

**DETERMINANTS OF STUDENTS POOR
PERFORMANCE IN CHEMISTRY IN PUBLIC
SECONDARY SCHOOLS OF KWALE COUNTY,
KENYA.**

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DECLARATION

This thesis is my original work and has not been presented for a degree in any other university.

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DEDICATION

This work is dedicated to my dear family for the immense support and encouragement they accorded me during the trying times as I endeavoured make meaning of this work. To my dear wife Winnie, daughters Mercy and Ellen; those lonely moments spent in solitude due to my absence did not all go in vain. Your support and understanding were priceless. Thank you very much for the sacrifice.

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Abbreviations and Acronyms

DEO- District Education Officer

DQASO- District quality assurance and standards officer

GIST- Girls in Science and Technology

HOD- Head of Department

ICT – Information Communication and Technology

KCSE- Kenya Certificate of Secondary Education

KNEC- Kenya National Examination Council

MOE- Ministry of Education

MOEST- Ministry of Education Science and Technology

SEPU- School Equipment Production Unit

SMASSE- Strengthening Mathematics and Science in Secondary Education

SPSS- Statistical Package for Social Sciences

TIMSS- Third International Mathematics for Scientific Survey

UNDP- United Nation Development Programme

UNESCO- United Nations Education Social and Cultural Organization

ABSTRACT

This study intended to isolate the determinant factors for persistent poor performance of students in chemistry in Kwale County in the Kenya certificate of secondary education (KCSE). Data available indicates that performance of students in chemistry in KCSE has continued to be poor over the years. The poor performance both at the County and national level in chemistry persists from the pre to post interventions measures administered by the Government of Kenya through the Ministry of Education in collaboration with many other education stake holders. Performance of students of Kwale County in Chemistry has always been below the national average. A sample of 482 forms three students from 9 public secondary schools were randomly selected using both simple and stratified random sampling to participate in a descriptive interactive survey study. The students and their chemistry teachers were provided with questionnaires while Chemistry teachers, their Principals and the District Quality Assurance and Standards Officers [DQASO] were orally interviewed. Data obtained from the study as well as physical observation of the nature of the teaching and learning resources and the conduct of both the practical and theory chemistry lessons were analysed using SPSS software. Results obtained were presented using both descriptive statistics such as mean, percentages and frequencies as well as inferential statistics including one way ANOVA, chi-square and contingency coefficient (CC) measure of association. Results showed that student' background characteristics; attitude factors particularly Chemistry teacher's negative perception of their learners' abilities; inadequate use of resource in the teaching and learning process and negative socio-cultural factors as well as inappropriate learning environment were the main causes of the students' persistent poor performance in Chemistry in Kwale County. It is recommended that the Ministry of Education through its various agents should, among other things, enhance supervision of curriculum implementation in schools, increase the amount allocated for tuition and release the funds in good time to enable prompt acquisition of learning materials. School managements, in conjunction with other stakeholders, should enhance teacher motivation and provide more and better teaching and learning facilities to enable a more conducive environment for learning. Finally, Chemistry teachers must enhance their teaching approaches by adopting a more practical approach to the teaching and learning practices that would motivate the students to perform better in the subject.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study.

Education remains the only major avenue for upward social mobility (Amutabi, 2003). In developing countries, Kenya included, most of the people still live below the poverty line. For such persons, the educational return remains as the major change agent for their livelihood (UNDP, 1994). However in exam-oriented systems of education, the quality of performance in the examination is the main determinant of those who would move up the social ladder and enjoy the limited opportunities available.

In Kenya like in many other examinations-oriented education systems, there exists a highly competitive national examination at the end of secondary school (Khatete, 1995). Those who perform well in the Kenya Certificate of Secondary Education (KCSE) examinations, with a mean grade of C and above, are selected to proceed for training in the government's institutions of higher learning and middle level colleges on government subsidy (KNEC, 2009 & MOE, 2009). On completing training, such persons are better placed to be absorbed in the highly competitive national and international job market. Performance of students particularly at the KCSE level therefore concerns all interested parties, especially the government of Kenya, the parents and the students themselves (Yeya, 2002).

The cut-throat competition is even more manifested in the science subjects such as Chemistry due to their perceived significant contribution to industrial and technological development particularly in attaining the Millennium Development Goals (MDGs) and Kenya's Vision 2030 (Riak, Mbugu, Tsuma, Ochuodho & Henry, 1996; Eshiwani, 1993; Birgen, 2004). The

development of a cadre of scientists and technicians involved in the selection and adaptation of important technologies would potentially improve the anticipated developments in agriculture, health and industries in line with the MDGs and Kenya's development plans (Musvosvi, 1998 as cited in Oduor, 2009). Failure in science subjects, Chemistry included, may therefore affect upward social mobility for many a households with poor performers.

The significant role of science in the attainment of the MDGs and Kenya's development has prompted the Government of Kenya to make it compulsory for each student to specialize in at least two out of the three science subjects (Chemistry, Biology and Physics) offered at the secondary school level. This notwithstanding, performance in these science subjects has continued to decline each year. The poor performances in sciences include Chemistry, which is one of the most "popular" science subjects that have continued to register high student enrolment in secondary schools. The perceived popularity of Chemistry, it was hoped, would translate into better performance. However, the performance has continued on a downward trend (KNEC, 2010). Available statistics show that in the last decade, students' achievement in Chemistry has remained low nationally and at the district level in Kwale County (KNEC, 1999; KNEC, 2010). Table 1.1 provides information on national performance of KCSE candidates in selected subjects for the period from 2006 to 2009.

Table 1.1 National KCSE results analysis by percentage in selected subjects 2006 – 2010

Year	Math	Chem	Bio	Phy	Agric	Geo	Eng
2006	19.04	24.91	27.45	40.32	43.15	41.72	39.76
2007	19.73	25.39	41.95	41.31	37.28	46.31	39.70
2008	21.29	22.74	30.32	36.71	48.52	37.01	33.78
2009	21.13	19.12	27.15	31.31	43.09	37.87	39.21

Source: KNEC (2010)

Table 1.1 indicates that Chemistry had the lowest mean percentage rating in 2009 and the second to last mean rating for the period ranging from 2006 to 2008. A similar trend in performance is observed for Chemistry in the case of Kwale County as is seen in Table 1.2.

Table 1.2 Kwale County KCSE results analysis of selected subjects 2002-2009 {Mean rating out of 12}

Year	Math	Chem	Bio	Phy	Agric	Geo	Eng
2002	1.85	2.53	3.17	3.28	4.47	3.23	3.23
2003	2.022	2.869	3.580	3.461	4.709	3.806	3.469
2004	2.076	3.108	3.764	4.225	4.876	4.076	3.396
2005	1.904	2.968	4.030	3.747	4.491	3.904	4.159
2006	2.097	3.609	4.328	4.403	4.720	4.262	4.410
2007	2.301	3.666	5.232	4.447	4.421	4.029	4.324
2008	2.265	3.374	4.827	4.213	4.532	3.936	4.273
2009	2.176	2.579	4.538	2.883	4.325	4.167	4.292

Source: Msambweni District Education Office, 2010

Table 1.2 shows that the performance in Chemistry for Kwale County was below the other subjects except for Mathematics in the period of 2002 to 2009. Studies have proposed various determinants of performance in sciences in general and Chemistry in particular. According to available research findings these factors include; poor teaching methodologies (Friedman, 2000), poor capital investment in terms of provision of science resources (Agusiobo, 1998), low teacher morale, substandard internal evaluation, poor administration and leadership, inadequate supervision and inspection of schools (Chiriswa, 2002), lack of support from parents, insecure working relationship between head teachers and their staff and indiscipline (Yeya, 2002) among others. In an attempt to check poor performance, the Government of Kenya through the Ministry of Education in collaboration with other stakeholders adopted a number of interventions. The measures included curriculum review and rationalisation to

reduce the load both on students and teachers, on-the-job training of science teachers through SMASSE (Strengthening of Mathematics and Science in Secondary Education) to enhance subject mastery levels and strengthening of inspectorate department to improve curriculum implementation and supervision (KESSP, 2005).

Even after such interventions, available data indicate that students' performance in Chemistry in Kwale County is still poor. From Table 1.2 the performance in Chemistry in Kwale County by mean score which was 2.53 in 2002 rose to 3.666 in 2007 before dropping to 2.579 in 2009 (Msambweni D. E. O's Office, 2010). This means that the interventions undertaken so far have not achieved the desired outcome. It is therefore probable that such interventions may not have been based on results of empirical and systematic studies on the determinants of poor performances in Chemistry in Kwale County (Ngugi & Nyakweba, 2005). This study therefore sought to investigate the factors determining continued poor performance in Chemistry in Kwale County with a view of identifying appropriate interventions to improve the performance in the study area.

1.2 Statement of the problem.

The poor performance in Sciences especially in Chemistry has continued to be a major concern for the Government of Kenya and other education stakeholders. The trend in performance has been more pronounced in rural areas such as Kwale County. The poor performance have led to low mean grades for most candidates and thus jeopardised their chances for upward social mobility. At the national level the poor performances has led to low uptake of careers in science and technology. In an effort to reverse the trend, the government adopted a number of

interventions targeting pupils, teachers and the overall teaching and learning environment. Despite these interventions, the poor performance in Chemistry in Kwale County continues with lower mean than the national averages being recorded year after year.

The continued poor performance in Chemistry have been attributed to a number of factors including students' attitude towards Chemistry, teachers' attitude towards students abilities, inadequate teaching and learning resources, and poor teaching methodologies. However, it is not clear which of these factors are responsible for the poor performance of Chemistry in Kwale County. The study therefore sought to isolate the factors which could have been responsible for Kwale County students' poor performance in Chemistry.

1.2.1 Purpose of the study

The aim of this study was to contribute to an improved chemistry teaching and learning environment at secondary school level. Its purpose was to identify from among the factors already stated which contributed to poor achievement in Chemistry and suggest possible interventions for enhancing good performance.

1.3 Objectives of the study

The objectives of the study were to:

- i. Find out the effects of background characteristics on student's performance in Chemistry
- ii. Establish the students' attitude towards Chemistry.
- iii. Establish Chemistry teacher's attitude towards their learners' ability in Chemistry.

- iv. Find out the effect of use of resources for teaching Chemistry on students' achievement in Chemistry.
- v. Identify intervention strategies that can help improve learners' performance in Chemistry.

1.4 Research questions

The study sought to answer the following questions:

- i. What are the effects of background characteristics on student's performance in Chemistry?
- ii. What are the students' attitudes towards Chemistry?
- iii. What are the effects of students' attitude on performance?
- iv. How do Chemistry teachers perceive their learners' ability in Chemistry?
- v. What are the effects of teacher's perception of the learner ability on the learner's performance in Chemistry?
- vi. Does the use of available resources affect students' achievement in Chemistry?

1.5 Research assumptions

During this study it was assumed that:

- i. The teachers interviewed had been teaching Chemistry in the specific schools for a reasonable period of time to be able to be conversant with the dynamics of their learning environments.
- ii. The syllabus coverage was uniform for all the schools.

- iii. The students who participated in this study learn under similar conditions as those whose KCSE results were analysed in the period ranging from 2002 to 2009.
- iv. The respondents were honest in answering all questions.

1.6 Significance of the study

The study drew its importance from the fact that achieving the aims of the country's industrialization could be jeopardized if a large proportion of the anticipated participants did not have adequate access to the appropriate kind of Chemistry education and training (Eshiwani, 1983; Orodho, 1996). A poorly educated workforce directly hampers a nation's productivity and economic competitiveness (Stevenson & Stigler, 1992). The findings were expected to practically contribute towards improvement of teaching and learning strategies of Chemistry not only for schools under study, but for the entire nation. Theoretically, the study was expected to contribute to the advancement of science knowledge for social and economic development. The findings of this study would also be beneficial to:

- a) Classroom teachers- It would help them in selecting methods that would improve the quality of teaching and learning.
- b) School administrators- They would benefit from suggestions on how to ensure an enabling learning environment for students and teachers to enhance performance in Chemistry.
- c) Students- Would benefit from suggestions on particular characteristics and study habits that enhance performance in Chemistry.
- d) Teacher trainers- Would get useful information on how teachers' attitudes contribute to performance in Chemistry and how it could be enhanced.

- e) Policy formulators- Would gather useful information which would shed light on why the interventions so far implemented have not so far yielded required outcome. This would enable policy implementers adopt only those strategies that promotes good performance in Chemistry.

1.7 Scope and limitations of study

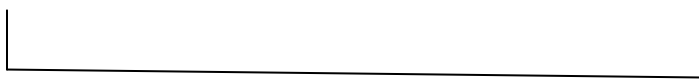
1.7.1 Scope of the study

This study sought to identify some factors responsible for students' poor performance in Chemistry in Kwale County. It involved Form three Chemistry students, their Chemistry teachers, and Principals of 9 selected public secondary schools in Kwale County. The District Quality Assurance and Standards Officers (DQASO's) of the County were also involved.

1.7.2 Limitations of study

Kwale County is cosmopolitan comprising a number of ethnic communities with different socio-cultural backgrounds that provided the various expected differences in the learners. Only Form three students were involved in the study due to their longer exposure to the Chemistry curriculum and the fact that they had chosen to specialise in the subject. Since the study involved secondary schools from only 1 out of 47 Counties, the sample may not be representative of all students from secondary schools in Kenya. The results of the study may also be limited by time and financial constraints.

1.8 Theoretical framework



Source: Adapted and modified from Di Viesta (1989).

