Table 4.5

Table 4.5 Students' gender

Gender	Frequency (f)	Percentage (%)
Male	40	46.5
Female	46	53.5
Total	86	100.0

The results obtained in Table 4.5 show that 40 (46.5%) of the students were male while 46 (53.5%) were female. It can thus be concluded that there was a slightly higher number of the female students than the male ones. This depicts a rise in access to science educational opportunities by the girl child in marginalized areas. It also eliminates gender biasness in the study findings.

The study also sought to determine the duration which the students had been learning in their current schools. The researcher asked the students to indicate the form in which they had joined their present schools. The results obtained were as shown in Figure 4.5

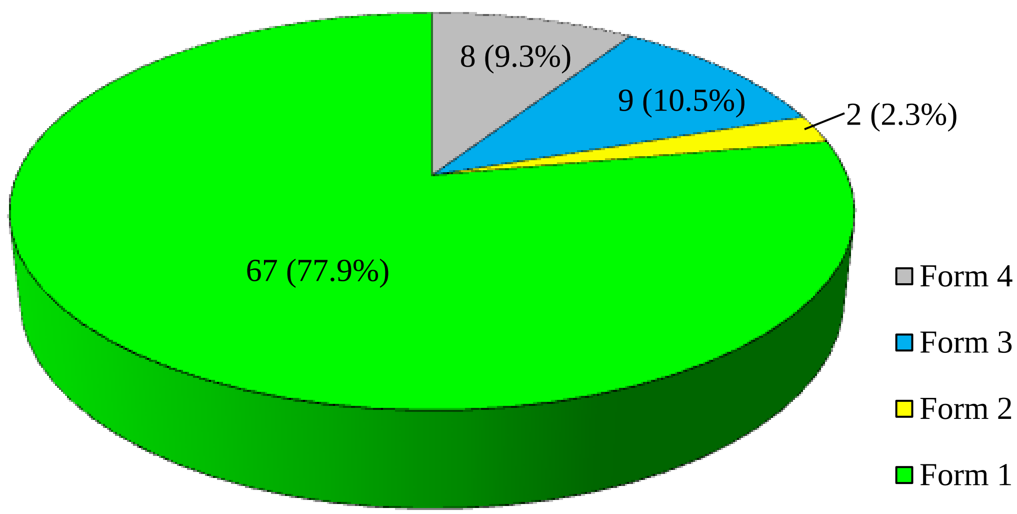

Figure 4.5 Students' class of joining current school

The results obtained in Figure 4.5 reveal that 67 (77.9%) of the students joined their current schools in form one, 9 (10.5%) form three, 8 (9.3%) form four while 2 (2.3%) had joined their current schools in form two. Therefore a vast majority of the students represented by 77.9% had been in their current schools for the past three years. This indicates a quite high retention rates in schools which serves to minimise wastage in education. It also an assurance that most of the sampled students had enough experience regarding the implementation of chemistry curriculum within their schools.

The study also sought to find out the academic background of the students in relationship to chemistry learning. The researcher asked them to state the marks which they frequently attained in school based chemistry tests. The results obtained were as shown in Table 4.6

Table 4.6 Academic background of the students in chemistry

Range of marks (%) that students score mostly in school based chemistry assessment tests	Frequency (f)	Percentage (%)
Below 24	5	5.8
25 – 44	7	8.1
45 – 59	27	31.4
60 -74	22	25.6
Above 75	25	29.1
Total	86	100.0

The findings in Table 4.6 reveal that 25 (29.1%) of the form four students frequently scored between (75-100) marks representing grade A, 22 (25.6%) scored between (60-74) marks representing grade B, 27 (31.4%) scored between (45-59) marks that represents grade C, 7 (8.1%) scored between (25-44) marks representing grade D, and 5 (5.8%) score between (0-24) marks representing grade E. Therefore most of the form four students representing 74 (86.8%) frequently score more than 45% marks, above grade C as such they have a good background in the subject. Cognizant of the foundation laying role of primary science for secondary school chemistry, this observation supports the findings by Khaombi (2016) that most students pass primary science. They join secondary schools with a good foundation in science.

To determine the extent to which the students attend to chemistry lessons, the researcher asked them to indicate their response on the questionnaire and the resultant information was as shown in Figure 4.6

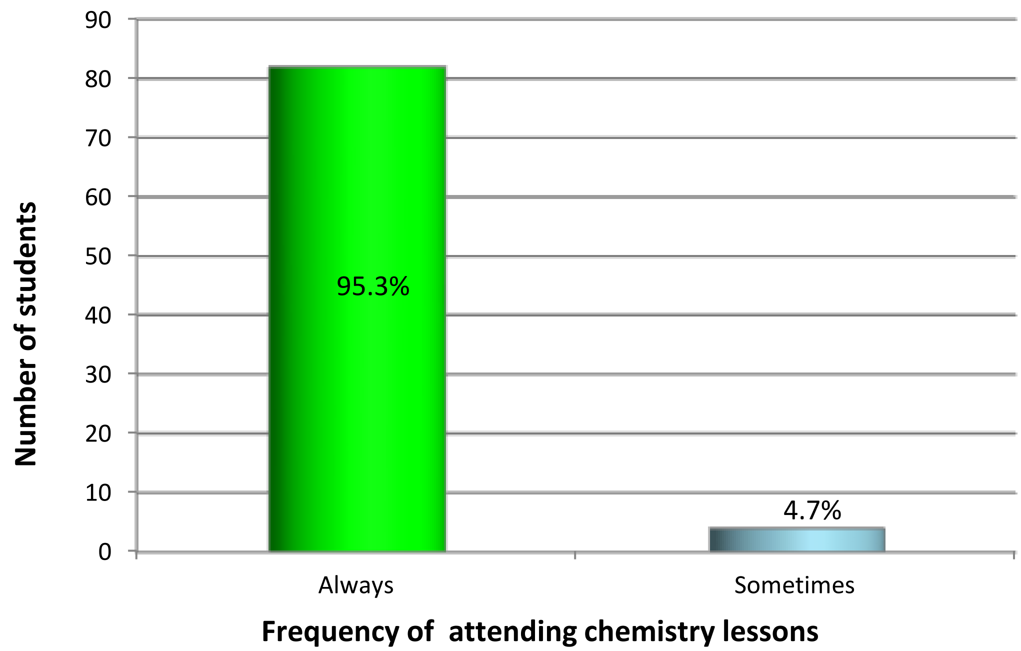

Figure 4.6 Student's frequency of attending chemistry lessons

The findings in Figure 4.6 show that 82 (95.3%) of the students always attend to chemistry lessons while 4 (4.7%) attend sometimes. Therefore almost all the form four students rarely miss chemistry lessons. Tuwei (2013) revealed that student absenteeism affects teaching and learning of mathematics. In the same way, learners' failure to attend to chemistry lessons may distort content flow thereby significantly affecting their comprehension of chemistry concepts as desired. This is because chemistry concepts are related in such a way that previously learnt content is fundamental thus required for understanding of subsequent concepts.

4.5 Facilities and implementation chemistry curriculum

To determine the influence of facilities on implementation of chemistry curriculum in public secondary schools, the researcher asked the respondents to indicate the state of availability and adequacy of the facilities of interest to the study. The researcher also ascertained the same in person by using an observation checklist. To establish whether the schools had a laboratory for conducting practical activities in chemistry, the researcher asked the all the respondents to indicate whether their school had the facility. The resultant information was as illustrated in Table 4.7

Table 4.7 Availability of a laboratory in schools

Laboratory available in school	Frequency (f)	Percentage (%)
Yes	114	100.0
No	0	0.0
Total	114	100.0

The findings in Table 4.7 reveal that all the public secondary schools had a laboratory for conducting chemistry experiments. These results are similar to those reported in Orado (2009), that all schools in Nairobi County had a laboratory. School laboratories facilitate effective teaching and learning (Neji et al, 2014). In specific reference to chemistry subject, the facility presents the most suitable environment for conducting practical activities, as such, its availability and adequacy has influence on the implementation of the subject's curriculum.

The study also sought to determine whether the laboratory had the basic laboratory fittings needed for conducting chemistry experiments. The respondents were asked to indicate whether some essential laboratory fittings of interest to the study were available and adequate. The results were as shown in Table 4.8

Table 4.8 Availability and adequacy of laboratory fittings

Adequacy and availability of some essential laboratory fittings	Sinks		Water supply		Chalkboard	
	f	%	f	%	f	%
Available and adequate	98	86.0	68	59.6	108	94.7
Available but inadequate	16	14.0	46	40.4	6	5.3
Total	114	100.0	114	100.0	114	100.0

The findings in Table 4.8 reveal that sinks, water supply and chalkboards were available and adequate by 98 (86.0%), 68 (59.6%) and 108 (94.7%) respectively. The findings also show that the sinks, water supply and chalkboards were available but inadequate to the tune of 16 (14.0%), 46 (40.4%) and 6 (5.3%) respectively. This implies that in as much as most of the laboratories had enough sinks there existed a challenge of water supply. Wet laboratories such as that one used in chemistry teaching need adequate supply of water. Apart from being used for clean up after the practical activities, the water is also used directly in some reactions. Regarding the availability and adequacy of chalkboards, most of the laboratories have a chalkboard. A chalkboard is essential for further illustration and simplification of taught concepts. It can thus be concluded that availability and adequacy of this fittings influence implementation of chemistry curriculum

The study also sought to find out whether the laboratories had furniture and whether they were enough. All the respondents were asked to indicate their responses on the questionnaire. The results obtained were as shown in Table 4.9

Table 4.9 Availability and adequacy of furniture in the laboratory

	Tables		Stools	
Adequacy of laboratory furniture	f	%	f	%
Available and adequate	89	78.1	76	66.7
Available but inadequate	25	21.9	38	33.3
Total	114	100.0	114	100.0

The findings in Table 4.9 reveal that laboratory tables and stools were available and adequate by 89 (78.1%), and 76 (66.7%) respectively. The findings also show that the laboratory tables and stools were available but inadequate by 25 (21.9%), and 38 (33.3%) respectively. This implies that despite most of the laboratories having furniture, there still exists a shortage. In addition, lab stools were more inadequate compared to lab tables. Tables are needed for placing the materials and equipment needed for a specific practical activity while stools are needed by students to sit on where need be thus their availability and adequacy affect the implementation of chemistry curriculum. According to Mudulia (2012) most low performing schools have ill equipped laboratories.