Figure 1.1 shows the relationship of factors that directly contribute to effective learning which then contribute to the student's achievement in Chemistry. Performance in Chemistry involves a number of independent variables. The variables include teacher and student characteristics, teaching strategies, resources and facilities, assessment and learning environment (Oliver, 1995). It is primarily the acquisition of proficiency in a subject that leads to positive attitude in that subject. The reverse is also true (Di Viesta, 1989). Chemistry teachers however in teaching the subject play an important role and therefore have a strong influence on the student's learning of the subject. Students often learn a great deal simply by observing other people (Ormorod, 1999). The qualification, commitment, motivation, experience and instructional styles of the teacher will therefore influence the learner's performances in Chemistry. Availability of facilities and resources for both teaching and learning enables the student to achieve in sciences (Kelly, 1978). The facilities include laboratory, laboratory equipments, textbooks, teaching aids, chemicals and materials. The frequency and quality of assessment by the Chemistry teachers also have a bearing on performance in Chemistry. Teachers should help students set realistic expectations for their academic accomplishments (Ormorod, 1999).

1.9 Operational definition of terms

Achievement: this is performance of a student measured by the school through test and national examinations.

Assessment: the process of determining students' achievement through tests, projects and examinations.

Chemistry: the branch of science that deals with the study of matter.

Chemistry achievement: the competency level attained in chemistry including mastery of basic skills (observation, recording, reporting), knowledge and concepts measured in terms of grades a student scores at KCSE level.

Chemistry curriculum: all the experiences a learner goes through in learning Chemistry. They include: content, practical work, project, group discussions, excursions and field work.

Curriculum: all the experiences a learner goes through in a learning institution. The experiences include time-tabled content (subject) and co-curricular activities.

Learning environment: all the surroundings and conditions under which students study.

Peer group pressure: the power to influence another person's beliefs, character or actions of a person of the same age.

Poor achievement: a score of below 40% obtained in Chemistry by a student at KCSE level.

Science: a vast body of connected knowledge of theories, concepts and facts developed by scientists through scientific methods.

1.10 Summary

This chapter provides the rationale for the study. It contains introductory concepts such as study background, statement of the problem as well as the research objectives and questions. It also highlights the scope and limits for the study as well as the theory around which the study resonates. Finally, a basic definition of critical terms used in the study is undertaken within the

chapter. It is upon this foundation that the rest of the work (literature review, research methodology for data collection and ultimately analysis) are based on.

CHAPTER TWO

REVIEW OF RELATED LITERATURE

2.1 Introduction

This chapter on literature review focuses on factors that affect performance of Chemistry and the interventions so far undertaken by the Government of Kenya. A lot has been written on

factors that determine performance of Sciences and Mathematics with the aim of improving their performance. This review considers the following as probable factors that could determine a student's performance in Chemistry:

- Attitude and performance
- Students characteristics
- Teacher characteristics
- Teaching strategies
- Resource availability and use
- Learning environment
- Assessment
- Government interventions.

2.2 Attitude and performance

Attitude is important in understanding human behaviour. To define what exactly an attitude is, many attempts have been made in literature. Generally it is defined as a complex mental state involving beliefs (Hussain, Ali, Khan, Ramzan & Qadeer, 2011). It is an individual's prevailing tendency to respond favourably or unfavourably to an object, person or group of people, institutions or events (Barros & Elia, 1997). The word is defined within the framework of social psychology as a subjective or mental preparation for action. It defines the outward and visible postures and human beliefs. Attitudes determine what each individual will see, hear, think and do. They are rooted in experience and do not become automatic routine conduct. Attitudes can be positive (values) or negative (prejudice). Attitude towards science denotes interest or feeling towards studying science. It is the students' disposition towards

‘like’ or ‘dislike’ in science. Attitude in science means the scientific approach assumed by an individual for solving problems, assessing ideas and making decisions in the sciences (Olatunde, 2009).

Teachers have a decisive role in any educational system and their competencies do not automatically ensure positive attitudes towards the teaching process. To put it simply, teacher attitudes are important because they affect the student. Teacher attitudes play a significant role in shaping the classroom environment which has an impact on a student's self efficacy which in turn influences a student's behaviour. All of these factors which can be loosely categorized as environment, personal factors, and behaviour interact and play off each other in a cyclical way (Woolfolk, 2007).

Papanastasiou (2001) reported that those who have positive attitude toward science tend to perform better in the subject. The affective behaviours in the classroom are strongly related to achievement, and science attitudes are learned (George & Kaplan, 1998). The teacher plays a significant role during the learning process and can directly or indirectly influence students' attitudes toward science which in consequence can influence students' achievement. Teachers are, invariably, role models whose behaviours are easily mimicked by students. What teachers like or dislike, appreciate or disapprove and how they feel about their learning or studies could have a significant effect on their students. By extension, how teachers teach, how they behave and how they interact with students can be more paramount than what they teach (Kwale SMASSE, 2004).

Student beliefs and attitudes have the potential to either facilitate or inhibit learning. Burstein (1992) in a comparative study of factors influencing Mathematics achievement found out that there is a direct link between students' attitudes towards Mathematics and student outcomes. Studies carried out have also shown that the teachers' method of teaching mathematics and his personality greatly accounted for the students' positive attitude towards Mathematics and that, without interest and personal effort in learning Mathematics by the students, they can hardly perform well in the subject (Olatunde, 2009).

In relation to science subjects, Halladyna and Shanghnessy (1982) concluded that a number of factors have been identified as related to students' attitude. Such factors include; teaching methods, teacher's attitude, influence of parents, gender, age, cognitive styles of pupils, career interest, societal view of science and scientists, social implications of science and achievement. Empirical studies have revealed the influence of methods of instruction on students' attitude towards science. Kema and Dube (1974) worked on the influence of science instruction; the result was that attitude becomes more positive after instruction. Long (1981) also concluded that diagnostic-prescriptive treatment promotes positive attitude. Hough and Peter (1982) further found out that groups of learners who scored significantly high in science achievement test also scored significantly high in attitude test. Gibbons, Kimmel and O'Shea (1997) opined that students' attitudes about the value of learning science may be considered as both an input and outcome variable because their attitudes towards the subject can be related to educational achievement in ways that reinforce higher or lower performance. This means that those students who do well in a subject generally have more positive attitudes towards that subject and those who have more positive attitudes towards a subject tend to perform better in the

subject (Olatunde, 2009). Akinmade (1992), has confirmed that students' attitude toward science are sine qua non for higher achievement in science.

Student's attitude toward the learning of Chemistry (a science subject) is a factor that has long attracted the attention of researchers. Ojo (1989) and Adesokan (2002) asserted that in spite of realization of the recognition given to Chemistry among the science subjects, it is evident that students still show negative attitude towards the subject, thereby leading to poor performance and low enrolment. According to Bassey, Umoren and Udida (2008), students' academic performance in Chemistry is a function of their attitude.

Attitude as an affective construct has been described as the basis for both "intellectual preparedness" and motivation in learning. This study therefore attempted to investigate the attendant contribution of student's attitude towards Chemistry and the Chemistry teacher's perception of their learners' ability in Chemistry as a contributor towards poor performance in Chemistry in Kwale County.

2.3 Students' characteristics and achievement

The purpose and programs of the educational system must be designed to meet the needs of each individual child (Eshiwani, 1983). The student characteristics include: entry behaviour, study time, peer group influence and aspiration. They vary from one individual student to the next. According to Kwale SMASSE (2004) baseline findings, there is a general feeling among students that Mathematics and Sciences (Chemistry included) are difficult subjects. This feeling was found to be greater in girls than boys. The feelings were found to be due to; socio-

cultural attitudes, teachers' attitude or predisposition towards the students, school culture, teaching methodology and performance. This study intends to further this work and determine to what extent the stated issues might be contributing to poor performance in Chemistry.

Erwin (1993) mentions that among upper primary and secondary school students' boys have a greater interest in science than girls. Twoli (2006) states that gender differences are particularly related to sciences interest in that boys were more interested in physical sciences while girls were more interested in the biological sciences. This indicates that there could be a relationship between gender and subject choice and probably performance. The study seeks to understand whether there is a significant relationship between gender, subject choice and performance of Chemistry. Gender imbalances among teachers could have a bearing on sex differentiation of subject choice. Statistics from Equal Opportunity Commission (1987) shows that teachers' subject qualification tend to reinforce sex stereotyping in curriculum choice because of the absence of non-stereotypical role models as cited in Singh (1994). There are relatively fewer female teachers teaching Chemistry in secondary schools hence girls lack what would be their immediate role models in Chemistry education (Kwale SMASSE, 2004). To what extent does this influence the teaching and learning of Chemistry in Kwale County?

Peer relationships exert their influence through the attitudes, expectations and understanding of roles that they leave with the individuals (Erwin, 1993). Whyte (1986) while researching on girls in science and technology (GIST) found that boys persistently intimidate girls in the science laboratory and refused them access to equipments. They therefore recommend removing of the more dominant group. He further advocates for isolation of girls- through

single-sex school (girl's schools) by saying that exclusion allows women to express and validate their own experiences to develop some autonomy, and to build some confidence. The question that this study intended to pursue was whether there existed variation in performance of girls in single sex schools (girls' schools) to those in mixed schools of the same level in Chemistry.

The characteristics of the student and the educational objectives must both be employed as guides in the design of maximally effective environments for learning for better achievement. According to Driver (1989), the role of education in our society is to train children to be creative and self-reliant. This is basically through achieving education (Chemistry education included) objectives. Africa lags behind the rest of the world in science and technology development: an indication of the relative failure of science education in Africa (UNESCO, 1986). For Kenya to develop industrially improvements are necessary in the provisions for science education and in particular Chemistry education at all levels in the country.

When motivational factors such as interest, attitude and aspiration are inculcated in the learners, they tend to spend more time studying the particular subject. This translates into higher achievement in sciences. Students understand better when they spend more time studying Chemistry and will therefore achieve to expected standard (Twoli, 2006). If the educational goal is to encourage the development of higher conceptual level with its associated adaptive capacity and flexibility, then this study will provide a guide for working towards the long-term goal.

2.4 Teacher characteristics and achievement

Teachers play an important role in determining the climate of their classroom (Trowbridge, 2004). According to Kwale SMASSE (2004), teachers are the most important agents that can influence change in students' attitude towards Mathematics and Sciences. They are in contact with the students most of the time. Through such contacts, they communicate their view point and expectations to students and the students are likely to faithfully believe them. A study by Fuller (1985) on factors influencing performance indicates that about 80% of studies confirm that in-servicing of teachers is positively correlated to achievement and 70% of the studies revealed a positive correlation between years of tertiary education and teacher training to achievement. This brings in the idea that the teacher himself/herself might be a determinant of performance. In the discussion about students' performance, teachers are especially likely targets of criticism. They would be better effective, it is charged, if they were better educated (Stevenson, & Stigler, 1992). He further asserts that standards set the course, assessment provide the benchmarks, but it is the teaching that must be improved to push us along the path to success. Might this also be the remedy for Chemistry in Kwale County and the country at large?

As if responding to issues raised by Stevenson and Stigler, (1992) Kwale SMASSE (2004) in their baseline study's findings suggests that when professional approach is embraced in teaching and learning process, the use of indirect verbal behaviour, for instance, acceptance of students' feelings, praises or encouragement is enhanced, may be associated with a more positive attitude towards learning and higher achievement by students. Gachathi Report (1976: 106) intimates:

“No matter how education is viewed, the role and the quality of teachers must be given the most critical consideration.”

Kwale SMASSE (2004) found that some science (Chemistry) teachers subjected learners to traditional "telling" or the narration marathon which leads to ineffective learning of knowledge, skills and concepts required in Chemistry as a practical subject. They therefore suggest that it be made imperative for Chemistry as well as other subjects to be handled by teachers who are technically qualified. Stigler & Hiebert (1999) proposes that teaching is the next frontier in the continuing struggle to improve schooling. Teacher's qualification goes with their effectiveness in the classroom. They play an important role in teaching and influence the students' acquisition of knowledge, skills and concepts.

According to Comber and Keeves (1973), teaching experience does not necessarily cause higher achievement in science, but knowledgeable teachers are less likely to pass on misconceptions, are more confident in imparting information, use less time for preparation and are able to present a wider range of examples and analogies which helps the students to comprehend concepts more easily. Commitment and instruction styles are also other characteristics that contribute to students' performance. Experienced teachers elicit strong achievement gains and accept responsibility for doing so. They believe that their students are capable of learning and as teachers, they are capable and responsible for teaching them successfully. They also team up with other teachers in order to share ideas and opinions on the strategies to be adopted in successful teaching and learning of Chemistry (Kwale SMASSE, 2006).

According to Tsuma (1998), science educators should ensure that learners get involved in the teaching and learning process always. This is due to the fact that the study of Chemistry is a

process of acquiring and generating knowledge and thought process based on accurate observation, thorough investigation, experimentation, logic, proof, explanation and validation. Gregg (1968) summed up the study of Chemistry as a direct result of one or more careful and unbiased experimental observation. Therefore every teacher has the task of creating teaching/learning environment that culminates into a rapport for meaningful and in-depth understanding of principles and concepts (Kwale SMASSE, 2006). This would enhance students' attitude to Chemistry.

Teachers make important decisions daily. Such decisions include selecting lesson content, text and materials, mode of presentation, learning activities and evaluation methods to construct classroom curriculum. The professional autonomy associated with these choices characterizes conception of teachers as professionals. Moreover, in-service training courses are necessary since teachers who attend them get to know the changes in the curriculum as far as the subject matter and teaching techniques are concerned (Beck & Earl, 2002).

Teacher's attitude and motivation play a pivotal role in the teaching and learning process. Educationists and employers know that it is essential to motivate learners and employees so that they can work hard to produce good results in whatever they do (Kithinji 2007, as cited in Twoli, Maundu, Muindi, Kii, & Kithinji, 2007). According to Kwale SMASSE District INSET-2004, although Science and Mathematics teachers may have positive attitude, they are beset with problems that frustrate their efforts to teach effectively and efficiently. The problems which they outlined include:

- i. General performance in Science and Mathematics: The fact that performance in national examination in Mathematics or science is not as good as in humanities could be a source of frustration to the teachers
- ii. It is possible that a number of teachers are not in the profession by choice. Although many of them adjust and accept teaching as a profession, there are those who take too long while others do not accept the profession at all.
- iii. Inadequate number of teachers. Findings during baseline studies indicated a lack of sufficient teachers particularly in rural areas. It is possible to get one teacher per subject (Chemistry or Biology or Physics). In such a case the teacher will be overworked and has no time for adequate preparation.
- iv. Students' attitude. When students have a negative attitude towards Mathematics and Science, teachers will no doubt be discouraged.
- v. Overloaded curriculum
- vi. Lack of facilities
- vii. Uncooperative administration especially in provision of required facilities
- viii. Poor remuneration.

The number of Chemistry teachers in employment in schools in Kwale County, their level of education, years of service and other requisite teacher characteristics formed part of this study. Of particular interest for this study included the level of preparedness of the teachers in teaching Chemistry in the rural schools from an urban training background, their attitude in

tackling the challenges the rural schools offers mostly with poor infrastructure and average or at times below average students.

2.5 Teaching strategy

Teaching, at its simplest, is a form of interaction- a particular form of exchange of knowledge, skills and understanding (Brenner, 2004). Effective teaching comes from the knowledge of the relationship between classroom process measured through observation of systems and student outcomes, most notably gains in standardized achievement test, for instance KCSE. However, some principles on effective teaching are rooted in logic of instructional design, for example, instructional methods (Corno & Snow, 1986).

The principles of effective teaching rest on fundamental assumptions about optimizing curriculum and instruction. The assumptions include:

- i. The school curriculum assumes different types of learning that call for different type of teaching. No single teaching method such as direct instruction or social construction of meaning can be the method of choice for all occasions.
- ii. For any subject, Chemistry included, instructional needs change as the students expertise develops. Therefore, what constitutes an optimal mixture of instructional methods and learning activities will evolve as the students- school years, instructional units and even individual lessons progress (Harris & Taylor, 1983; Corno & Snow, 1986; Gastel, 1991).
- iii. The students need to learn effectively and progress through the curriculum. Effective instruction needs to focus on the zone of proximal development, which is the range of knowledge, concepts and skills that the students are not yet ready to acquire on their own but can acquire with the help from their teachers. Teachers have different styles and

strategies for helping students learn particularly Chemistry concepts and skills and there is no one right way to teach.

If students are to learn science, we must give them respect for observation rather than the pronouncement of textbooks (Garson, 1988). This is more so important after the findings of Kwale SMASSE (2004), project baseline studies which found that most science teachers enter into the activity of teaching armed only with textbooks.

There are some features about science (Chemistry) that have implication on how it should be taught (Fisher, 2003). Science is about constructing meaning out of knowledge. It is not a simple matter of a teacher ascertaining whether or not a student has understood a concept (Winn, 1993) because the construction of knowledge comes about through the need to assimilate, translate and accommodate knowledge into our schema of existing ideas.

According to Khatete (1995), constructivism brings about the desired outcome of conceptual change by creating a conflict between the student's naïve ideas and the accepted scientific (chemical) ideas. It is the role of the teacher to establish the students ideas in a given concept area then introduce analogies of accepted scientific concepts so that the student can compare their own conceptions with the 'chemically' accepted concepts. This may lead to a better understanding of the scientific concepts hence greater achievement in sciences- in this case Chemistry.

It is important for the teacher to always remember that students do not come to class "empty headed". Therefore, when planning for teaching, the teacher must develop strategies that will

make the process of learning more meaningful, the type of teaching and learning process that will make students change their unscientific conceptions. There are those who like to arrange for challenging experiences that will make students learn chemistry in a meaningful way. A teacher who exposes learners to a variety of experiences give them an opportunity to form, test and transfer concepts. It is by reflecting, exploring, testing, amending and revising our current concepts to meet new circumstances and experiences that we undertake meaningful learning (Twoli, 2006).

Khatete (1995) further suggests that teaching and learning process should be a spiral mode of teaching which would facilitate the restructuring of students' concepts hence better understanding of science (Chemistry) which translates to high achievement. However, he notes that the school teaching and learning practices in Kenya are examination-oriented at all levels of schooling, secondary level included. There exists a highly competitive national examination at the end of secondary schooling and good schools are classified based on the top 100 best "performers" in the KCSE results countrywide. Such schools are regarded by all: parents, students, MOEST and the society as a whole, as the best for students.

Due to the foregoing scenario, head teachers and the entire teaching staff of most schools will resort to drilling of their students through repetitive teaching of what is likely to lead to a higher percentage of their students passing the KCSE so that their school can appear in the top 100 nationally or as currently practiced, produce the greatest number of students in the top 100 nationally. Twoli (2006) talks of teachers who ignore serious treatment of concepts as they work for 'the exam', hoping that their students will survive. This practice reduces students to

passive recipients who are supposed to imbibe knowledge from teachers, memorize it and reproduce it all in examination. Failure to reproduce means low achievement on the part of the students. The practice has great implication for the curriculum developers and teachers who may not be aware of the adverse effects of the practice on students learning of sciences and Chemistry in particular. According to Harris and Taylor (1983), effective teaching practices should allow for increased opportunity to learn. Students tend to learn more when most of the time allocated for curriculum activities and classroom management systems emphasizes maintaining their engagement in those activities. An effective teacher allocates most of the available time to those activities designed to accomplish instructional goals. Establishment of a learning orientation involves beginning the lesson and activities by communicating the purpose of the activity, connecting it to prior knowledge and cueing the students' that kind of activity that requires and establishes the learning orientation (Baez, 1967; Kelly, 1978).

The teaching/ learning of secondary sciences can characteristically be described by placing it somewhere between two extremes of one or more continua. These include the abstract-concrete continuum, the direct-indirect influence continuum or the theoretical-practical continuum. The continua imply the extent of teacher profile in the learning process, whether his/her profile is a dominating one (controlling the amount, pace and direction of learning) or one that frees the learner to construct his/her own knowledge. In sciences, learners are taught theories and concepts, which are invisible i.e. abstract (Kwale SMASSE, 2007). The learners' thinking is taken from the known to unknown or concrete to abstract. In order for learners to concretize the abstract theories and concepts, they need to be taken through activities that provide evidence that can be used to explain the concepts/theories. Consequently, the quantum

of laboratory practical work and fieldwork must be substantially increased. To aid learning by inquiry, more exploratory methods must be incorporated into the curriculum. A large number of experiment kits and multimedia teaching aids should be created using as far as is possible locally available materials with accompanying do-it-yourself books (Twoli, 2006).

The net result of education is a trained mind and education is what is left after all that has been learnt in school has been forgotten (Harlen, 1999; & Parkinson, 1994). The quantity of practical work that students are exposed to, the teaching approaches that the teachers adopt especially in the candidate class and other general teacher's classroom approaches of the day-to-day teaching of Chemistry in Kwale County, was an important aspect of investigation in this study.

2.6 Resource availability, use and achievement

Science deals with the phenomena of nature. These phenomena cannot be studied effectively through abstract or theoretical discussions only. Currently, in all systems of education, Mathematics and Science teaching is set to involve practical work (Kwale SMASSE, 2005). Most science students find that actual objects, models, or living specimens make phenomena concrete enough to be understood (Trowbridge, 2004). According to Maundu, Muthwii and Sambili (2005), a classroom teacher requires various kinds of teaching resources such as textbooks, apparatus, chemicals, charts, models, motion pictures as well as facilities such as laboratories and others to enhance the effectiveness of his/her instruction. A resource is any source of information, expertise, supply or support. Resources play an important role in enhancing the teaching /learning process by modifying the teaching and learning situation. The use of the resources involves a broad range of the human senses at the same time in the

learning process. This facilitates learning and helps in conveying the intended purpose. According to Gregg (1968), every bit of chemical knowledge is a direct result of one or more careful and unbiased experimental observations. Most of these observations are made by using at least one or more of the five senses. Students' performance in practical work is determined by proper use of laboratory tools (glassware, and equipments) and the correct execution of procedural techniques (filtration, titration, preparation of solutions) (Kwale SMASSE, 2005).

According to Bhagwan (2005), a growing body of research in the cognitive science suggest that students learn and better retain what they learn when engaged in 'authentic' learning tasks. Twoli (2006) maintains that in many countries, the school Chemistry curriculum is more laboratory-based, and a large proportion of learning is spent on practical or hands-on experiences. He goes on to say that the practical sessions accord the students an opportunity to manipulate concrete objects, specimens, equipments and chemicals under the guidance of the teacher. There results from this an increased interaction between students, resources and teachers among many other benefits. This is more so important considering that practical lessons among other factors help learners prepare for the practical examination (Woolnough, 1985). Performance in the practical examination is vital since KNEC has a rule that for a candidate to have a good pass in science, Chemistry included, a pass in practical paper is compulsory. The extent to which students access learning resources particularly those that aid in application of chemical concepts in practical lessons goes a long way in determining students' overall performance in Chemistry.

According to Nderitu (2009), most if not all schools have a rule that students are responsible for apparatus under their use. Should any break during use, they are to pay for the broken apparatus. Considering that most of the apparatus used in Chemistry are glass wares most of which are expensive, many students shy away from experiments due to this rule. He therefore recommends a reversal of this rule for meaningful learning and hence performance. This study attempted to establish the prevalence of this practice in schools in Kwale County and if it had any effect on students' quality manipulation of the Chemistry practical learning resources.

Rughubir (1979) argues that availability of instructional resources does not necessarily translate into effective teaching and learning of a subject. Adequacy of resources is much more important in achieving the latter. This is because most of the resources play an important role in understanding concepts and imparting skills to the learner (Franyo, 2007). The learner can only adequately acquire these concepts and skills through the actual use of or contact with the resources. This is particularly important in the sciences where the hands-on approach to learning has been demonstrated to play a crucial role in the understanding of concepts and retention of content taught, as well as developing the ability to think scientifically. Determining the quantity and extent of use of resources for teaching and learning of Chemistry in selected schools of Kwale County formed a crucial segment of this study. Rughubir (1979) suggested that learners should be made aware that scientific principles apply in everyday things and are not confined to the special apparatus, usually imported from abroad, and only found in the laboratories. This is particularly important in rural schools which have very few equipment and at times no chemicals due high cost of the commercially available resources for teaching and learning Chemistry. Okafor (1996) reported that 5% of the post-primary schools in Lagos

State, Nigeria had no laboratory; schools with laboratories were ill-equipped with human and material resources. These factors, which are not peculiar to Lagos State alone, are likely to affect student's achievement in Chemistry. It is due the prevalence of such a scenario in most rural schools that the SMASSE project came up with improvisation. It was the interest of this study to determine the level of improvisation in Kwale County schools. How possible is it to improvise Chemistry materials, supplies and glass wares using locally available materials? Have the teachers embraced improvisation and how is it affecting learning of Chemistry? What is the impact of improvisation on hands on experience in rural schools of Kwale County? These are some of the questions that this study endeavored to answer.

Information Communication and Technologies (ICTs) provide a window of opportunity for educational institutions and other organizations to harness and use technology to complement and support the teaching and learning process. E-learning is an example of the use of these ICT-supported teaching and learning methods whose use in educational institutions is gaining momentum with the passage of time (Omwenga, 2004). According to Bhagwan (2005), the modern reform agenda for schools particularly that part of agenda dealing with providing an instructional programme that enables all students to meet challenging standards, can be strongly supported by technology. On realizing that ICT has a significant positive impact on achievement in all subject areas, across all levels of schools, Bhagwan (2005) outlines the following as the most important contributions of ICT:

- 1) Has a positive effect on student's attitude.
- 2) Makes instruction more student-centred, encourages co-operative learning and stimulates increased teacher/student interaction.

- 3) Provide multimedia products that graphically illustrate concepts.
- 4) Provide challenging visual/spatial tasks which develop mathematical and logical thinking.
- 5) Enables students develop high-order mathematical thinking by making abstract ideas concrete.

According to Bhagwan (2005), computers with their calculators, database and graphic capabilities already support the work of practicing scientists and mathematicians. It is highly appropriate that they be used also to support student learning in these areas.

ICTs provide an array of powerful tools that may help in transforming the present isolated, teacher-centred and text-bound classrooms into rich, student-focused, interactive knowledge environments. To meet these challenges, learning institutions must embrace the new technologies and appropriate ICT tools for learning. They must also move towards the goal of transforming the traditional paradigm of learning (Omwenga, 2004). It was therefore the intention of this study to attempt to investigate the level of access of schools to ICT and the extent of its integration into teaching and learning of sciences and in particular Chemistry.