4.6 Materials and implementation chemistry curriculum

To determine the influence of materials on implementation of chemistry curriculum in public secondary schools, the researcher asked the respondents to indicate the state of availability and adequacy of the materials of interest to the study. The researcher also ascertained the same in person by using an observation checklist. In order to determine whether the primary instructional materials for experiment based teaching were available and adequate in the school laboratories, the researcher asked the respondents to indicate it on the questionnaire. The resultant information was as illustrated in Table 4.10

Table 4.10 Availability and adequacy of instructional materials

	Apparatus		Chemicals	
Adequacy of instructional materials	f	%	f	%
Available and adequate	84	73.7	88	77.2
Available but inadequate	30	26.3	26	22.8
Total	114	100.0	114	100.0

The findings in Table 4.10 show that the apparatus and chemicals were available and adequate by 84 (73.7%), and 88 (77.2%) respectively. It also shows that the apparatus and chemicals were available yet inadequate by 30 (26.3%), and 26 (22.8%) respectively. This suggests that most of the experiment based instructional materials were available. Chepkorir et al (2014) posits that in order for students to master chemical reactions, they need to mix chemicals and observe subsequent reactions. This is only possible if the said chemicals and apparatus are available thus their availability and adequacy affects chemistry teaching. In addition, according to Orado (2009) school laboratories need to be well equipped with the necessary apparatus and chemicals which in turn must be utilised so as to enhance students' understanding of scientific concepts.

The study also sought to find out whether the basic laboratory safety equipment were available and enough. All the respondents were asked to indicate their response on the questionnaire. The results were as shown in Table 4.11

Table 4.11 Availability and adequacy of safety equipment

	Gloves		First aid kits		Fire extinguisher		Lab coats		Lab rules charts	
Adequacy of safety equipment	f	%	f	%	f	%	f	%	f	%
Available and adequate	72	63.2	79	70.2	99	86.8	82	71.9	80	70.2
Available but inadequate	29	25.4	21	18.4	14	12.3	23	20.2	23	20.2
Not available	13	11.4	14	12.3	1	0.9	9	7.9	11	9.6
Total	114	100.0	114	100.0	114	100.0	114	100.0	114	100.0

The findings in Table 4.11 reveal that the laboratory safety equipment was available and adequate as follows; gloves 72 (63.2%), first aid kits 79 (70.2%), fire extinguisher 99 (86.8%), lab coats 82 (71.9%) and charts containing lab rules 80 (70.2%). The findings also show that these safety equipment was available but inadequate as follows; gloves 29 (25.4%), first aid kits 21 (18.4%), fire extinguisher 14 (12.3%), lab coats 23 (20.2%) and charts containing lab rules 23 (20.2%). The findings also show that the safety equipment was lacking as follows; gloves 13 (11.4%), first aid kits 14 (12.3%), fire extinguisher 1 (0.9%), lab coats 9 (7.9%) and charts containing lab rules 11 (9.6%). This means that most of the lab safety equipment for use by the students, chemistry teachers and lab technicians were available, nevertheless some were inadequate. Conducting experiments entail handling of some dangerous chemicals and delicate apparatus. This requires the donning of appropriate attire such as gloves and lab coats. First aid kits and fire extinguishers should be standby in case of an eventuality. It is also crucial for laboratory users to have basic knowledge of lab safety rules and first aid procedures. It can thus be concluded that, availability of laboratory safety equipment affect the implementation of chemistry curriculum.

Generally, these findings regarding materials and facilities resemble those in Mutuku (2014) that most of the school laboratories in Makindu, Makueni County are not well equipped with the materials and facilities needed for effective curriculum implementation. At this juncture it is important to point out that inadequacy or unavailability of an essential laboratory item(s) chemical(s), apparatus, fitting(s) may frustrate a teacher's intentions using of experimentation approach to teach certain chemistry concepts. These may inadvertently foster ineffective implementation of chemistry curriculum (Ijidike and Oyelana, 2015).

The observed relatively quite high adequacy of most laboratory materials and facilities for teaching chemistry also indicates the success of the laboratory equipment grant initiative by the MOEST. In the initiative, the government seeks to enhance effective implementation of science subjects' curriculum by allocating funds to schools for acquisition of laboratory chemicals and apparatus only.

4.7 Teacher qualifications and chemistry curriculum implementation

The study sought to establish the influence of teacher qualifications on the implementation of chemistry curriculum. The researcher posed items regarding the same in order to seek the opinion and level of agreement of the principals, chemistry teachers and the students. The researcher also posed items about the attendance of chemistry teachers to in service training workshops.

To determine whether a teacher's qualifications had influence on implementation of chemistry curriculum, the researcher posed an item for the respondents to indicate their opinion. The results were as shown in Table 4.12

Table 4.12 Respondents' opinion on whether a teacher's qualifications influence implementation of chemistry curriculum.

A teacher's qualifications have influence	Principals		Chemistry teachers		Students	
	f	%	f	%	f	%
Yes	6	100.0	20	90.9	82	95.3
No	-	-	2	9.1	4	4.7
Total	6	100.0	22	100.0	86	100.0

The findings in Table 4.12 show that 6 (100.0%) all the principals, 20 (90.9%) of the chemistry teachers and 82 (95.3%) of the form four students opined that indeed a chemistry teacher's qualifications influence implementation of the subject's curriculum. Nevertheless 2 (9.1%) of the chemistry teachers and 4 (4.7%) of the form four students disagreed with that viewpoint. Therefore a chemistry teacher's qualifications have influence implementation of the subject's curriculum. According to the reviewed literature the skills and knowledge level of a chemistry teacher on the subject matter influences both students' attitudes and the teacher's effectiveness.

The study also sought to determine whether teachers' with higher qualifications implement the subjects' curriculum satisfactorily by asking the respondents to indicate their agreement about the same. The results obtained were as shown in Table 4.13

Table 4.13 Respondents' satisfaction with implementation of chemistry curriculum by teachers with higher qualifications

Satisfied	Principals		Chemistry teachers		Students	
	f	%	f	%	f	%
Yes	5	83.3	16	72.7	85	98.8
Undecided	-	-	5	27.3	-	-
No	1	16.7	-	-	1	1.2
Total	6	100.0	22	100.0	86	100.0

The findings in Table 4.13 reveal that 5 (83.3%) of the principals, 16 (72.7%) of the chemistry teachers and 85 (98.8%) of the students were of the view that highly experienced chemistry teachers implement the subjects' curriculum satisfactorily. However 1 (16.7%) of the principals, and 1 (1.2%) of the students differed with the assertion while 5 (27.3%) of the chemistry teachers were undecided. This suggests that highly qualified chemistry teachers implement the curriculum satisfactorily. Zang (2008) also reported that science teachers with higher academic and professional qualifications in scientific disciplines positively influence student's achievement in science. In addition, Adedayo and Owolabi (2012) examined the influence of teacher qualifications on performance of senior secondary school students in physics subject, in Ekiti state, Nigeria. The study revealed that students taught by highly qualified teachers performed well compared to those taught by lowly qualified teachers.

The study also sought to find out whether chemistry teachers' experience influences implementation of the subject's curriculum. The results obtained were as shown in Table 4.14

Table 4.14 Respondents' satisfaction with implementation of chemistry curriculum by teachers with more experience

Satisfied	Principals		Chemistry teachers		Form four students	
	f	%	f	%	f	%
Yes	6	100.0	19	86.4	83	96.5
Undecided	-	-	-	-	1	1.2
No	-	-	3	13.6	2	2.3
Total	6	100.0	22	100.0	86	100.0

The findings in Table 4.14 show that all the principals, 19 (86.4%) of the chemistry teachers and 83 (96.5%) of the students were in consensus that chemistry teachers with more experience implement the subjects' curriculum satisfactorily. However 3 (13.6%) of chemistry teachers and 2 (2.3%) of the students disagreed with that position while 1 (1.2%) of the students were undecided. This indicates that experienced chemistry teachers implement the subjects' curriculum satisfactorily. Okono et al (2015) determined the correlation between a teachers experience and use of experimentation approach to teach physics, in Gem District. It was revealed that experienced teachers taught by experimentation more frequently due to their possession of strong instructional skills and a high ability of improvising experiments. Therefore it is highly likely that a similar relationship exists when comes to chemistry teaching.

In addition, according to Chen and Wei (2015) a teacher's knowledge of how to teach specific content in specific context (pedagogical content knowledge -PCK) significantly influences utilization of curriculum materials. In essence, pedagogical content knowledge develops from experience and frequent use of curriculum materials when teaching. This implies that experienced chemistry teachers appreciate the effectiveness of experimentation approach in chemistry pedagogy hence frequently utilize it more often.

In order to determine the instructional capability of newly recruited chemistry teachers, the researcher asked the students to indicate their opinion on the questionnaire. The results obtained were as shown in Table 4.15

Table 4.15 Satisfaction of students with the teaching capability of newly recruited chemistry teachers

Newly recruited chemistry teachers teach well	Frequency (f)	Percentage (%)
Agree	65	75.5
Undecided	1	1.2
Disagree	20	23.3
	86	100.0

The findings in Table 4.15 show that 65 (75.5%) of the students agreed that the curriculum implementation capability of newly recruited chemistry teachers was satisfactory, 1 (1.2%) were undecided while 20 (23.3%) disagreed. This means that most of the students 75.5% are satisfied with the curriculum implementation capability of newly recruited chemistry teachers. According to Gatana (2011) qualified chemistry teachers should deliver quality instruction to the effect of improving student performance. Nevertheless, the observed 23.3% disagreement by some students on this aspect is a sufficient cause for worry as it requires an investigation as well.

The study also sought to find out whether the chemistry teachers attend to SMASE and KSEF in-service training workshops. The results obtained were as shown in Table 4.16

Table 4.16 Attendance of teachers to SMASE and KSEF in-service trainings

Attended in-service training workshop	SMASE		KSEF	
	f	%	f	%
Yes	19	86.4	5	22.7
No	3	13.6	17	77.3
Total	22	100.0	5	100.0

The findings in Table 4.16 show that 19 (86.4%) of the chemistry teachers had attended to SMASE training workshops, 5 (22.7%) had attended to KSEF training workshops, 3 (13.6%) had never attended to SMASE training workshops and 17 (77.3%) had not attended KSEF in service training workshops. This suggests that more chemistry teachers had attended to SMASE in service training workshops than the KSEF ones. Njagi (2013) while investigating attendance to in-service capacity building workshop by mathematics teachers reported the same trend of more teachers attending to SMASE workshops than the other in service trainings. According to Ijidike and Oyelana (2015) in set workshops enrich the existing skills of servicemen thereby making them more efficient in carrying out their day to day activities while at work.

The study also sought to find out the actual number of times which the chemistry teachers had attended to SMASE and KSEF in service training workshops. The researcher asked the chemistry teachers to indicate their response on the questionnaire and the results obtained were as shown in Table 4.17

Table 4.17 Number of times which the chemistry teachers attended to SMASE and KSEF in service training workshops

Times of attendance to in-service trainings	SMASE		KSEF	
	f	%	f	%
(1-2) times	9	47.4	3	60.0
(3-5) times	7	36.8	2	40.0
Above 5 times	3	15.8	-	-
Total	19	100.0	5	100.0

The findings in Table 4.17 show that 9 (47.4%) of the chemistry teachers had attended to SMASE in service training workshops (1-2) times, while 7 (36.8%) had attended (3-5) times and 3 (15.8%) had attended to the training more than five times. It is important to mention that very few chemistry teachers represented by 5 (22.7%) had attended to KSEF training workshops. Out of the few 3 (40.0%) had attended to the training (1-2) times while 2 (40.0%) had attended to the training (3-5) times. Similarly, Njagi (2013) determined attendance of mathematics teachers to in service seminars and reported that few teachers representing 25.9%, 22.2% and 29.6% had attended to in service seminars once, twice and more than twice respectively. According to SABER

(2012) on-the-job-support for teachers enhance their skills and knowledge, motivate them to remain in the service.

4.8 Assessment methods and chemistry curriculum implementation

The study sought to establish the influence of assessment methods on the implementation of chemistry curriculum. The researcher posed items regarding the same and sought the responses from the principals, chemistry teachers and the form four students. To determine whether the schools had an examination policy, the researcher asked the principals and chemistry teachers to indicate it on the questionnaire. The resultant information was as illustrated in table 4.18

Table 4.18 Availability of examination policy in the schools

Examination policy is available	Principals		Chemistry teachers	
	f	%	f	%
Yes	6	100.0	22	100.0
No	-	-	-	-
Total	6	100.0	22	100.0

The findings in table 4.18 reveal that all the schools had an examination policy. Besides emphasising the greatest importance placed on assessment of teaching and learning in schools, this observation also exemplifies the examination orientedness of the Kenyan education system. An examination policy remains an integral component of chemistry teaching and learning process because according to Kyalo (2016) assessment influences chemistry performance.

By providing a standard framework for assessment in schools, an examination policy may influence chemistry curriculum implementation.

The study also sought to find out from the students the number of examinations which they sat for per term. The results obtained were as shown in Figure 4.7

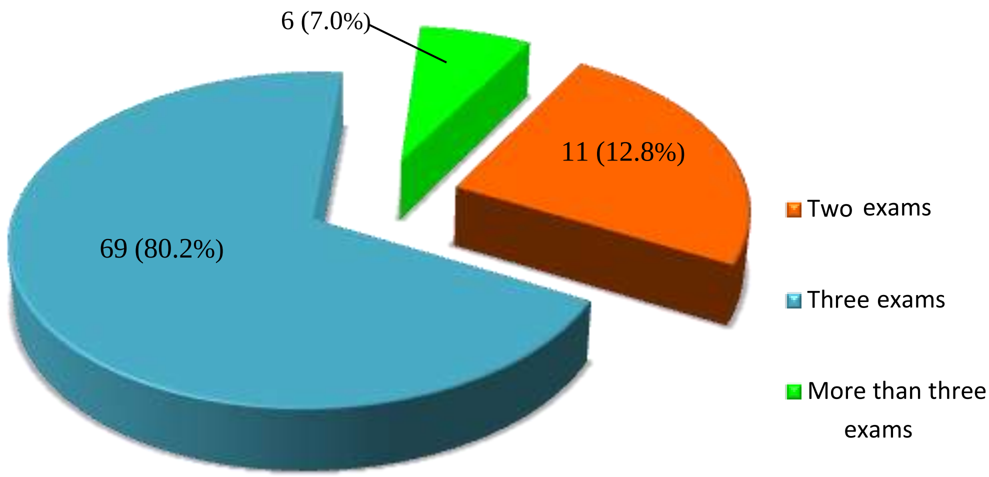

Figure 4.7 Number of chemistry examinations students sat for per term

The findings in Figure 4.7 show that 69 (80.2%) of the schools administer three chemistry assessment tests per term, 11 (12.8%) administer two while 6 (7.0%) administer more than three. This gives a general impression that most of the schools represented by 87.2% administer at least three chemistry assessment tests per term. According to Ituma (2012) assessment is inseparable from curriculum implementation since it is a very crucial element of the process. It was further observed that, administration of Continuous assessment tests (CATs) and mid-term exams was common to all the schools while topical tests, random assessment tests (RATs), and interclass chemistry contests/competitions were being administered by the schools outside the confines of the examination policy.

The administration of other tests outside the schools examination policy is purposed to expose the learners to as many examinations as possible.

The study also sought to determine from the teachers and students the extent to which some specific assessment methods were being used in chemistry. The results obtained were as shown in Table 4.19

Table 4.19 Assessment methods frequently used by chemistry teachers

	Always		Sometimes		Not at all	
Assessment method	f	%	f	%	f	%
Written tests	11	50	11	50	-	-
Practical tests	6	27.3	16	72.7	-	-
Projects	1	4.5	8	36.4	13	59.1

The findings in Table 4.19 reveal that the use of assessment methods by teachers always is as follows; written tests 11 (50.0%) practical tests 6 (27.3%) projects 1 (4.5%) while the use of the assessment methods sometimes is as follows written tests 11 (50.0%) practical tests 16 (72.7%), projects 8 (36.4%). The results also show that 13 (59.1%) of the teachers do not use project work at all for assessment. This means that written tests and practical tests are the most frequently used forms of assessment in chemistry while projects are rarely used. Kyalo (2016) observed the same trend whereby written tests and practical tests were in frequent use during chemistry assessment as compared project work. The preferential use of written and practical tests and the disuse of project work by the KNEC in national exams is the likely contributor of their corresponding pattern of usage in secondary school chemistry curriculum.

4.9 Lesson allocation and implementation chemistry curriculum

To establish the influence of lesson allocation on the implementation of chemistry curriculum, the researcher posed items regarding the same for the principals, chemistry teachers and the form four students. The study sought to find out whether the principals were chemistry teachers, the researcher asked them to indicate it on the questionnaire. The results were as illustrated in Figure 4.8

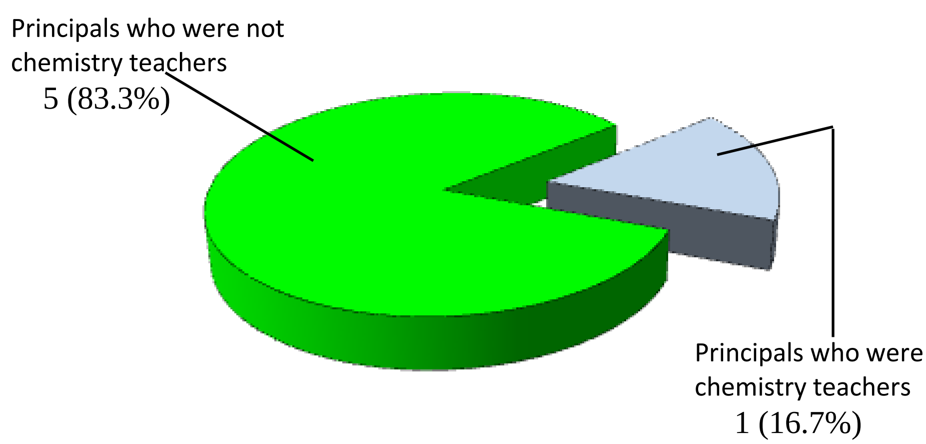

Figure 4.8 Principals responses on whether they were chemistry teachers

The findings in Figure 4.8 reveal that 5 (83.3%) of the schools principals were not chemistry teachers while 1 (16.7%) were chemistry teachers. This implies that only a handful of the principals representing 16.7% were chemistry teachers. Since most of the principals teach non-practical based subjects, whose content can be presented without conducting experiments, it implies that they have enough time for supervising the teachers so as to ensure effective curriculum implementation. According to Achimugu (2016) ineffective supervision and monitoring of teaching and learning process in schools by those in charge affect proper implementation chemistry curriculum.