2.7 Learning environment and achievement

The type of classroom interaction determines not only the effectiveness of the learning situation, but also the attitudes, interest and in part, even the personality of the child. Gammage (1971) argues that in the context of classroom interaction, personality, as it is, affects learning. The child's reaction to success, failure, praise and blame- relative to the interaction with the

teacher, become crucial since they relate not only to the pupil's social and emotional behaviour in the classroom but also to motivation. The teacher must therefore be careful about what happens in the first few encounters with the pupils as it is likely to establish the classroom environment of the particular class. The learning environment or atmosphere found inside the classroom is of extreme importance in moulding the character of the students and determining the efficiency with which learning takes place. The motivation of the learner to achieve may be enhanced or damaged by the teacher's attitude towards the students and how he or she interacts with them (Flanders, 1970; Anderson, Ryan & Shapiro 1989). The teacher can make the students be eager to learn or inhibit their interest and attitudes.

Classroom teacher-student interaction is important since it either enhances or inhibits effective learning that translates into higher or lower achievement. Bandura (1997) states that it is necessary to consider what the child responds to in the environment as well as the nature of interaction with the environment that leads to change. The effectiveness of teaching strategies largely depends on the match between the levels of concepts being encountered and the development level of the child (Barbara & San, 2006).

Life has many stresses and both the teacher and the student suffer from them. Sometimes a teacher may suffer from 'burn out' (a psychological condition produced by stress). Some teachers let out on the students which greatly interfere with the learning in terms of attitude, motivation, students' self-esteem and even their stress level (Anderson, 1989). According to Kwale SMASSE (2004), the student cares more about how as a teacher, you relate to them than how much you know. If they are positive about you, they will look for more positive things

about you. The classroom interaction that governs verbal communication between the teacher and the learner are learned in the course of children's learning experiences. Many signals pass between the teacher and the learner, which convey feelings about a topic and give information, which help organize conversation. Flanders (1970) and Franyo (2007) argue that if these signals are responded to appropriately, it is possible for effective communication to take place. Among the teachers, there are those who choose to ignore or do not notice these cues, so they influence the communication to be one-sided. Such are autocratic teachers and therefore make the students to withdraw and become uninterested in learning. In this situation, the listener(s) can show disapproval in various ways- making explicit remarks about the subject which forces them to have a negative attitude resulting in low achievement. The quality of teacher-student interactions which ultimately influences the quality of teaching learning experience is a point of focus for this study.

In the traditional classroom, wisdom and knowledge is supposed to flow from the teacher to the student. The teacher is the final authority as far as the possession of knowledge is concerned and the student is considered an 'empty vessel' who is supposed to imbibe the presented knowledge (Twoli, 2006). Unfortunately, this is what most of the teachers believe in. The interaction of the teacher and the student, which is one of the most important aspects of the education process, still may be one of the most neglected aspects of the teaching and learning process implying the need for constant investigations (Abuseji, 2007). According to SMASSE report findings of 2000, heads of secondary schools must take a more responsible role both in administrative and academic activities in the schools they head. Hellinger and Heck (1995) states that in many ways, the school head is the most important and influential individual in

any school. It is his/her management skills that set the benchmark, the direction, the tone and the learning environment. His/her management is pivotal for the morals of the teachers and set the degree of concern for what students may or may not become. One basic role of schools is to provide a suitable environment conducive for learning. Therefore, the heads should ensure that all available resources are directed towards this end. Starting projects for the sake of it without due consideration of high academic achievement including in Chemistry is a failure on the part of heads. The empty laboratories, libraries and stores in schools are due to lack of prioritization in the use of meagre resources generated (Kwale SMASSE, 2005). Teachers work within hierarchies in institutions that place highly visible constraints upon their professional discretion (Hawthorne, 1992). Teacher's efforts which make a difference in the students' achievement are influenced by the school administration. Could this be a factor contributing to the poor performance of Kwale County Chemistry students?

The heads of schools cannot escape the blame for the persistent poor performance of students in Chemistry in Kenyan schools. This is because a school's performance is a reflection of the head's management style (Kwale SMASSE, 2006). Kombo (1998) states that the basic reasons why some schools perform better than others in examinations is that while some school heads organize the learning process for their students, others leave it to chance. Head teachers who are committed to their work are responsible and have a sound moral conduct and provide favourable learning environment to students. The extent to which the administrative style of a school's Principal influences the learning environment and ultimately performance in Chemistry in Kwale County formed an integral part of this study. What is the relationship between the teachers and their Principal? What is the relationship between the Principal and

the students? Do the students take it that the Principal cares whether they pass or fail in Chemistry? What are some of the contributions of the local community in shaping the learning environment? These among many others are questions that this study endeavoured to answer.

2.8 Assessment and achievement

According to Ayot (1986) the techniques and frequency of assessment/examination profoundly affect the content of the curriculum, how it is taught and ultimately performance. Assessment includes informal classroom processes such as observing pupils tackling a task, questioning them about their work, looking at the records of their previous work or listening in on their discussions. More formal processes include testing and setting assignment for marking and the national system of tests and examinations. Generally, assessment provides insight into very specific aspects of the thinking and performance of pupils (Brenner, 2004). Questions such as; what does a student think about a situation or a topic, why is a student's performance of certain skilled task deteriorating among others are of vital importance to a classroom teacher. The use of assessment to ask and answer such questions improves the information available to the teacher and makes it possible to identify and address learning difficulties (Beck & Earl, 2002; Black, 2002).

The other issue necessary for consideration is how a student's previous encounter with the assessment outcome of the subject affects overall performance. According to Embeywa (1985), to feel positively towards a subject area, one has to achieve highly in that subject. There is strong motivational orientation towards a subject area with high academic yield (high performance). Perhaps consistent poor performance in Chemistry de-motivates students thus

enabling the vicious circle of poor performance in Chemistry. The study attempted to evaluate the correlation between students' previous performance and their attitude to Chemistry.

Black (2002) identifies factors that he considers to be seemingly crucial for successful learning and other factors he considers to act as a hindrance. Those that enhance learning include:

- i. Regular classroom testing and the use of the results to adjust teaching and learning rather than competitive grading.
- ii. Enhanced feedback between teachers and students, which may be oral, or in the form of written comments on work.
- iii. The active involvement of all the students.
- iv. Careful attention to the motivation and self-esteem of students, encouraging them to believe that they can learn what is being taught.
- v. Time allowed for self-assessment by students, discussion in groups and dialogue between teachers and students.

Those that hinder achievement include:

- i. Tests, which encourage rote and superficial learning, even when teachers claim they wish to develop understanding.
- ii. Failure by teachers to discuss and review testing methods between themselves.
- iii. Over-emphasis on giving of marks and grades at the expense of useful advice to learners.

- iv. Approaches that compare students in a way that persuades them that the purpose is comparison rather than personal improvement which demotivates some students.
- v. Testing, feedback and record-keeping which serves a managerial rather than learning function.

Research into the use of formative assessment in classroom settings has confirmed the important contribution that it has on effective teaching and learning (Black & William, 1998). Informal classroom assessment offers immediate information to support teaching functions. It provides timely evidence to guide teachers' interventions in support of pupils' learning and their management of the on-going lesson (Black & William, 1998; Beck & Earl, 2002). It helps match the planning of the future lessons more effectively to the learning characteristics and needs of particular groups of students (Brenner, 2004). It also provides the basis from which teachers can give pupils constructive oral and written feedback, and helps them set appropriate targets for the development of their work. Black (2002) further states that:

- i. Careful framing of the teacher's questions encourage active student's participation.
- ii. Increasing 'wait time' after questions give students time to think and contribute.
- iii. Comments on written tasks identify what has been done well and what still needs improvements.
- iv. Making criteria for evaluating any learning achievement should be transparent to students.
- v. Students should be taught habits and skills of collaboration in peer-assessment.

- vi. Encourage students to keep in mind the aims of their work and assess their own progress to meet the aims.
- vii. Students be sensitised about the formative use of the summative tests.

In view of the above, assessment has a profound effect on the teaching process. According to Twoli (2006), assessment is an important aspect of any educational programme. It is through assessment that we determine whether a range of our objectives have been realised. In fact, effective learning can hardly proceed without the feedback that assessment provides and must be a contributing factor to students' poor performance.

2.9 Government interventions

In a time of constant change, complexity and seemingly increasing challenges, an organization must look for ways to remain afloat and chart a course that will help achieve its goals (KSSEP, 2005). Educational quality has always been a concern for educators. In particular, the issue of educational quality has become an area of great interest and concern to many Sub-Saharan African nations due to the conviction that education plays an important role in national development (Audinos, Lairez & Makwati 2003, as cited in Ehsani, 2006). Coupled with such a belief is the concern that the quality of education in Africa is declining, and indeed, that African educational systems are in a crisis (Samoff, 1999, as cited in Ehsani, 2006).

Educational quality can be conceptualized in several different ways: quality in terms of resources and inputs (Fairweather & Brown, 1991; Adams, 1993; Kamat 2000); quality as a process (Frymier 1983; Adams, 1993; Kamat 2000); quality as content (Adams 1993) and

quality in terms of outputs and outcomes (IEQ Project Paper; 1991; Adams 1993). Quality considered as outputs and outcomes is arguably the most popular component of educational quality in current school systems (Adams 1993). Outputs and outcomes include levels of achievement (“The Dakar Framework for Action”; 2000) reflected by test scores (Adams & Chapman, 2002). It seems to be especially stressed in the Kenyan context considering the importance of a centrally administered national examination for primary and secondary school leavers, the results of which are used as indicators of educational quality in Kenya (Wasanga, 2004).

Kenya has always placed education as a priority at all levels, promoting education as a key indicator for social and economic development (Amutabi, 2003). The Government, communities, and development partners and other stakeholders continue to make substantial investments to support education programmes within the sector (Ngigi & Macharia, 2006). Teaching of Chemistry and the performance of students particularly at the KCSE level have been the concern of all the interested parties, particularly the government and parents. This is so because effective science teaching is the avenue to attainment of scientific and technological success. During the last four decades, Kenya’s secondary school students’ Chemistry achievement has remained low (KNEC, 1999) necessitating several curriculum reviews. The first post-colonial Chemistry curriculum was developed soon after attaining independence in 1963. This curriculum was teacher and book centred and therefore inappropriate since it neglected students’ abilities, interests and potential (Gachathi, 1976; Kimiti, 1984). Later curricula attempted to ensure appropriate teaching methods but were not implemented successfully for lack of qualified Chemistry teachers (Kimiti, 1984; Mullei, 1987). They

include the 1967 UNESCO Chemistry Pilot Project, the 1970 School Science Project and the Kenya National Examinations Council Chemistry Syllabus (1973). With the introduction of the 8-4-4 education system in 1985, the study of Chemistry became compulsory in Forms 1 and Form 2 but many schools offered it from Form 1 to Form 4. The Chemistry syllabus encouraged small group teaching and teaching through experiments and projects and although curriculum developers wanted Chemistry taught through these learner-based approaches, its teaching in secondary schools remained largely expository (Mullei, 1987; KIE, 1992; Kiboss, 1997).

When all these interventions failed to yield meaningful improvement in achievement of the Sciences and Mathematics, SMASSE (Strengthening of Mathematics and Science in Secondary Education) Project was launched in 1998. SMASSE, a Kenya – Japan initiative has contributed immensely in the research and hence attempt in remedying the poor performance in Mathematics and Sciences in the country. The project was born out of the need to improve performance in the crucial mathematics and science subjects that had been hitherto unimpressive. It was launched in July 1998 on a pilot basis in 9 Districts: Kisii, Gucha, Kakamega, Kajiado, Makeni, Muranga, Maragua, Butere –Mumias and Lugari. In October 2000 its scope of coverage was extended under an in-country training programme to include an additional six districts of Meru South, Kilifi, Taita-Taveta, Baringo, Kiambu and Garissa (Ngugi & Nyakweba, 2005 as cited in Oduor, 2009). The purpose of the project was to strengthen the quality of Mathematics and Science education at secondary schools, through training teachers. After a successful completion of the pilot phase of the project, SMASSE was in July 2003 expanded to cover the entire country (Ngugi & Nyakweba, 2005).

As is customary with research findings dissemination, issues isolated during the pilot phase in sampled districts as responsible for affecting performance in Mathematics and science were assumed to apply also for the rest of the country – Kwale County schools inclusive. These findings therefore were used in the SMASSE inservicing of Mathematics and science teachers at the various INSET seminars throughout the republic. Might this roll out without first undertaking a thorough investigation of the unique challenges of teaching and learning of Chemistry in Kwale County as well as the rest of the district be a reason as to why the roll out of the programme in the County and other areas of the republic has been met with negligible success? It is on the basis of this assumption that the study sought to investigate the factors that could be uniquely contributing to the persistent poor performance in Chemistry in Kwale County, Kenya with a view to fill the gap.

2.10 Summary of literature review.

From the foregoing review, it is evident that appropriate effort has been expended by various researchers to address the poor performance in sciences in general and Chemistry in particular. The efforts have attempted to isolate various factors that contribute to low achievement in Chemistry at the national level. In the course of the review it was realised that the factors considered tended to be more related to low achievement of the Sciences in general and not Chemistry in particular. The factors therefore may not apply to achievement in Chemistry in Kwale County. This is more so when it is considered that no empirical and systematic studies on factors that affect achievement in Chemistry in Kwale County have so far been done. The researcher therefore sought to determine which factors among those advanced in the review are

responsible for the persistent poor achievement of students in Chemistry in Kwale County. An appropriate research methodology including instruments for data collection was therefore prepared for this task.