The study also sought information regarding the number of lessons which the principals were allocated in a week by asking them to indicate their response on the questionnaire. The results obtained were as shown in figure 4.9

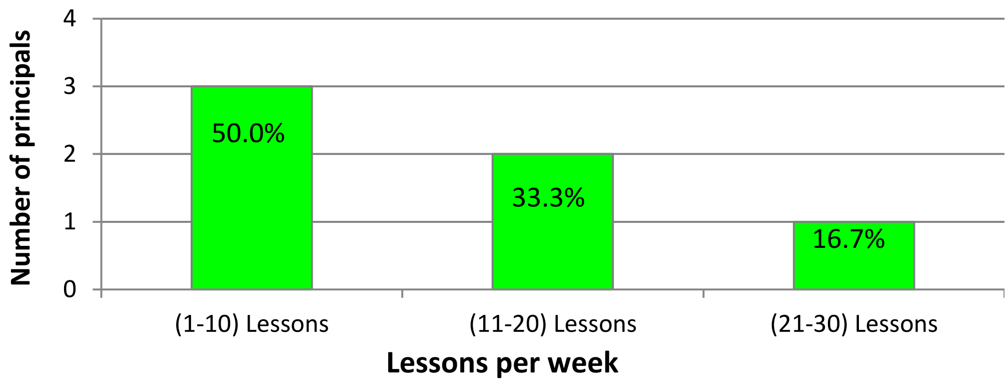

Figure 4.9 Principals responses on their number of lessons per week

The findings in Figure 4.9 show that 3 (50%) of the principals had less than 10 lessons, 2 (33.3%) had between (11-20) lessons while 1 (16.7%) had between (21-30) lessons. This implies that most of the principals 5 (83.3%) had less than 20 lessons. This is a light lesson load. Coupling this observation with the previous finding that 5 (83.3%) of the principals were non-practical based subject teachers it therefore means that they have a light workload. This guarantees them ample time for executing their curriculum supervisory roles including overall administration in the institution. According to Cross (2013) heavy workload arising from administrative roles assigned to teachers lower the effectiveness in service delivery amongst the affected teachers.

The study also sought information from the chemistry teachers on the number of fellow chemistry teachers in the school by asking them to indicate it on the questionnaire. The responses were as shown in Table 4.20

Table 4.20 Number of chemistry teachers in the schools

Class interval	x	f	∑fx	%
1 – 2	1.5	1	1.5	1.8
3 – 4	3.5	17	59.5	71.7
5 – 6	5.5	4	22	26.5
Total		22	83	100.0

The findings in Table 4.20 reveal that 17 (71.7%) of the public secondary schools had (3-4) three chemistry teachers, 4 (26.5%) had between (5-6) chemistry teachers while 1 (1.8%) had between (1-2) chemistry teachers. This clearly shows that most of the schools representing 21 (98.2%) had more than two chemistry teachers. This translated to an average of four chemistry teachers per school. Linking this result with the computed estimates of school enrolment, it can be concluded that the chemistry teacher to chemistry student ratio in the Garissa sub county is approximately 39 students per teacher per class. This ratio is within the recommended student to teacher ratio and shows that the sub county is not faced with the problem of chemistry teacher shortage. While acknowledging that largeness of a class is relative based on country, UNESCO (2015) considers a class of 50 students as large. However, it is also noted that it is rather the quality of instruction that matters and not the class size.

The study also sought to determine the second teaching subject of the chemistry teachers by asking them to indicate their response on the questionnaire. The results obtained results were as shown in Figure 4.10

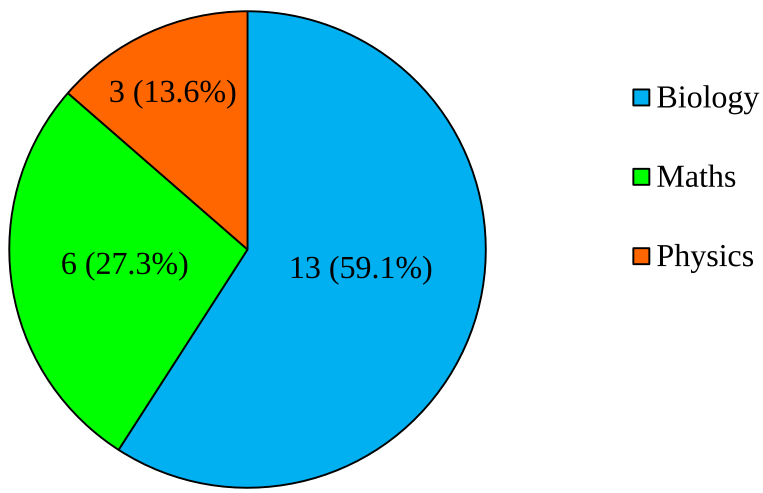

Figure 4.10 Second teaching subjects of the chemistry teachers

The findings in Figure 4.10 show that 13 (59.1%) of the chemistry teachers were of biology and chemistry combination, 6 (27.3%) were of maths and chemistry combination and 3 (13.6%) had specialized in physics/chemistry. This implies that 19 (72.7%) of the teachers specialized in two practical based science subjects as such they are capable of implementing chemistry curriculum easily and effectively. According to Gatana (2011) science subjects are ideologically interconnected and have similar instructional methodologies, a feature that makes their teaching easy. Furthermore having two practical based science subjects translates into a heavy workload considering the experimentation demand of the content of both subjects. Essentially, According to Okono et al (2015) teaching by experiments requires lesson preparation and pre-trial of experiments before actual execution. This enhances physics teachers' workload and reduces their frequency of teaching by use of the highly recommended experimentation approach. Similarly, heavy workload also threatens teaching of chemistry by experiments.

The study also sought information regarding the weekly lesson burden of the chemistry teachers. The results were as shown in Figure 4.11

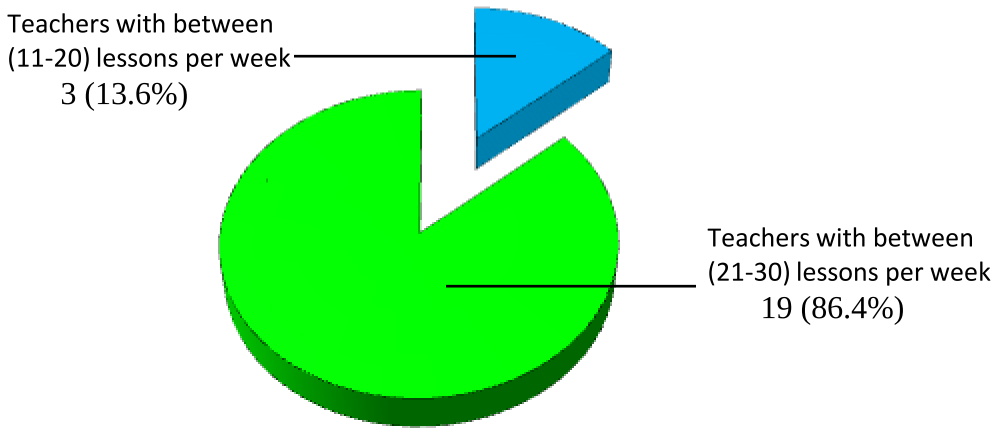

Figure 4.11 Chemistry teachers' number lessons per week

The findings in Figure 4.11 show that 19 (86.40%) of the chemistry teachers had between (21-30) lessons while 3 (13.6%) had between (11-20) lessons. It can therefore be concluded that most of the chemistry teachers representing 86.4% had between (21-30) lessons. This means that the lesson load of most chemistry teachers lied within the recommendation of MOEST and TSC which is about 28 lessons. This outcome tends to agree with the observation by Orado (2009) that most chemistry teachers in secondary schools found within Nairobi County have an acceptable teaching load. A moderate or low teaching load is expected to give a committed chemistry teacher ample time come up with the most suitable approaches for effective presentation of subject matter to learners during lesson time.