CHAPTER THREE

METHODOLOGY

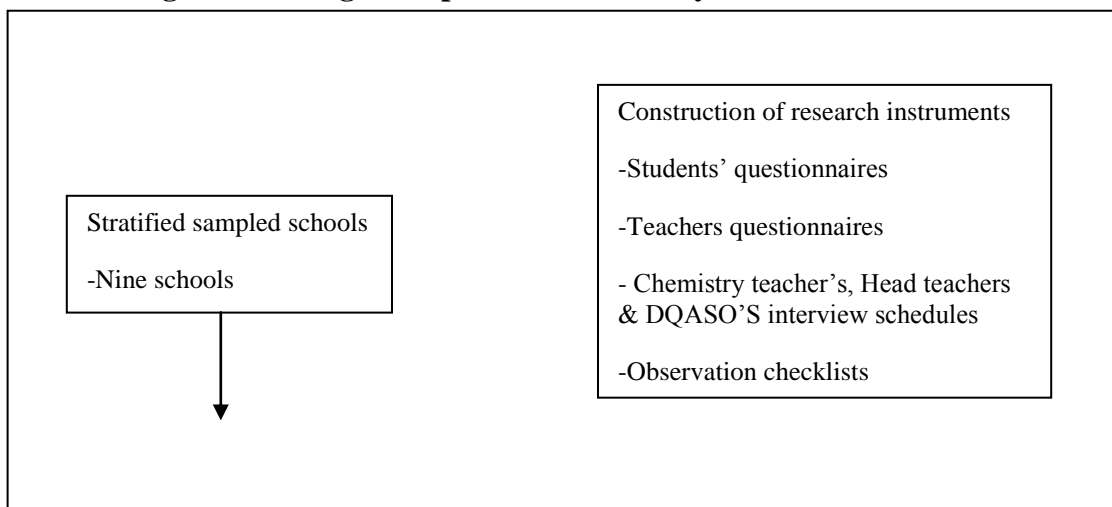
3.1 Introduction

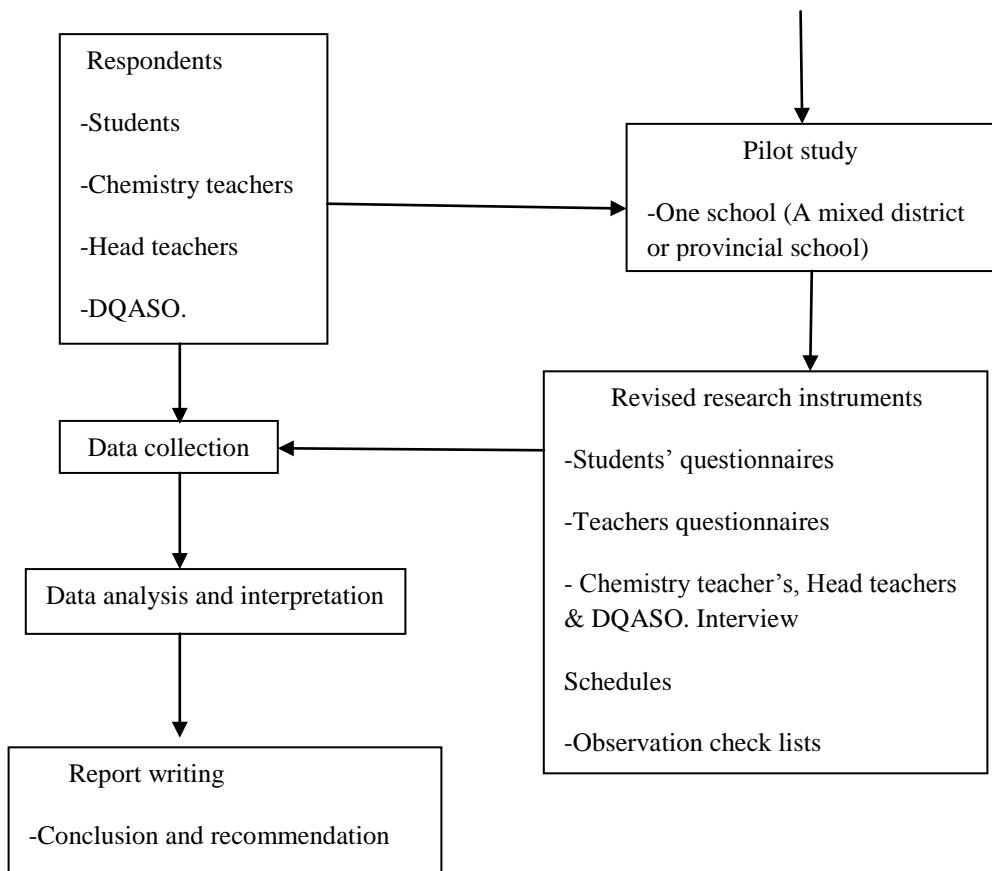
This chapter outlines the study design, study location, target population, sampling procedure, and instruments used in data collection, the pilot study, procedure used for data collection and methods employed in data analysis.

3.2 Research design

The study employed descriptive cross-sectional survey design. The design was used since it enabled the researcher collect data across the sampled population using the same instruments at the same time. The survey design also enabled the researcher obtain information concerning the determinant factors for performance and assess the opinions of Principals, Chemistry teachers and students on how these factors contribute to performance in Chemistry (Best & Kahn, 1992; Gay, 1992). Descriptive technique gives a vivid descriptive account of the factors identified and how they contribute to achievement in Chemistry (Robson, 2002; Mugenda & Mugenda, 2003). It is also designed to show the relationship between the factors and performance and attempts to advance an explanation for poor performance in Chemistry based on the data to be collected. Figure 3.1 illustrates the conceptual frame work of the research design.

Figure 3.1 Design and process of the study.





Source: Cohen & Manion (1994).

Figure 3.1 represents the research process from the stage of construction of the research instruments to the final stage of report writing and presentation. The process includes the process of preparation of the research instruments, pretesting and validation of the instruments, the sampling process to identify the respondents for the study from the target population, the process of data collection, data analysis and finally report writing.

3.2.1 Variables

The variables in this study included students' performance which is the dependent variable while the independent variables included students attitude, teacher characteristics, teaching strategies,

availability and use of resources and facilities, students' characteristics, learning conditions in the school and assessment.

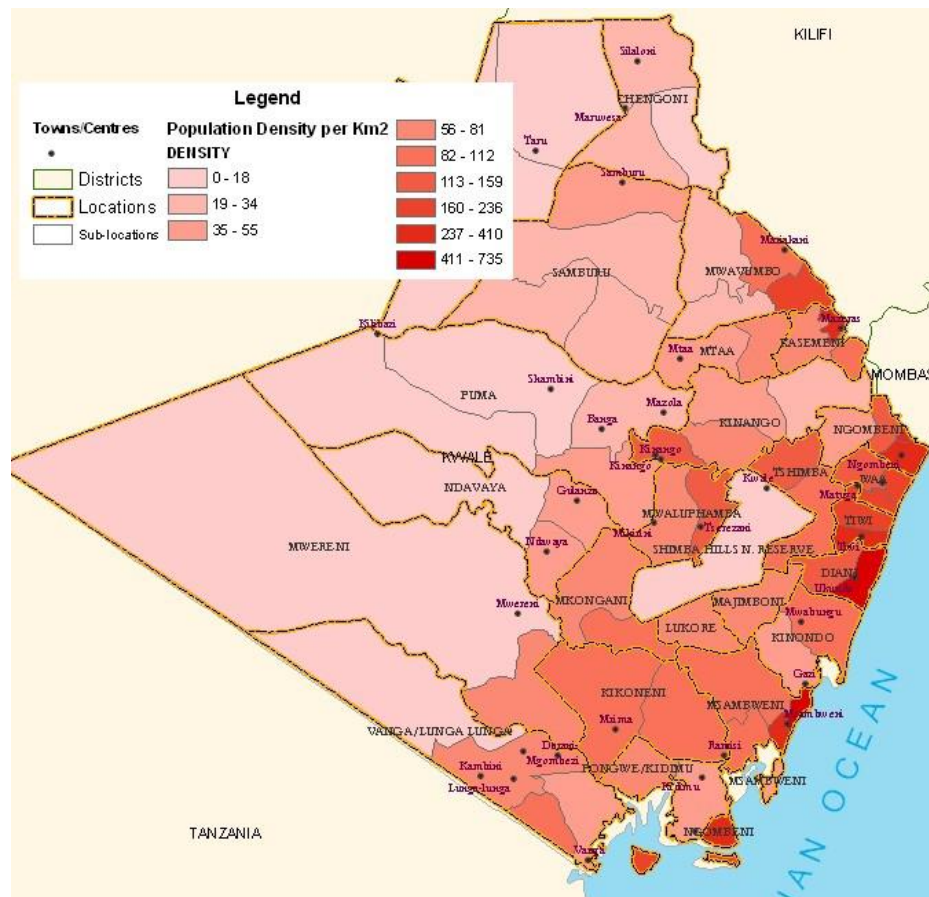
3.3 Location of the study

The study was conducted in Kwale County within the Coastal region of Kenya. Kwale County is in the Southern part of the Coastal region of Kenya, about 500 kilometres South of Nairobi. Figure 3.1 provides a map of Kwale County. The County covers an area of 8,322 km² of which 62km² are under water (Roschanki, 2007). It is bordered by Taita Taveta County to the West; Kilifi County to the North; Mombasa County and Indian Ocean to the East and United Republic of Tanzania to the South. It currently consists of Kinango, Kwale and Msambweni Districts. Until 2007 it was operating as a single administrative district unit. The larger administrative unit was selected so as to obtain a wide and varied study sample.

Kwale County has a resident population of 566,887 persons and consists of 3 political constituencies. The poverty index is 63%, with a higher percentage of the people living below the poverty line [Ministry of Planning and National Development 2006]. According to the First Report on Poverty in Kenya, Volume I, 31.77% of adults were living below food poverty level, while 40.23% and 26.2% were living below absolute poverty and hardcore poverty levels. There are some natural resources (titanium, limestone, iron ore, zinc, calcium, lead) within the County and being part of the coastal belt, it attracts tourism; the main tourist centre being Diani beach, while Shimba Hills National Park also attracts a lot of attention from travellers. But the benefits of tourism only reach a few isolated centres and the nature of the tourism (mainly all-inclusive package tourism) makes only a small impact on the local economy (Roschanki, 2007).

Agriculture is the main economic activity in the County’s arable land, while livestock and fishing also play an important role and approximately 86 percent of the labour force in those areas are engaged in agriculture related activities while the rest are involved in trading and informal employment (Kwale District strategic plan 2005 – 2010). The County currently has about 32 registered Public secondary schools with a net enrolment ratio of 68.5% in 2002, which was an increase from 53.9% in 1999 [Kenya Ministry of Education Science and Technology 2003].

Figure 3.2 Location, Administrative Areas and Population Densities of Kwale County



Kwale County was selected as the study location due to the immense challenges that its students face since it is in the arid and semi arid (ASAL) area of the republic. The experiences that its students face could provide an insight to various stakeholders in coming up with an all inclusive

policy on educational practice particularly as regards this research, the factors of performance that are responsible for poor performance of students in Chemistry. Additionally, the researcher resides within the County and this gave an advantage since the researcher had a free interaction environment of the research with the respondents during data collection.

3.4 Target population

The study targeted all public secondary schools with a candidate class (registering candidates for KCSE). Kwale County at the time of this study had 32 public secondary schools which had been registering candidates for KCSE for at least 4 consecutive years, whose names appear in Appendix 1. There were 2880 Form three Chemistry students in the said schools, 50 Chemistry teachers, 32 head teachers and 3 area education field officers (the DQASO) who were the target population for the study. Form three students were involved in the study due to their longer exposure to the Chemistry curriculum and the fact that they had chosen to specialise in the subject. They therefore could be relied on to give more accurate information required for this study in the absence of form fours who were busy preparing for examinations and could not get time to participate in the study.

3.5 Sampling techniques and sample size

3.5.1 Sampling techniques

A sample is any number of cases less than the total number of cases in the population from which it is drawn (Ingule & Gatumu, 1996). Sampling saves time and expenses of studying an entire population (Robson, 2002). Form three students from stratified sampled public secondary schools were considered for this study. This is due to the fact that in the absence of form fours who were busy preparing for exams, they were found better placed to provide more concrete information required for this study than the remaining students.

3.5.2 Sample size

The study involved an interactive survey of 9 out of the 32 schools selected through stratified random sampling. This means that about 28.125% of the schools were selected to participate in the study. The 32 schools were first stratified into provincial and district schools. Then, members of each stratum were further stratified into boys', girls', and mixed schools. After stratification, simple random sampling was used to identify schools to participate in the survey through picking of lots as per the sampling grid shown in Table 3.1. In schools with more than one stream, each with 45 or more students, lots were used to identify the stream to participate in the study. All the students in the selected stream were allowed to take part in the study. The principal of each of the participating schools was requested to take part in the study as well as the Form three Chemistry teachers. In schools with more than one Chemistry teacher teaching the Form 3 classes, the longest serving teacher hence the more experienced teacher was requested to participate in the study. Table 3.1 is an illustration of the sampling process of Kwale County public secondary schools.

Table 3.1 Sampling grid.

Type/Category of school		Total number	Number of	Population sampled		
Type	Category			Chemistry	Chemistry	School

		of schools	schools sampled	students	teachers	principals
Provincial	Boys only	3	1	30	1	1
	Girls only	3	1	58	1	1
	Mixed	4	1	68	1	1
District	Boys only	-	-	-	-	-
	Girls only	3	1	60	1	1
	Mixed	19	5	271	5	5
Total		32	9	482	9	9

From Table 3.1, a total of 9 schools were selected to participate in the study. Of the nine schools, three were selected from the provincial schools and six from the district schools' category.