In order to determine whether the chemistry teachers held other positions of responsibility in addition to the regular chemistry teaching, the researcher asked them to indicate their response on the questionnaire. The results were as shown in Figure 4.12

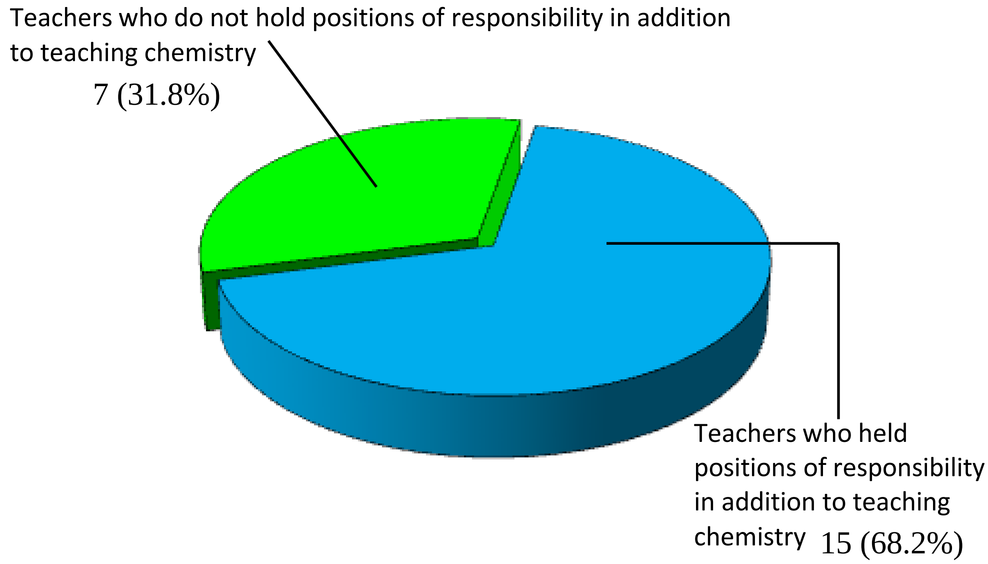

Figure 4.12 Chemistry teachers with positions of responsibility

The findings in Figure 4.12 show that 15 (68.2%) of the chemistry teachers had been assigned positions of responsibility in addition to teaching while 7 (31.8%) were not. Therefore most of the chemistry teachers represented by 68.2% held a position of responsibility in addition to teaching. Holding of administrative and managerial posts in a school enhance the number of tasks which a chemistry teacher is required to accomplish. According to SABER (2012) number of job tasks and the anticipated time of completion influence teachers' job performance and even motivation. Considering that most chemistry teachers had a practical oriented second teaching subject and a weekly lesson burden of between (21-30) lessons per week, it means that they had a heavy workload. This situation has adequate potential to bring a negative impact on curriculum implementation

The study also sought to find out the actual positions of responsibility held by the chemistry teachers. The results obtained were as shown in Figure 4.13

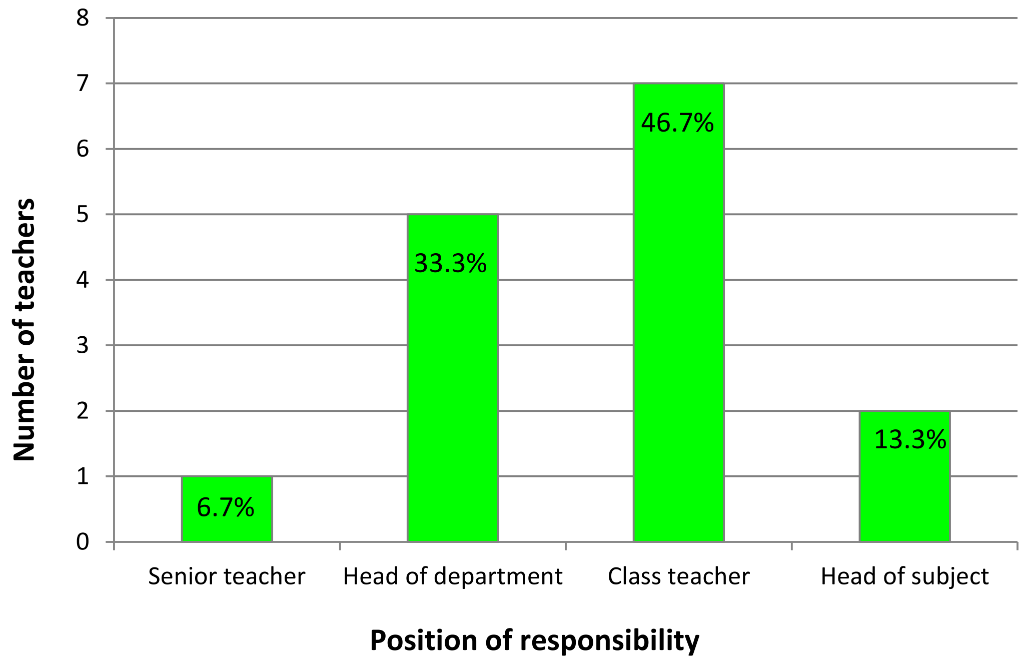

Figure 4.13 Positions of responsibility held by some chemistry teachers

The findings in Figure 4.13 reveal that out of the 15 (68.2%) of the chemistry teachers that held positions of responsibility in school, 7 (46.7%) were class teachers, 5 (33.3%) departmental heads, 2 (13.3%) Subject heads while 1 (6.7%) was a senior teachers. As already pointed out, holding of administrative and managerial posts in a school enhance the number of tasks which a chemistry teacher is required to accomplish. According to Mwagiru (2014) High workload for teachers hinders their innovativeness. Implementation of chemistry curriculum demands for creativity and innovativeness on the part of the teacher. This may prove challenging for a teacher who is overloaded with job tasks.

The study also sought to find out from the students whether they were being taught during other times apart from the timetabled lessons. The results obtained were as shown in Table 4.21

Table 4.21 Students responses on being taught during other times in addition to the timetabled lessons

Students taught during other times in addition to the timetabled lessons	Frequency (f)	Percentage (%)
Yes	62	72.1
No	24	27.9
	86	100.0

The findings in Table 4.21 reveal that 62 (72.1%) of the students admitted to being taught during other times apart from the timetabled one while 24 (27.9%) did not. This suggests that most of the chemistry teachers have to find extra time for teaching which implies insufficiency of the allocated instructional time for the subject. This conceives a need for either allocating more chemistry lessons on the block timetable or downsizing of chemistry curriculum content. According to Achimugu (2016) the voluminous nature of chemistry curriculum, overwhelming number of activities, and inadequate time for syllabus coverage negate effective implementation of its curriculum. In the context of this study the observation may also be attributed to the teacher's position of responsibility, second teaching subject and high lesson load. The study also sought to find out whether the schools had a lab assistant. The results obtained were as shown in Table 4.22

Table 4.22 Availability of a lab assistant in the school

Lab assistant is available	Principals		Chemistry teachers		Students	
	f	%	f	%	f	%
Yes	6	100.0	22	100.0	81	94.2
No	-	-	-	-	5	5.8
Total	6	100.0	22	100.0	86	100.0

The findings in Table 4.22 show that all the principals, chemistry teachers, 81 (94.2%) of the students reported that their schools had a lab assistant while 5 (5.8%) of the students reported that their schools did not have a lab technician. It therefore suggests that all the schools had had lab assistants. This outcome is similar to the observation in Orado (2013) that all schools in Nairobi County have laboratory technicians. Laboratory technicians are concerned with laboratory management. They also assist chemistry teachers prepare for practical lessons. Presence of lab attendants in school eliminates the need of a chemistry teacher to double up as a lab technician. This has the advantage of allowing the chemistry teacher enough time for instructional designing and further research on subject matter to be presented in the lesson. This enhances the quality of teaching and may positively influence implementation of chemistry curriculum. Mudulia (2012) recommends adequate staffing of school science department with both teachers and support staff for attainment of effective curriculum implementation.

CHAPTER FIVE

SUMMARY OF STUDY, CONCLUSSIONS AND RECOMENDATIONS

This chapter contains summary of the study, conclusions, recommendations and suggestions for further study.

5.1 Introduction

The purpose of this study was to investigate the influence of school based factors on the implementation of chemistry curriculum in Garissa sub county, Kenya. The study was under the guidance of five key objectives as follows: - to determine the influence of facilities on the implementation of chemistry curriculum in public secondary schools, to determine the influence of materials on the implementation of chemistry curriculum in public secondary schools, to establish the influence of teachers' qualifications on the implementation of chemistry curriculum in public secondary schools, to determine the influence of assessment methods on the implementation of chemistry curriculum in public secondary schools, to determine the influence of lesson allocation on the implementation of chemistry curriculum in public secondary schools.

5.2 Summary of the study

Descriptive survey research design was used in the study. The target of the study was all the eight public secondary schools in Garissa Sub County. In particular, eight principals, 27 chemistry teachers and 940 form four chemistry students of the public secondary schools were selected to participate in the study.

The study sample was composed of eight principals, 27 chemistry teachers and 94 students. Questionnaires and observation checklists were the main data collection instruments for the study. Pilot testing was performed so as to ascertain the authenticity of the data collection instruments. The instruments were also subjected to validity and reliability tests before use in actual data collection. Analysis and presentation of the collected data was accomplished with the aid of a computer program – Microsoft excel 2010. Both qualitative and quantitative data analysis was carried out. Quantitative data was first verified by use of triangulation technique which entailed confirmation of doubtful responses from the other participants and also by use of the observation checklists. The data was then summarised based on the questions and category of respondents for easy analysis, presentation and interpretation. Descriptive statistics such as frequencies, percentages, and mean were used to explain the outcome of the study. The quantitative data which corroborated the qualitative outcome was analysed by explaining the logical links emanating between them. The analysed data was then presented by use of frequency tables, pie charts and bar graphs.

5.2.1 Facilities and implementation of chemistry curriculum

The findings regarding the influence of facilities on chemistry curriculum implementation revealed that all schools had laboratories. In those laboratories, necessary fittings such as sinks, water supply and chalkboards were available by 86.0%, 59.6%, and 94.7% respectively. Laboratory furniture such as tables and stools were available by 78.1% and 66.7% respectively. In this regard, it was concluded that there was a considerable shortage of water supply in the laboratories followed by stools. Relating this finding with the observation that the practical tests were always used by a low magnitude of 27.3%, while sometimes by a quite high magnitude of 72.7%, it was concluded that facilities affect implementation of chemistry curriculum in terms of their availability and adequacy. This is because effective implementation of chemistry curriculum depends on availability of the laboratory facilities with necessary infrastructure.

5.2.2 Materials and implementation of chemistry curriculum

The findings on influence of materials on implementation chemistry curriculum, it was revealed that most schools had instructional materials such as apparatus, chemicals by 73.7%, and 77.2% respectively. It was also revealed that most schools had laboratory safety equipment such as gloves, first aid kits, fire extinguishers, lab coats and lab rules charts by 63.2%, 70.2%, 86.8%, 71.9%, and 70.2% respectively. Since the availability of these materials was quite high, it was concluded that availability and adequacy of materials influence implementation of chemistry curriculum as evidenced in the observed endeavour by most schools to avail the items which were of interest to the study.

5.2.3 Teacher qualifications and implementation of chemistry curriculum

Findings on the influence of teacher qualifications on implementation of chemistry curriculum revealed that at least nine out of ten of the respondents in each category opined that a chemistry teacher’s qualifications influence implementation of the subjects' curriculum. Additionally 83.3% of the principals, 72.7% of the chemistry teachers and 98.8% of the form four chemistry students agreed that chemistry teachers with higher qualifications implement the subjects' curriculum satisfactorily. Finally all the principals, 85.3% of the chemistry teachers and 96.5% of the students were in agreement that chemistry teachers with more experience also implement the subjects' curriculum effectively.

5.2.4 Assessment methods and implementation of chemistry curriculum

Findings on how assessment methods influence the implementation of chemistry curriculum showed that, all the schools had an examination policy. It was also revealed that 75.6% of the public secondary schools administer at least three chemistry assessment tests per term. Continuous assessment tests (CATs) and Mid-term exams were commonly administered in all public secondary schools. Additionally written and practical tests were in frequent use during assessment of chemistry learning while projects were in rare use.

5.2.5 Lesson allocation and implementation of chemistry curriculum

Findings on the influence of lesson allocation implementation of chemistry curriculum showed that 86.4% of the chemistry teachers had between (21-30) lessons out of which 68.2% held various positions of responsibility in addition to teaching. Also 72.1% of the form four students admitted to being taught during other times apart from the time scheduled on the teaching timetable. This tends to imply that the time allocated for teaching chemistry on the block timetable was insufficient for covering the syllabus hence the perceived need for the chemistry teachers to look for extra instructional time. It also showed that all the schools had lab assistants to help the teachers in chemistry curriculum implementation.

5.3 Conclusions

Based on the findings it was concluded that availability of laboratory facilities and materials influence the implementation of chemistry curriculum. This is because of the practical nature of chemistry makes it rely on experiment based teaching. The pedagogical approach itself requires availability of requisite subject specific resources including a laboratory that is complete with the necessary fittings, instructional materials, safety equipment.

Concerning the influence of teacher qualifications on chemistry curriculum implementation the study established that the qualifications of a chemistry teacher have an impact on implementation of the subjects' curriculum. In this context, highly qualified and more experienced chemistry teachers implement the subjects' curriculum to the satisfaction of the principals, fellow chemistry teachers and students.

On assessment methods and implementation of chemistry curriculum, it was noted that all the schools had an examination policy. Most schools were also administering at least three chemistry assessment tests per term within the framework of the examination policy. In addition, most schools dwelt on using written and practical tests in chemistry assessment while abandoning projects.

The frequent use of written and practical tests which are in fact the main assessment methods in KCSE is a clear indication that indeed assessment methods influence implementation of chemistry curriculum.

Findings on whether lesson allocation influence implementation of chemistry curriculum revealed that most of the chemistry teachers had (21-30) lessons, Most of them had a practical based second teaching subject and also held various positions of responsibility in the school. It was also observed that most of the chemistry teachers had to look for extra instructional time in addition to that allocated on the teaching timetable thus lesson allocation affects implementation of chemistry curriculum.

5.4 Recommendations

Based on the findings of the study, it was recommended that:

i) The government through KICD's chemistry subject specialists should reduce to a manageable size the volume of content in secondary school curriculum chemistry and its corresponding number of practical activities so as to enable its coverage within time allocated for the subject on school timetable.

ii) The efforts by government through the ministry of education to professionally develop the capacity of teachers through in service training workshops such a KSEF should be bolstered for the benefit of more teachers.

iii) The government through KICD and KNEC should device mechanisms of integrating examinable project work content into the formal chemistry curriculum for secondary schools.

iv) Administrators of public secondary schools where practical based science teachers that are holding other positions of responsibility should consider hiring additional staff to the science department for equitable distribution of workload.

5.5 Suggestions for further study

Based on the findings of the study, future studies should be conducted so as to determine the following:

i) School based factors influencing the implementation of chemistry curriculum in rural based public secondary schools.

ii) Influence of learner based factors on implementation of chemistry curriculum in public secondary schools.

iii) Teacher based factors influencing the implementation of chemistry curriculum in public secondary schools.

REFERENCES

Achimugu, L (2016) *Factors affecting the effective implementation of senior Secondary education in chemistry curriculum in Kogi state, Nigeria.* Retrieved from https :// s3.amazonws.com /

Adedayo, J.O Owolabi, O.T (2012) *Effects of teacher's qualifications on performance of senior secondary physics students.* Implication on technology in Nigeria.

American Chemical Society (2017) *Undergraduate chemical science.* Retrieved From http:// www.stonybrook.edu/commcms/chemistry/education/ UndergradChemSci.html

Atieno, A. J. (2014) *Influence of teaching and learning resources on students performance in Kenya certificate of secondary education in free day secondary education in Embakasi district, Kenya.* (Masters project) Retrieved from http://eap.uonbi.ac.ke

Bakari, J, Likoko, S and Ndinyo, F. (2012). Effects of physical facilities on performance in Kenya Certificate of Secondary Examinations in public schools in Bungoma south Kenya. *International Journal of Science and Research (IJSR)* ISSN (Online): 2319-7064. Retrieved from https:// www.ijsr.net.

Baubeng, I. Osei, A. T, Ampiah, G. J, (2014). *An investigation into Physics teaching in senior high schools.* Journal article. Retrieved from http:// www.sciedu.ca/journal/index.php/wje/article/download/5713/3378

Broman,K, Ekborg, K, and Johnels, D (2011) *Chemistry in crisis?* Perspectives on Teaching and learning chemistry in Swedish upper secondary schools. PhD thesis. Retrieved from https://www.naturfagsenteret.no/binfil/down load2.php?tid=1833497

Brunner, J. (1966). *Toward a theory of instruction.* Cambridge MA: Havard university press

Chepkorir, S, Cheptonui, M. E, Chemutai, A. (2014). The relationship between teacher related factors and student attitudes towards secondary school chemistry subject in Bureti district, Kenya. Journal article. *Journal of technology science and education.*

Childs, E. P (2015) Some challenges for teaching and learning science at third level. *Chemistry education research group and EP*STEM, National Centre for STEM Education University of Limerick, Ireland*. Retrieved from https://conference.pixel-online.net/NPSE/files/npse/ed0004/PPT/ 0211-SSE835-PPT-NPSE4.pdf

Cross, D (2013) *Teacher wellbeing and its impact on student learning.* Retrieved from http://www.research.uwa.edu.au/data/assets/pdf_file/0010/2633590

Edomwonyi-otu, L. and Avaa, A. (2011). The challenge of effective teaching of chemistry: A case study.*Leonardo Electronic Journal of Practices and Technologies*, 10 (18), 1-8

Gatana, R. N (2011). *Factors influencing girls' performance in Chemistry in KCSE in Nairobi County.* (Masters project) Retrieved from http :// erepository .uonbi.ac.ke

Ijidike, P. I. (2015) *Factors influencing effective teaching of chemistry: A case study of some selected high schools in Buffalo City Metropolitan Municipality, Eastern Cape Province, South Africa.* Retrieved from http://www.krepublishers.com/IJES-8-3-605-15-435

Ituma, G. M. (2012) *Analysis of school based chemistry assessment used in secondary schools in Kajiado north district, Kenya.* (Masters project)

Kaptingei, P and Rutto, K.D (2014). Challenges Facing Laboratory Practical Approach In Physics Instruction In Kenyan District Secondary Schools. Volume 3, *International Journal of Advancements in Research & Technology,*

KICD, (2010) secondary summative evaluation. Retrieved from http://kicd.ac.ke/93-departments/153-secondary-summative-evaluation.html

Khaombi, C (2016) *Factors affecting KCSE performance in public secondary Schools: A case of selected schools public secondary schools in Lugari Sub County, Kakamega County, Keny.* A post graduate diploma project.

Kigwilu, P and Githinji, J (2015). Teachers factors influencing effective implementation of artisan and craft curriculum in community colleges in Kenya.Retrievedfromhttp://asrjetsjournal.orgAmericanScientificJournal/article/download/983/596

Kimeu, R. M, Tanui, E. and Ronoh, A. (2015). Influence of instructional resources on secondary schools students academic performance in Makueni, Kenya. *International Journal of Scientific Research and Innovative Technology.*

Kones, P. C. (2012). *Strategies adopted by secondary school principals to address the rising cost of education. A case of Kuresoi district,Nakuru county*. (Masters project) Retrieved from http://erepository.uonbi.ac.ke

Kyalo B. M (2016) *School factors influencing students' performance in Chemistry in Kenya certificate of secondary education in Makueni county, Kenya.* (Masters project) Retrieved from http :// erepository .uonbi.ac.ke

Likoko, S., Mutsotso, S., and Nasongo, J. (2013). The Adequacy of Instructional Materials and Physical Facilities and their Effects on Quality of Teacher Preparation in Emerging Private Primary Teacher Training Colleges in Bungoma County, Kenya. *International Journal of Science and Research (IJSR)*, 2(1) India Online ISSN: 2319-7064. Retrieved from www.ijsr.net.

Makori, A. and Onderi, H (2013). An evaluation of secondary school principals' perception of learning resources in free secondary education era in Kenya. *African Educational Research Journal*, 1, (3): 171-182.