3.6 Research instruments

Three instruments were used in this study to obtain information from the respondents. The instruments include:

- a) Questionnaires: - A list of structured questions was given to the respondents to answer. They were developed to address the specific objectives of the study. Questionnaires were found appropriate in enabling the researcher gather a large amount of data from many subjects economically (Orodho, 2009). There were two categories of questionnaires; students and teachers. The questionnaires were developed based on the research objectives.
- b) Observation guide: - A check list used in recording observations. Also referred to as the coding scheme. The guide was developed using SEPU guideline to schools.
- c) Interview schedule: - A list of pre-recorded questions that the interviewer asks the interviewee and the answers recorded on the schedule. There were three types of interview

schedule intended for use in this research; Chemistry teachers, principals and the education field officer's. Each was developed based on the research objectives stated.

3.6.1 Students' questionnaires

This was made up of closed and open ended questions with the aim of getting information about the attitude of learners towards Chemistry. There were forty six items in the questionnaire. Section I consisted of eight general introductory statements. Section II consisted of thirty eight statements. Some of the statements were rated on a 5-point Likert- type scale ranging from “**Strongly Disagree**” with a score of **1** to” **Strongly Agree**” with score of **5**. The students were required to tick in the box corresponding to their option. A sample of this questionnaire is attached as Appendix II.

3.6.2 Teacher's questionnaire

This consisted of thirty two statements. Section A consisted of eleven introductory statements while section B consisted of twenty one statements some of which were rated on a 5-point Likert scale similar to the students' questionnaire. The questionnaire was to obtain information on attitude of teachers towards Chemistry students, their approach in teaching Chemistry and the government's interventions implemented. A sample of this questionnaire is attached as Appendix III.

3.6.3 Observation guide

This is a check list prepared using the SEPU guideline for instructional resources required in the teaching and learning of Chemistry. The check list was used to assess the effectiveness of instructional methods, variation of teaching methods, availability and adequacy of instructional resources. A sample of this schedule is attached as Appendix VII.

3.6.4 Interview schedules

The interview was administered to the Chemistry teacher, Principals of participating schools and education field officers to obtain information required to supplement those obtained from questionnaires and classroom observation. The interviews were carried out in form of discussions with the parties concerned. The interviewer wrote notes in the course of discussion. A sample of these schedules is attached as appendices IV, V & VI.

3.6.5 Validity of the instruments

Validity refers to the degree to which an instrument measures what it is supposed to measure. According to Kothari (1985), content validity can be determined by using a panel of persons who shall judge how well the measuring instrument meets the standards. For this study content validity was tested by discussing the instruments with the supervisors, research specialists in the Department of Educational Communication and Technology and other research specialists of Kenyatta University. The experts analysed the instruments suitability in line with the research questions. The expert's comments helped to improve the validity of the questionnaires. The pilot test also helped to improve the teachers' questionnaires as well as the interview schedules.

3.6.6 Reliability of the instruments

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials. To test for reliability, a pilot study was carried out at Ramisi Secondary School. A mixed school was purposely targeted at this stage since it provided the researcher with all the categories of targeted population in one sitting (had both male and female students). The researcher administered the instruments himself with the assistance of the Chemistry teacher in the school to 56 (32 girls and 24 boys). The researcher also administered Chemistry teacher's instruments, interviewed the school principal, observed a theory and a practical Chemistry lesson session, evaluated level of availability of the Chemistry teaching and learning resources. Split half method of assessing reliability was used to test for the reliability of the data. Split half technique, according to Kothari (1985), requires only one testing session hence eliminating the chance error due to differing conditions. Mugenda and Mugenda (2003) indicate that in research study a reliability coefficient can be computed to indicate how reliable data is. The questionnaires were numbered and their contents entered into a SPSS computer code sheet and reliability determined using split half for the even numbered and odd numbered questionnaires. A reliability coefficient of 0.692 was obtained and since 0.7 indicates an acceptable reliability coefficient [Jackson, 2003], the coefficients of all sections were found to be reliable hence the safe conclusion that the questionnaire used in this study as main data collection tools was reliable.

3.7 Data collection

The researcher obtained permission to conduct research from the university and the Ministry of Education through Msambweni district education office. Upon obtaining consent, the study was undertaken in three phases:

Phase one involved the researcher visiting participating schools in order to be introduced, familiarize, and seek respondents' permission to be involved in the study.

In phase two, the researcher administered the questionnaires to the students and Chemistry teachers. The researcher assured the respondents of the confidentiality of the given information. The researcher equally interviewed the school principals; observed one theory and one practical lesson in progress per school as well as the teaching and learning resources and facilities in the participating schools using the observation checklist [Appendix VII]

The third and final phase entailed the researcher interviewing the area field officers (DQASO) to obtain factors considered by the field officers to be contributing to poor performance of Chemistry in Kwale County. The researcher also sought any intervention measures which the field officers had put in place to remedy the situation.

3.8 Data analysis

At the end of data collection, data analysis was carried out to show how each variable contributed to performance in Chemistry. The data from the study was analysed qualitatively and quantitatively using percentages, means, frequency distribution with the aid of Statistical Package for Social Sciences (SPSS). Since data was descriptive, invariants such as means, frequencies and percentages were used to describe the findings of the study. A one way Analysis of Variance (ANOVA) data analytical technique was used to investigate the interrelationship between the factors that affect performance in Chemistry in Kwale County while Chi-square and Contingency Coefficients (CC) measure of association were used to determine the relationship between students' background characteristics and performance in Chemistry.

3.9 Logistical and ethical considerations

According to Mugenda and Mugenda (2003), logistics in research refers to all those processes, activities or actions that a researcher must address or carry out to ensure successful completion of a research project. During the pre-field work, the researcher established a work plan, constructed the research instruments, obtained a research permit, carried out sampling, pre-tested and corrected the instruments. During the post-test, the researcher analyzed the data obtained and kept them for future reference. Ethical consideration for this study included communicating the aims of the investigation to the respondents, establishing rapport with the respondents and being honest at all times. The researcher took necessary precautions for the confidentiality of both the data and the respondents (Cohen & Manion, 1994).

3.10. Summary

This chapter outlined the process of data collection for the purposes of identifying the factors responsible for the persistent poor performance of Kwale County Chemistry students. The processes included research methodology used, sampling procedure, instruments for data collection, testing and correction of the instruments and the actual process of data collection. The data collected were then processed through coding and entry into computer software for quantitative and qualitative analysis.

CHAPTER FOUR

DATA ANALYSIS, RESULTS AND DISCUSSION

4.1 Introduction

The chapter presents an analysis of the data collected from a sample of 482 students from 9 public secondary schools, nine Chemistry teachers, nine Principals of the sampled schools and two District Quality Assurance and Standards Officers of Kwale County.

4.2 Data analysis

Data analysis and report findings were done using descriptive statistics in the form of tables, frequencies and percentages. For analyses of the relationships between independent and dependent variables, inferential statistics were used.

4.2.1 Quantitative data

Quantitative data analysis was based on descriptive and inferential statistics. Data analysis began by coding the data according to the research questions. The data was then entered into the computer using the Statistical Package for Social Sciences (SPSS) program for analysis. Frequency tables, means, percentages and standard deviations were used to present the information. Chi-square tables, ANOVA and Contingency Coefficients [CC] were computed in order to determine the relationship between the independent and dependent variables [Inferential statistics].

4.2.2 Qualitative data

For qualitative data, coding and assigning labels to variable categories was done. Common themes were then obtained from the data collected and clustered in a patterned order so as to

identify variables that depicted general concepts and differences. Inferences were drawn from the data under each theme and conclusions were then made from the findings.

4.3 Background characteristics of the students

4.3.1 School category.

Respondents were drawn from three different school categories: Boys' only, girls' only and mixed schools. A summary of the finding is represented in Table 4.1.

Table 4.1 School category

Category of School	Frequency	%
Boys only	30	6.2
Girls only	118	24.5
Mixed	334	69.3
Total	482	100

Table 4.1 provides information on sampled students' distribution based on school category. Of the total sampled respondents, 30 (6.2%) were drawn from boys' only, 118 (24.5%) from girls' only and 334 (69.3%) from mixed schools category. Kwale County consists of mostly mixed schools both of the provincial and district category followed by girls' only schools and lastly boys only schools (only 3 boys' only schools for the whole County). This therefore explains why the population of the sample representing boys from boys' only schools is the least followed by girls and lastly the sample representing mixed schools is the largest.

4.3.2. Type of primary school

A summary of the study finding that classifies students based on the type of primary school they attended is represented in Table 4.2.

Table 4.2 Type of primary school attended

Type of primary school attended	Frequency	Percentage
Public	437	90.7
Private	45	9.3
Total	482	100

In table 4.2 data collected indicates that 437 (90.7%) of the respondents had public primary school background while 45 (9.3%) had a private school background. Kwale generally being a rural based County have very few private primary schools. Being an ASAL (Arid and semi arid) area most families are poor and cannot afford the high fee charged by private schools. Most of its primary school going population attends public schools and ultimately transit to the secondary school at the end of primary education. This therefore explains the big disparity in the backgrounds of the respondents since the study sample was drawn from district and provincial schools, the bulk of this sample are from the County with highly skewed public primary school background.

4.3.3 Respondents' age

Table 4.3 gives a summary of information on respondents' age.

Table 4.3 Respondents' age distribution

Age	Boys		Girls		Total	
	Freq	%	Freq	%	Freq	%
16 and below	14	2.9	29	6.0	43	8.9
17-18	130	27.0	154	32.0	284	59.0
19-20	80	16.6	38	7.9	118	24.3
21 and more	20	4.1	10	2.0	30	6.1
No response	3	0.6	4	0.8	7	1.5
	247	51.3	235	48.7	482	100

In table 4.3 which provides information on respondent students' age, data analyzed showed that respondents' ages varied between 15-25 years. The variations of the age was fairly spread across gender and 43 (8.9%) respondents were 16 years and below while 284 (59.0%) were

between 17 to 18 years old. One hundred and eighteen (24.3%) were in the 19 to 20 years bracket while 30 (6.1%) were 21 or more years old while 7 (1.5%) did not indicate their age. A critical analysis of the data shows a unique trend of age distribution across the gender. It is seen that twice as many girls as boys are in the age bracket of 16 and below. The situation almost even out at 17-18 years but takes a drastic turn at 19-20 years age bracket and beyond where now it is found that there are twice as many boys or more to girls. This means that in Kwale County, boys join school at a more mature age than girls. This could be attributed to socio-cultural factors that either makes boys join schooling at a more advanced age than girls or those that forces a mature girl child out of the school system much earlier than the boy child.

4.3.4 Gender

Table 4.4 gives a summary of information on gender distribution of the respondents.

Table 4.4 Gender distribution

Type of school	Boys		Girls		Total	
	Frequency	%	Frequency	%	frequency	
Boys Only	30	6.2	0	0.0	30	6.2
Girls Only	0	0.0	118	24.5	118	24.5
Mixed	217	45	117	24.3	334	69.3
Total	247	51.2	235	48.8	482	100

From table 4.4 which gives information on the respondents' gender distribution, results from data analysis shows that the respondents comprised 247 (51.2%) boys and 235 (48.8%) girls. Of the boys, 30 (6.2%) were drawn from boys' only schools while 217 (45%) were from mixed school category. Likewise 118 (24.5%) of the female respondents were from girls' only schools while 117 (24.3%) were drawn from mixed school category. The sample almost

attained a near gender parity in population sample. However gender parity was not attained mainly due to the low population of girls in mixed school category. Fewer boys were sampled in boys only school due to low concentration of this type of school within the County.

4.3.5. School residential status

The students were classified as boarders and day scholars based on their school residential status. A summary this finding is represented in Table 4.5

Table 4.5 Respondents' residential status

Residential status	Boys		Girls		Total	
	Freq.	%	Freq.	%	Freq.	%
Boarders	106	22.0	162	33.6	268	55.6
Day scholars	141	29.1	73	15.1	214	44.4
Total	247	51.1	235	48.7	482	100.0

Data obtained as is represented in Table 4.5 showed that 268 (55.6%) were boarders while 214 (44.4%) were day scholars. Further it was shown that 162 (33.6%) girls and 106 (22.0%) boys were boarders while 141 (29.1%) boys and 73 (15.1%) girls were day scholars. It is noted that there are more girls in boarding school than boys. The reverse is true for sample in mixed schools where the population of boys is almost twice as much as that of girls. It is probable that the acute poverty levels of Kwale County resident makes the girl child vulnerable (Mukui, 2005 and Roschanki, 2007). While some girls are forced to drop out of school due to early marriage, others do so due to early pregnancy while there are those fall prey to the thriving illicit commercial sex trade with tourist at the coastal beach resorts of Kwale County. Most parents with daughters in schools therefore prefer putting them in boarding schools as a

safeguard, hence the high population density of the sample of girls in boarding schools and the low population in day schools.

4.3.6. Kenya Certificate of Primary Education [KCPE] Science grade

Table 4.6 gives a summary of an analysis of the respondents KCPE science grade as an entry behaviour for not only Chemistry but also for the other science subjects as well.