Mucai E. W (2013). *Availability and utilization of educational resources in influencing students performance in secondary schools in Mbeere south, Embu County, kenya.* Master's thesis. Retrieved fromhttp://irlibrary. ku.ac.ke

Mudulia M.A (2012). The Relationship between Availability of Teaching / Learning Resources and Performance in Secondary School Science Subjects in Eldoret Municipality, *Kenya. Journal of Emerging Trends in Educational Research and Policy Studies(JETERAPS)3(4):530-536*

Musyoki, L. M (2015). *Determinants of students achievement in chemistry and proposed strategies in public secondary schools in Mwala District, Mach akos county, Kenya*. Master's thesis. Retrieved from http://irlibraray.ku. ac.ke

Mwagiru, A.N (2014) *School factors influencing implementation of strengthening mathematics and science education in science teaching in public primary Schools in Kandara division, murang'a County.* Masters project.

Mwangi, J. T (2016) *Effect of chemistry practicals on students performance in chemistry in public secondary schools of Machakos and Nairobi counties of Kenya.* Doctor of philosophy thesis. Retrieved from http:// erepository. uonbi.ac.ke

Neji, H. A (2014), Evaluating the adequacy of laboratory facilities on students academic performance in seconadary schools in Calabar, *Nigeria. Journal research and method of education. Vol. 4-(IOSR-JRME)*

Njagi, L. I (2013) *An investigation into some of the factors which influence students performance in mathematics in public secondary schools in Embu west district, Embu County, Kenya.* Master's thesis.

Njagi, W. M and Silas N.E (2015) Relevance of Kenya secondary school chemistry instruction in preparation of students pursuing chemistry at university level. *Vol.3. International Journal for Innovation Education and Research, 5-10-1-SM.*

Ogembo, J. O, Otanga, H, Yaki, N. H (2015). Students and teachers attitudes and performance in chemistry in secondary schools in Kwale County, Kenya. Journal article. *Global journal of interdisciplinary social sciences.*

Ogweno, O. P (2015). Teaching and Learning Resources as Determinants of Students Academic Performance in Secondary Agriculture, in Rachuonyo North Sub County, Kenya. *Volume3,International Journal of Advanced Research* (2015). Retrieved from http://www.journalijar.com

Okono, O. E, Sati, P. L and Awuor, M. F. (2015). Experimental approach as a methodology in teaching physics in secondary schools. *International Journal of Academic Research in Business and Social Sciences*

Onyara, B. N (2013). *School based factors influencing student's academic Performance at Kenya certificate of secondary education in Teso south district.* (Masters project) Retrieved from http://erepository.uonbi.ac.ke

Orado, N. G. (2009). *Factors influencing performance in chemistry practical work among secondary schools in Nairobi province. Kenya.* (Masters project) Retrieved from http:// irlibraray.ku.ac.ke

Orodho, J. A. (2004). Techniques of research proposals and reports, Nairobi: Masola publishers.

SABER (2012) *What matters most in teacher policies?* A framework for building More effective teaching profession

UNESCO (2015) Tool kit for creating inclusive, learning friendly environments. *Practical tips for teaching large classes.* Retrieved from http:// unescodoc. unesco.org/images/0014/001488/148867e.pdf

Zhang, D (2008). *The effects of teacher education level, teaching experience and teaching behaviours on student achievement.* Retrieved from http://digital commons.usu.edu

Ziganyu, J.K. (2010) *Factors affecting curriculum implementation in secondary schools in Kenya: A case of Kakamega south district.* (Masters project)

APPENDIX I: LETTER OF INTRODUCTION

Bonface Muse,

Department of Educational

Administration and planning,

University Of Nairobi

P.O. Box 92

Kikuyu.

Date: / /2017

The Principal

____________________Secondary School

Dear Sir/Madam

RE: REQUEST TO CONDUCT RESEARCH IN YOUR SCHOOL

I am a master's student at the University of Nairobi. I am carrying out research to investigate **"School based factors influencing implementation of chemistry curriculum in public secondary schools in Garissa sub county, Kenya."**

I kindly request you to allow me to collect the required information from you, your chemistry teachers and form four students. The information obtained will be purely for the purpose of this research and the identity of the respondents will be treated as strictly confidential.

Your assistance and support on this matter will be highly appreciated.

Yours faithfully

Bonface Muse

APPENDIX II: PRINCIPAL'S QUESTIONNAIRE

The purpose of this questionnaire is to collect data on the school-based factors influencing the implementation chemistry curriculum in public secondary schools in Garissa Sub County. You are asked to provide answers to the questions as honestly as possible. The researcher assures you that the information gathered is for academic purposes only and it will be treated with utmost confidentiality. Please tick [√] where appropriate or fill in the required information in the provided spaces.

Part A: Background information

1.

Gender	Age in years	Highest level of education	Length of service as a principal (years)
☐ Male	☐ 25 & Below	☐ Master's degree	☐ Less than 2
☐ Female	☐ 26-30	☐ Bachelor's degree	☐ 2-5
	☐ 31-40	☐ Higher Diploma	☐ 6-10
	☐ 41-50	☐ Diploma	☐ 11-15
	☐ 51-60	☐ KCSE	☐ 16-20
		☐ Others	☐ More than 20

Part B: Materials and facilities and chemistry curriculum implementation

2. (a) Does the school have a laboratory for conducting practical activities in chemistry subject?

Yes [ ] No [ ]

(b) If no, is there a special place or room in the school where:

(i) Apparatus and lab chemicals are kept? Yes [ ] No [ ]

(ii) Chemistry experiments are conducted? Yes [ ] No [ ]

3. To what extend does the school have the following items in the laboratory/that special room set aside for conducting chemistry experiments?

Item/s	Available & adequate	Available but inadequate	Not available
Lab Chemicals			
Apparatus			
Lab tables			
Lab stools			
Water supply			
Sinks			
First aid kits			
Charts on lab rules			
Lab coats			
Gloves			
Chalkboard			
Fire extinguishers			

Part C: Teacher qualification and chemistry curriculum implementation

4 (a) In your opinion, does a teacher's qualification influence chemistry curriculum implementation?

Yes [ ] No [ ]

(b) To what extend do you agree with the statements below:

(i) Chemistry teachers with higher qualifications implement the subject's curriculum satisfactorily.

Agree [ ] Undecided [ ] Disagree [ ]

(ii) Chemistry teachers with longer years of service implement the subject's curriculum satisfactorily.

Agree [ ] Undecided [ ] Disagree [ ]

5. Do your chemistry teachers attend to the in service trainings listed below?

SMASE Yes [ ] No [ ]

KSEF Yes [ ] No [ ]

Part D: Assessment methods and chemistry curriculum implementation

6. (a) Is there an examination policy in the school? Yes [ ] No [ ]

(b) Please, List various exams administered by the school based on the school's examination policy…………………………………………….....................

…………………………………..………………………………………...

7. (a) Are there other tests outside the examination policy that are administered by the chemistry teachers to students?

Yes [ ] No [ ]

(b) If yes, please list the tests……………………..

……..……………………………………………………………...................

8. Below are some assessment methods used in chemistry. Tick against the ones frequently used in your school.

Written tests [ ] Practical tests [ ] Projects [ ]

Part E: Lesson allocation and chemistry curriculum implementation

9. What is the current school enrolment?...

10. How many teachers of chemistry does the school have?..................................

11. (a) Are you a chemistry teacher? Yes [ ] No [ ]

(b) If yes, what is your second teaching subject?

Maths [ ] Physics [ ] Biology [ ] Others [ ]

(c) If your response is others, please specify………………………………...

12. How many lessons do you have in a week as per the block timetable?

Less than 10 [ ] 11-20 [ ] 21-30 [ ] More than 30 [ ]

13. Does the school have a lab assistant? Yes [ ] No [ ]

---Thank you for your participation---

APPENDIX III: CHEMISTRY TEACHER'S QUESTIONNAIRE

The purpose of this questionnaire is to collect data on the school-based factors influencing the implementation chemistry curriculum in public secondary schools in Garissa Sub County. You are asked to provide answers to the questions as honestly as possible. The researcher assures you that the information gathered is for academic purposes only and it will be treated with utmost confidentiality. Please tick [√] where appropriate or fill the required information in the provided spaces.

Part A: Background information

1. What is your gender? Male [ ] Female [ ]

2. Indicate your age bracket.

Below 25 years [ ] 26-35 years [ ] 36-45 years [ ]

46-55 [ ] Above 55 [ ]

3. What is your highest level of education?

M.Ed. [ ] M.sc [ ] B.Ed. [ ] B.sc [ ] Dip/Ed [ ]

KCSE [ ] Others [ ]

Part B: Materials and facilities and chemistry curriculum implementation

4. (a) Does the school have a laboratory for conducting practical activities in chemistry subject?

Yes [ ] No [ ]

(b) If no, is there a special place or room in the school where:

(i) Apparatus and lab chemicals are kept? Yes [ ] No [ ]

(ii) Chemistry experiments are conducted? Yes [ ] No [ ]

5. To what extend does the school have the following items in the laboratory/that special room set aside for conducting chemistry experiments?

Item/s	**Available & adequate**	**Available but inadequate**	**Not available**
Lab Chemicals			
Apparatus			
Lab tables			
Lab stools			
Water supply			
Sinks			
First aid kits			
Charts on lab rules			
Lab coats			
Gloves			
Chalkboard			
Fire extinguishers			

Part C: Teacher qualification and chemistry curriculum implementation

6. (a) In your opinion, does a teacher's qualification influence chemistry curriculum implementation ?