Table 4.6 KCPE Science score

Grade	Boys		Girls		Total	
	f	%	f	%	f	%
A	34	7.1	20	4.1	54	11.2
B	139	28.8	100	20.7	239	49.6
C	71	14.7	105	21.8	176	36.5
D	2	0.4	10	2.1	12	2.5
E	1	0.2	0	0	1	0.2
Total	247	51.2	235	48.7	482	100.0

Data collected indicated that 54 (11.2%) respondents had scored an A, 239 (49.6%) scored a B, and 176 (36.5%) scored a C while the remaining 13 (2.7%) scored either a D or an E in primary science in KCPE. This means that 97.3% of the respondents indicated to have passed primary science by scoring a C and above thereby having good entry behaviour and hence had a good foundation to pursue Chemistry- a science subject. Of the respondents who scored A, 34 (7.1%) were boys while 20 (4.1%) were girls, 139 (28.8%) boys and 100 (20.7%) girls scored B while 71 (14.7%) boys and 105 (21.8%) girls scored C. An analysis based on gender shows that boys had slightly better science entry behaviour than girls which could be an earlier indication of effects of stereotypes.

4.3.7 Chi-square analysis on the effects of background characteristics on performance

In an attempt to determine whether the background characteristics of Kwale County students had any effect on their performance in Chemistry, a Chi-square correlational analysis was calculated and the results presented in Table 4.7.

Table 4.7 Chi-square analysis of the effects of background characteristics on performance

Background characteristics	N	(X²)	df	p	C
School category	482	6.225	8	0.622	0.455
Type of primary	482	2.528	4	0.640	0.055
Gender	482	5.890	4	0.207	0.140
Class population	482	9.731	4	0.045	0.060
Residential status	482	2.748	4	0.601	0.279
KCPE science grade	482	37.667	16	0.002	0.381

Table 4.7 contains Chi-square analysis of the effects of students' background characteristics on performance in Chemistry. Results of the analysis were as is summarised in Table 4.8, 4.9, 4.10, 4.11 and 4.12.

a. School category and performance

The Chi-square analysis of effect of school category on performance in Chemistry was as is contained in Table 4.8.

Table 4.8 Effect of School category on performance

			Trend of performance					Total
			Declined Significantly	Declined Slightly	Remained	Improved slightly	Improved Significantly	
school category	Girls only	Count	6	24	34	43	11	118
		% within school category	5.1%	20.3%	28.8%	36.4%	9.3%	100.0%
		% of Total	1.2%	5.0%	7.1%	8.9%	2.3%	24.5%
	Boys only	Count	2	8	5	12	3	30
		% within school category	6.7%	26.7%	16.7%	40.0%	10.0%	100.0%
		% of Total	.4%	1.7%	1.0%	2.5%	.6%	6.2%
	Mixed	Count	37	64	91	113	29	334
		% within school category	11.1%	19.2%	27.2%	33.8%	8.7%	100.0%
		% of Total	7.7%	13.3%	18.9%	23.4%	6.0%	69.3%
Total		Count	45	96	130	168	43	482
		% within school category	9.3%	19.9%	27.0%	34.9%	8.9%	100.0%
		% of Total	9.3%	19.9%	27.0%	34.9%	8.9%	100.0%

Results of the analysis shown in Table 4.8 shows that respondents from boys' only schools registered a higher proportion of those reporting significant improvement (10.0%) compared to those from girls' only schools (9.3%) and mixed schools (8.7%). Similar trends were witnessed with those who reported slight improvement (boys' only=40%; girls' only=36.4% and mixed schools=33.8%) as well as those whose performance slightly declined (boys' only=26.7%; girls' only=20.3% and mixed schools=19.2%). However, respondents from girls' only schools reported a higher proportion of those whose trend in performance did not change (28.8%) compared to those from mixed schools (27.2%) and boys' only schools (16.7%) while respondents from mixed schools reported higher proportion of those whose trend in performances declined significantly. The Chi-square results $\{X^2=6.225; df=8; P=0.622\}$ indicated that there was no significant relationship between trend in performance and school

category that the respondents attended at 0.05 level of significance. Nonetheless, Chi-square test results on performance in the last end of term test and school category ($X^2=125.474$; $df=8$; $P=0.000$) shows a significant relationship between the elements at 0.05 level of significance. The results of contingency coefficient ($C= 0.455$) measure of association showed that school category accounted for 46% of the total variation in the performance in Chemistry. This implies that poor performance is more prevalent in mixed and girls only schools. This could be explained by the misconception that science subjects are male oriented disciplines and the unique challenges that students face in studying in such schools.

b. Type of primary school and performance

The effect of type of school on students performance in Chemistry was as is summarised in Table 4.9.

Table 4.9 Effects of respondents' type of primary on performance in Chemistry

			Trend of performance					Total
			Declined Significantly	Declined Slightly	Remained	Improved Slightly	Improved Significantly	
Type of primary	Public	Count	41	84	117	154	41	437
		% within type of primary	9.4%	19.2%	26.8%	35.2%	9.4%	100.0%
		% of Total	8.5%	17.4%	24.3%	32.0%	8.5%	90.7%
	Private	Count	4	12	13	14	2	45
		% within type of primary	8.9%	26.7%	28.9%	31.1%	4.4%	100.0%
		% of Total	.8%	2.5%	2.7%	2.9%	.4%	9.3%
Total	Count	45	96	130	168	43	482	
	% within type of primary	9.3%	19.9%	27.0%	34.9%	8.9%	100.0%	
	% of Total	9.3%	19.9%	27.0%	34.9%	8.9%	100.0%	

Results of the analysis contained in Table 4.9 shows that students with public primary school background had a higher proportion of those reporting significant improvement (9.4%) as compared to those with private school background (4.4%).

Similar trends were observed for those reporting slight improvement (public=35.2%; private=31.1%) and significant decline (public=9.4%; private=8.9%). Students with private schools' background however had comparatively higher proportions of those reporting no change in trend in performance (private= 28.9%; public=26.8%) and those reporting slight decline (private=26.7%; public=19.2%). The Chi-square results $\{X^2 = 2.528; df=4; P=0.640\}$ indicated that there was no significant relationship between trends in performance and type of primary school a student attended at 0.05 level of significance. Further analysis using contingency coefficient ($C = 0.055$) measure of association showed that only 6% of the total variation in the performance in Chemistry could be attributed to the type of the primary school that the respondents attended. This shows that there is no major variation between performance and type of school that the respondent attended in primary.

c. Gender and trend in performance.

The effects of respondents' gender on performance were as is contained in Table 4.10.

Table 4.10 Effects of respondent's gender on performance

		Trend of performance					Total	
		Declined Significantly	Declined Slightly	Remained	Improved Slightly	Improved Significantly		
Gender	Boy	Count	29	49	58	90	21	247
		% within gender	11.7%	19.8%	23.5%	36.4%	8.5%	100.0%
		% of Total	6.0%	10.2%	12.0%	18.7%	4.4%	51.2%
Girl	Count	16	47	72	78	22	235	
		% within gender	6.8%	20.0%	30.6%	33.2%	9.4%	100.0%
		% of Total	3.3%	9.8%	14.9%	16.2%	4.6%	48.8%
Total	Count	45	96	130	168	43	482	
		% within gender	9.3%	19.9%	27.0%	34.9%	8.9%	100.0%
		% of Total	9.3%	19.9%	27.0%	34.9%	8.9%	100.0%

From the data contained in Table 4.10, girls reported a higher proportion of those reporting significant improvement in performance (9.4%) compared to boys (8.5%), those reporting no change in performance (girls=30.6%; boys=23.5%) and those whose performance declined

slightly (girls=20.0%; boys=19.8%). Boys on the other hand reported higher proportion of slight improvement in performance (36.4%) compared to girls (33.2%) as well as significant decline in performance (boys=11.7%; girls=6.8%). The chi-square results ($X^2=5.890$; $df=4$; $P=0.207$) indicated that there was no significant relationship between trends in performance and gender at 0.05 level of significance. A further analysis using contingency coefficient ($C=0.444$) measure of association showed that a significant 44% could be accounted for by the variation in performance. This shows that there exist variation between performance and gender. This could also be explained by the misconception attributed to stereotypes.

d. Class population and performance.

Overall analysis showed that all the sampled schools had over 45 students per stream. The results of Chi-square analysis ($X^2=9.731$; $df=4$; $P=0.045$) showed that there existed a significant relationship between class population and trend in performance at 0.05 level of significance. Further analysis using contingency coefficient ($C=0.060$) measure of association showed that only 6% of the total variation in the performance in Chemistry can be attributed to classroom population of the respondents. This shows that there is no major variation between the various class populations of the respondents.

e. Residential status and performance.

The effects of respondent's residential status on performance in Chemistry were computed and the results were as is seen in Table 4.11.

Table 4.11 Effects of respondents' residential status on performance

	Trend of performance					Total
	Declined	Declined	Remained	Improved	Improved	

			Significantly	Slightly		Slightly	Significantly	
Residential status	Boarder	Count	25	52	80	89	22	268
		% within residential status	9.3%	19.4%	29.9%	33.2%	8.2%	100.0%
		% of Total	5.2%	10.8%	16.6%	18.5%	4.6%	55.6%
	Day scholar	Count	20	44	50	79	21	214
		% within residential status	9.3%	20.6%	23.4%	36.9%	9.8%	100.0%
		% of Total	4.1%	9.1%	10.4%	16.4%	4.4%	44.4%
Total	Count	45	96	130	168	43	482	
	% within residential status	9.3%	19.9%	27.0%	34.9%	8.9%	100.0%	
	% of Total	9.3%	19.9%	27.0%	34.9%	8.9%	100.0%	

From Table 4.11, day scholars reported a higher proportion of those reporting significant improvement (9.8%) compared to boarders (8.2%). Similar trend was observed with those who improved slightly (day scholars=36.9%; boarders=33.2%) and those who slightly declined (day scholars=20.6%; boarders=19.4%). Boarders however had higher proportion of those reporting no change in performance (boarders=29.9%; day scholars=23.4%) while they reported equivalent trend in performance in significant decline (boarders=9.3%; 9.3%). The Chi-square results ($X^2=2.748$; $df=4$; $P=0.604$) indicated that there was no significant relationship between trends in performance and the respondents residential status. Similar Chi-square test results were obtained from an analysis of relationship between residential status and respondents' performance in the previous end of term Chemistry test. A further analysis using contingency coefficient ($C= 0.279$) measure of association showed that about 28% could be accounted for by the variation in performance. This shows that there exist variation between performance and the respondents' residential status. This could be explained by the variation in the amount of contact hours that the boarders and day scholars have with their teachers and time available to each of them for personal studies.

f. Respondents' KCPE science results and performance

The effects of respondents' KCPE science grade on performance in Chemistry were computed and the results were as is seen in Table 4.12.

Table 4.12 Effects of respondents' KCPE science background on performance

		Trend of performance					Total	
		Declined Significantly	Declined Slightly	Remained	Improved Slightly	Improved Significantly		
KCPE science grade	A	Count	5	9	7	21	12	54
		% within KCPE science grade	9.3%	16.7%	13.0%	38.9%	22.2%	100.0%
		% of Total	1.0%	1.9%	1.5%	4.4%	2.5%	11.2%
	B	Count	26	59	57	77	20	239
		% within KCPE science grade	10.9%	24.7%	23.8%	32.2%	8.4%	100.0%
		% of Total	5.4%	12.2%	11.8%	16.0%	4.1%	49.6%
	C	Count	12	27	59	67	11	176
		% within KCPE science grade	6.8%	15.3%	33.5%	38.1%	6.3%	100.0%
		% of Total	2.5%	5.6%	12.2%	13.9%	2.3%	36.5%
	D	Count	2	1	7	2	0	12
		% within KCPE science grade	16.7%	8.3%	58.3%	16.7%	.0%	100.0%
		% of Total	.4%	.2%	1.5%	.4%	.0%	2.5%
	E	Count	0	0	0	1	0	1
		% within KCPE science grade	.0%	.0%	.0%	100.0%	.0%	100.0%
		% of Total	.0%	.0%	.0%	.2%	.0%	.2%
Total	Count	45	96	130	168	43	482	
	% within KCPE science grade	9.3%	19.9%	27.0%	34.9%	8.9%	100.0%	
	% of Total	9.3%	19.9%	27.0%	34.9%	8.9%	100.0%	

Results of the analysis contained in Table 4.12 shows that respondents who scored A in primary science reported a higher proportion of those who improved significantly (22.2%) compared to those who scored other grades (B=8.4%; C=6.3%). A similar trend was observed with those who improved slightly (A=38.9%; C=38.1%; B=32.2% and D=16.7%). The reverse was reported with the number of respondents who did not record any change in trend of performance in which those who scored D in KCPE science registered the highest proportion (D=58.3%; C=33.5%; B=23.8% and A=13.0%). For those who declined slightly, respondents

who scored B registered the highest proportion (B=24.7%; A=16.7%; C=15.3% and 8.3%) while respondents who scored D in KCPE science registered the highest proportion of those who declined significantly (D=16.7%; B=10.9%; A=9.3% and C=6.8%). The Chi-square results ($X^2=37.667$; $df=16$; $P=0.002$) indicated that there was a significant relationship between trends in performance in Chemistry and the respondents primary science grade at 0.05 level of significance. Results contingency coefficient ($C= 0.381$) measure of association analysis showed that the respondents KCPE science grade accounted for a significant 39% of the total variation in the performance in Chemistry. This implies that poor performance is more prevalent among students with poor KCPE science grade. This could be explained by these students poor science background.