Yes [ ]   No [ ]

(b) To what extend do you agree with the statements below:

(i) Chemistry teachers with higher qualifications implement the subject's curriculum satisfactorily.

Agree [ ]   Undecided [ ]   Disagree [ ]

(ii) Chemistry teachers with longer years of service implement the subject's curriculum satisfactorily.

Agree [ ] Undecided [ ] Disagree [ ]

7. Have you attended any of the in-service training programs listed below? If yes, state the number of times that you have attended to the workshop/training.

SMASE Yes [ ] No [ ] How many times……………………

KSEF Yes [ ] No [ ] How many times……………………

Part D: Assessment methods and chemistry curriculum implementation

8. (a) Is there an examination policy in the school? Yes [ ] No [ ]

(b) Please, List various exams administered by the school based on the school's examination policy…………………………………………………

………………………………………………………………………………

9. (a) Are there other tests outside the examination policy that you administer to the students ?

Yes [ ] No [ ]

(b) If yes, please list the tests……………..

………………………………………………………………………………

10. Below are some assessment methods used in chemistry. To what extend do you test your learner's progress by use of the following methods?

Written tests: Always [ ] Sometimes [ ] Not at all [ ]

Practical tests: Always [ ] Sometimes [ ] Not at all [ ]

Projects: Always [ ] Sometimes [ ] Not at all [ ]

Part E: lesson allocation and chemistry curriculum implementation

11. How many teachers of chemistry does the school have?..................................

12. (a) What is your second teaching subject?

Maths [ ] Physics [ ] Biology [ ] Others [ ]

(b) If your response is others, please specify……………………......................

13. How many lessons do you have in a week as per the block timetable?

Less than 10 [ ] 11-20 [ ] 21-30 [ ] More than 30 [ ]

14. (a) Do you hold any of these positions in the school (even if it is on acting capacity) Deputy principal, Senior teacher, HoD(s), Class teacher?

Yes [ ] No [ ]

(b) If yes, please list the position(s) that you hold………….........................

……………………………………………………………………………..

15. Does the school have a lab assistant? Yes [ ] No [ ]

---Thank you for your participation---

APPENDIX IV: STUDENT'S QUESTIONNAIRE

The purpose of this questionnaire is to collect data on the school-based factors influencing the implementation chemistry curriculum in public secondary schools in Garissa Sub County. You are asked to provide answers to the questions as honestly as possible. The researcher assures you that the information gathered is for academic purposes only and it will be treated with utmost confidentiality. Please tick [√] where appropriate or fill in the required information in the provided spaces.

Part A: background information

1.

Gender	Class	Percentage marks mostly attained in chemistry exams	Extend to which you attend to chemistry lessons
☐ Male ☐ Female	☐ Form 4 ☐ Form 3 ☐ Form 2 ☐ Form 1	☐ Below 24 ☐ 25 - 44 ☐ 45 - 59 ☐ 60 - 74 ☐ Above 75	☐ Always ☐ Sometimes ☐ Never

Part B: materials and facilities and chemistry curriculum implementation

2. (a) Does the school have a laboratory for conducting practical activities in chemistry subject?

Yes [ ] No [ ]

(b) If no, is there a special place or room in the school where:

(i) Apparatus and lab chemicals are kept? Yes [ ] No [ ]

(ii) Chemistry experiments are conducted? Yes [ ] No [ ]

3. To what extend does the school have the following items in the laboratory/that special room set aside for conducting chemistry experiments?

Item/s	Available & adequate	Available but inadequate	Not available
Lab Chemicals			
Apparatus			
Lab tables			
Lab stools			
Water supply			
Sinks			
First aid kits			
Charts on lab rules			
Lab coats			
Gloves			
Chalkboard			
Fire extinguishers			

Part C: teacher qualification and chemistry curriculum implementation

4. (a) In your opinion, does a teacher's qualification influence chemistry curriculum implementation?

Yes [ ] No [ ]

(b) To what extend do you agree with the statements below:

(i) Chemistry teachers with higher qualifications teach well by giving clear explanations of scientific concepts.

Agree [ ] Undecided [ ] Disagree [ ]

(ii) Chemistry teachers who have taught for more years teach well.

Agree [ ] Undecided [ ] Disagree [ ]

(ii) Newly employed chemistry teachers teach well.

Agree [ ] Undecided [ ] Disagree [ ]

Part D: assessment methods and chemistry curriculum implementation

5. (a) How many chemistry exams do you sit for in the school per term?

None [ ] One [ ] Two [ ] Three [ ] Above three [ ]

(b) Please, List them down …………………………………………………

…………………………………………………………………………………

6. (a) Does your chemistry teachers give you other tests apart from the ones you usually sit for during every term? Yes [ ] No [ ]

(b) If yes, please list the tests……………………….....................................

……………………………………………………………………………...

7. Below are some assessment methods used in chemistry. To what extend does your chemistry teacher use them?

Written tests Always [ ] Sometimes [ ] Not at all [ ]

Practical tests Always [ ] Sometimes [ ] Not at all [ ]

Projects Always [ ] Sometimes [ ] Not at all [ ]

Part E: lesson allocation and chemistry curriculum implementation

8. How many chemistry lessons do you have in a week as per the block timetable?

Less than four [ ] five [ ] More than five [ ]

9. (a) Does your chemistry teacher teach you during other time(s) in addition to the usual lesson time indicated on the timetable? Yes [ ] No [ ]

10. Does the school have a laboratory assistant? Yes [ ] No [ ]

---Thank you for your participation---

APPENDIX V: CHECK LIST

Part A: Background information

1. Name of school…………………………………...................................

2. Location of school: Urban based □ Rural based □

Part B: Materials and facilities and chemistry curriculum implementation

3. Tick whether the following are available or not.

a) (i) Chemistry laboratory? Yes □ No □

(ii) If No, is there a special room set aside that serves as a laboratory?

Yes □ No □

b) Lab Chemicals? Yes □ No □

c) Lab apparatus? Yes □ No □

d) Lab assistant? Yes □ No □

e) Consumable stores ledger for Lab chemicals? Yes □ No □

f) Is the Consumable stores ledger above updated? Yes □ No □

g) Non-consumable stores ledger for lab apparatus? Yes □ No □

h) Is the Non-consumable stores ledger above updated? Yes □ No □

Part D: Assessment methods and chemistry curriculum implementation

4. Tick whether the following are available or not.

a) School’s examination policy Yes □ No □

b) Examination timetables Yes □ No □

c) Sample CAT papers Yes □ No □

c) Assignments in chemistry exercise books Yes □ No □

d) Practical examination papers Yes □ No □

e) Sample chemistry projects Yes □ No □

f) Records of Field trips Yes □ No □

Part E: Lesson allocation and chemistry curriculum implementation

5. Tick whether the following are available or not.

a) Block timetable Available □ Not available □

b) Evidence of remedial teaching Available □ Not available

APPENDIX VI: RESEARCH AUTHORISATION LETTER

NATIONAL COMMISSION FORSCIENCE, TECHNOLOGY ANDINNOVATION

Telephone: +254-20-2213471, 2241349,3310571,2219420
Fax: +254-20-318245,318249
Email: dg@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

9th Floor, Utalii House
Uhuru Highway
P.O. Box 30623-00100
NAIROBI-KENYA

Ref. No. **NACOSTI/P/17/91192/18093**

Date: **7th July, 2017**

Bonface Sande Muse
University of Nairobi
P.O. Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on ***"School-based factors influencing implementation of chemistry curriculum in public secondary schools in Garissa Sub County, Kenya,"*** I am pleased to inform you that you have been authorized to undertake research in **Garissa County** for the period ending **7th July, 2018.**

You are advised to report to **the County Commissioner and the County Director of Education, Garissa County** before embarking on the research project.

On completion of the research, you are expected to submit **two hard copies and one soft copy in pdf** of the research report/thesis to our office.

GODFREY P. KALERWA MSc., MBA, MKIM
FOR: DIRECTOR-GENERAL/CEO

Copy to:

The County Commissioner
Garissa County.

The County Director of Education
Garissa County.

National Commission for Science, Technology and Innovation is ISO9001: 2008 Certified

APPENDIX VII: RESEARCH PERMIT

THIS IS TO CERTIFY THAT:
MR. BONFACE SANDE MUSE
of UNIVERSITY OF NAIROBI, 0-70100
Garissa,has been permitted to conduct
research in *Garissa County*

on the topic: *SCHOOL-BASED FACTORS INFLUENCING IMPLEMENTATION OF CHEMISTRY CURRICULUM IN PUBLIC SECONDARY SCHOOLS IN GARISSA SUB COUNTY, KENYA*

for the period ending:
7th July,2018

Permit No : NACOSTI/P/17/91192/18093
Date Of Issue : 7th July,2017
Fee Recieved :Ksh 1000

....
Applicant's Signature

....
Director General
National Commission for Science, Technology & Innovation

....

CONDITIONS

1. The License is valid for the proposed research, research site specified period.
2. Both the Licence and any rights thereunder are non-transferable.
3. Upon request of the Commission, the Licensee shall submit a progress report.
4. The Licensee shall report to the County Director of Education and County Governor in the area of research before commencement of the research.
5. Excavation, filming and collection of specimens are subject to further permissions from relevant Government agencies.
6. This Licence does not give authority to transfer research materials.
7. The Licensee shall submit two (2) hard copies and upload a soft copy of their final report.
8. The Commission reserves the right to modify the conditions of this Licence including its cancellation without prior notice.

REPUBLIC OF KENYA

National Commission for Science, Technology and Innovation

RESEARCH CLEARANCE PERMIT

Serial No.A 14824

CONDITIONS: see back page