In summary, the Chi-square test carried out showed that while there was no significant relationship between trend of performance in Chemistry and some background characteristics of respondents such as gender, school category, type of primary school attended and residential status, there was a significant relationship between trend in performance and class population as well as respondents' KCPE science grade. The findings imply that the high chemistry class population and students poor science background relative to Chemistry are the causes of the Kwale County Chemistry students persistent poor performance in the subject. This finding is in agreement with other findings such as that of Usman and Memeh (2007) who stated that poor achievement in Chemistry was explained by several factors including students' background problems. According to Afolabi (2005), primary education is no doubt the foundation stage of the career in the education. The experience gathered from the primary level will always

influence the student's academic performance in the secondary schools especially at the early stage of the secondary school life.

4.4 Students attitude towards Chemistry.

Eleven items were used in the questionnaire to assess Kwale County students' attitude towards Chemistry. To achieve this objective, the study sought to inquire whether students considered Chemistry as an important subject or not, whether or not they enjoyed both the theory and practical lessons of the subject, who influenced their choice of the subject and the amount of time they invested in studying the subject among others. The summary of the analysis is represented in Table 4.13.

Table 4.13 Scores on students' attitude towards Chemistry.

STATEMENT	N	SD (%)	D (%)	NS (%)	A (%)	SA (%)
Chemistry is useful in my future life.	482	1.9	3.1	9.3	32.2	53.5
I do not like Chemistry.	482	42.1	28.4	15.4	10.2	3.9
I enjoy Chemistry theory lessons.	480	6.0	9.4	12.1	41.5	31.0
I enjoy Chemistry practical lessons.	482	3.3	3.9	6.0	40.0	46.7
Chemistry is a difficult subject.	482	23.2	24.7	16.6	19.7	15.8
I like my Chemistry teacher.	481	3.7	6.4	7.1	32.4	50.3
I often study Chemistry on my own.	482	10.4	14.5	13.3	35.3	26.6
My friends influenced me to choose Chemistry.	481	42.0	27.7	12.3	9.6	8.5
My Chemistry teacher influenced me to choose Chemistry.	481	36.8	23.7	13.1	11.6	14.8
I enjoy doing other science subjects (Biology and Physics) more than Chemistry.	482	15.4	16.4	13.7	25.5	29.0
I like studying Chemistry most of my free time.	481	15.8	23.1	16.6	29.1	15.4

Table 4.13 gives a summary of the analysis of students' attitudes towards Chemistry. On the issue of importance of the subject, 1.9% strongly disagreed with the notion that Chemistry is important, 3.1% disagreed, 9.3 were not sure, 32.2% agreed while 53.5% strongly agreed that

Chemistry is important for their future life. This means that about 85.7% considered Chemistry as important to their future life. Probed on their dislike for the subject, 42.1% strongly disagreed, 28.4% disagreed, and 15.4% were not sure. A further 10.2% admitted to their dislike of the subject by agreeing while 3.95% strongly agreed that they disliked Chemistry. A total of 70.5% therefore attested to liking Chemistry. On the difficulty of the subject, 23.2% of the respondents strongly disagreed with the notion that Chemistry is a difficult subject, 24.7% disagreed while 16.6% of the respondents were non committal. Another 19.7% agreed that the subject was difficult while 15.8% strongly felt that Chemistry was difficult. Cumulatively therefore, 47.9% did not consider the subject difficult while 35.5 considered Chemistry as a difficult subject with the remaining 19.7% being non committal.

Concerning classroom practice the feelings of the students towards both theory and practical Chemistry lessons were sought. It can be deduced that the respondents enjoyed taking both theory and practical lessons since of those who did not enjoy theory lessons, a paltry 6.0% strongly disagreed to enjoying, and 9.4% disagreed while 12.1% were not sure. On the other hand, 41.5% agreed that they enjoyed Chemistry theory lessons and 31.0% strongly agreed with the same sentiment. As per practical lessons, 3.3% strongly felt that they did not enjoy, 3.9% disagreed to enjoying the lessons while 6.0% were not sure. Of the 86.7% remaining respondents, 40.0% agreed that they enjoy Chemistry practical lessons while 46.7% strongly agreed.

According to Kwale SMASSE (2004), students care more about how as a teacher, one relates to them than how much the teacher knows. If they are positive about the teacher, they will look

for more positive things about the teacher. This study therefore sought to determine how respondents perceive their Chemistry teacher as a determinant of their attitude towards the teacher and ultimately the subject (Chemistry) the teacher handled. In their response, 82.7% cumulatively scored for liking their Chemistry teacher while the remaining 17.2% said they either did not like their Chemistry teacher or were not sure. Of those who said they disliked their teacher, 3.7% strongly disagreed to liking the teacher, 6.4% disagreed while a further 7.1% were not sure. On the other hand 32.4% agreed that they liked the subject teacher and 50.3% strongly agreed.

In terms of time invested in the study of the subject, an important aspect of attitude, 10.4% of the respondents strongly disagreed that they often studied Chemistry, 14.5% disagreed while 13.3% were non committal (not sure). On the other side of the spectrum, 35.3% agreed that they often studied Chemistry and 26.6% strongly with the same statement. Asked whether they liked studying Chemistry, 15.8% strongly disagreed, 23.1% disagreed while 16.6% were not sure. Of the rest of the respondents, 29.1% agreed that they liked studying Chemistry and 15.4% strongly agreed. On comparing Chemistry to other Science subjects (Biology and Physics), 54.5% agreed that they enjoyed doing the other Science subject to Chemistry, 31.8% disagreed while 13.7% were not sure.

The last set of items in this section endeavoured to determine whether the respondent was influenced by either peers or Chemistry teacher or choice of the subject was made independently. On whether it was out of the influence of friends that they chose to specialise in Chemistry, 42.0% strongly disagreed, 27.7% disagreed while 12.3 were non committal. It was only 9.6% of the respondents who agreed that peers influenced their choice and the remaining

8.5% strongly agreed to the same statement. On whether the Chemistry teacher influenced their choice, 36.8% strongly disagreed, 23.7% disagreed while 13.1% were not sure. On the other hand, 11.6% agreed to being influenced by the Chemistry teacher to choose to specialise in the subject and 14.8% strongly agreed to the same statement.

4.4.1 Effects of students' attitude on their performance in Chemistry

To test the effects of students' attitude on performance in Chemistry, a one way Analysis of Variance (ANOVA) test was done based on the respondents previous test results and their attitude and the findings were as presented in Tables 4.14 and 4.15.

Table 4.14 Scores for attitude – Descriptive

Students scores	N	Mean	Std. Deviation	Std. Error	95% confidence interval for mean		Minimum	Maximum
					Lower bound	Upper bound		
<30	173	36.97	5.278	0.401	36.18	37.76	19.00	52.00
30-44	127	37.53	4.452	0.395	36.75	38.31	28.00	53.00
45-59	81	38.67	4.658	0.517	37.64	39.70	25.00	52.00
60-75	66	38.59	4.989	0.614	37.36	39.82	26.00	51.00
>75	28	40.50	4.694	0.887	38.68	42.32	31.00	49.00
Total	475	37.84	4.962	0.227	37.39	38.29	19.00	53.00

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n on an ANOVA (Descriptive) result of scores for attitude. The results shows that the respondents (students) who scored 75% and above had the highest score (40.5) on the elements of attitude followed by those who scored between 45% and 59% (38.67), then 60% to 75% (38.59), followed by those who scored 30% to 44% (37.53) and lastly those who scored less than 30% (36.97) in that order. A summary of an ANOVA analysis for students score on attitude is represented in table 4.15.

Table 4.15 Scores for attitude – ANOVA

	Sum of squares	df	Mean square	F	p
Between groups	433.694	4	108.424	4.535	0.001
Within groups	11237.464	470	23.909		
Totals	11671.158	474			

Table 4.15 gives a summary of the students' ANOVA score on attitude. The ANOVA results { $F=4.535$; $df=4$; 470 ; 474 ; $P=0.001$ } in Table 4.8b shows that the observed mean difference was significant at 0.05 level of significance. This therefore means that the students who scored high marks in Chemistry also tend to have a positive attitude towards the subject. Hough and Piper (1982) from their study similarly found that groups of students who scored significantly high in science achievement test also scored significantly high in attitude test. The study finding agrees also with that of Serin and Mohammadzadeh (2008); Oluwatelure and Oloruntegbe (2010) who found out in their studies that there was a significant relationship between students' attitude towards science and their science achievement. This assertion had also been proved by Bassey, Umoren and Udida (2010) who found out in their study on secondary school students' attitude and performance in Chemistry in Akwa Ibom state - Nigeria that there is a significant positive relationship between students' attitude towards Chemistry and their performance in Chemistry. Kan and Akbas (2006), also in their research on affective factors that influence Chemistry achievement found out that students attitude towards Chemistry course on its own is a significant predictor of achievement in Chemistry and explains a significant proportion of variance of Chemistry achievement.

4.5 Teacher's perception of learners' ability in Chemistry

Teachers perception of their learners' ability and its effect on performance in Chemistry were established both from students and teachers accounts.

4.5.1 Students account of Chemistry teachers' perception of learners' ability in Chemistry.

This item was intended to give the students' conception of their teacher's attitude towards their ability in Chemistry as a determinant of the teacher's attitude towards their students' performance in the subject. Consequently respondents were required to score for level of class participation, teacher's friendliness and the amount of group tasks given by the subject teacher among other issues. The summary of this analysis is represented in Table 4.16.

Table 4.16 Students' perception of Chemistry teachers' attitude towards students' ability in Chemistry.

STATEMENT	N	SD (%)	D (%)	NS (%)	A (%)	SA (%)
Our Chemistry teacher allows us to participate in the learning of Chemistry.	482	3.7	6.0	4.4	35.1	50.8
Our Chemistry teacher is friendly and supportive.	481	5.4	3.5	5.2	32.6	53.2
Our Chemistry teacher usually promptly marks and returns the practical work done before the next one.	482	14.3	18.7	17.8	26.3	22.8
Our Chemistry teacher usually gives us assignments and marks them promptly.	482	16.0	14.5	8.9	34.2	26.3
Our Chemistry teacher usually insists that we do correction and remarks them.	482	13.5	16.2	10.2	33.8	26.3
Our chemistry teacher gives us group tasks which he/she ensures is done.	482	18.0	22.6	9.8	29.3	20.3
My chemistry teacher believes that I can perform well in Chemistry.	481	5.4	7.5	9.4	29.7	48.0

Table 4.16 gives a summary of students' perception of their teacher's attitude towards students' performance in Chemistry. Of the 482 respondents, 18 (3.7%) strongly disagreed to being allowed by their Chemistry teacher to participate in the learning of Chemistry, 29 (6.0%)

disagreed while 21 (4.4%) were non committal. Of the remaining respondents, 169 (35.1%) agreed to being allowed while 245 (50.8%) strongly agreed. Likewise 26 (5.4%) respondents strongly disagreed with the idea that their Chemistry teacher was friendly and supportive, 17 (3.5%) disagreed while 25 (5.2%) were non committal. **On the other hand**, 157 (32.6%) agreed with the statement and 256 (53.2%) respondents strongly agreed.

Concerning practical work, 237 (49.1%) of the respondents agreed that their Chemistry teacher promptly marks and returns practical work done, 159 (33.0%) disagreed while 86 (17.8%) were not sure. About assignments, 293 (60.5%) scored for being given regular assignments which the teacher promptly marks and returns to them, 147 (30.5%) disagreed while 43 (8.9%) were non committal. Majority of the respondents, 290 (60.1%) also reported that their teacher always insist they do correction which are then remarked, 143 (29.7%) disagreed while 49 (10.2%) were non committal. In terms of group work, 239 (49.6%) of the respondents said that their Chemistry teacher gives them supervised group tasks, 196 (40.6%) disagreed while 47 (9.8%) were not sure. Lastly 374 (77.7%) of the respondents said that they felt their teacher believed that they could perform well in Chemistry, 62 (12.9%) disagreed with the same idea while 45 (9.4%) were not sure.

From the above analysis, it is evident that Kwale County Chemistry students consider their teacher's attitude towards their abilities in Chemistry to be positive. An ANOVA test was therefore done to verify the effects of this perception on students' trend of performance and the results given in Tables 4.17 and 4.18. Table 4.17 provides a summary of an ANOVA (Descriptive) analysis of the students' perception of teacher's attitude towards their ability in Chemistry and performance.

Table 4.17 Scores of students' perception of teachers' attitude towards their ability and trend in performance - Descriptive

Trend of performance in the last 3 test	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower bound	Upper bound		
Declined Significantly	45	23.600	6.99805	1.04321	21.4976	25.7024	7.00	35.00
Declined Slightly	96	25.791	5.80366	.59233	24.6157	26.9676	8.00	35.00
Remained	130	24.738	6.03035	.52890	23.6920	25.7849	8.00	35.00
Improved Slightly	167	26.700	5.53903	.42862	25.8543	27.5469	11.00	35.00
Improved Significantly	42	27.404	5.38317	.83064	25.7272	29.0823	16.00	35.00
Total	480	25.758	5.94582	.27139	25.2251	26.2916	7.00	35.00

Table 4.16 gives a summary of an ANOVA analysis (Descriptive) of students' perception of their Chemistry teacher's perception of their abilities in Chemistry. The results shows that students whose scores improved significantly in the last 3 end of term Chemistry tests had the highest score (27.404) on the elements of attitude followed by students whose scores had improved slightly (26.700), then those whose scores declined slightly (25.791), followed by those whose scores in Chemistry remained the same (24.738) and lastly those whose performance declined significantly (23.600) in that order.

Table 4.18 gives a summary of an ANOVA analysis of students' perception of Chemistry teacher's perception of their abilities and trend in performance in Chemistry.

Table 4.18 Scores for students' perception of teachers' attitude towards their ability and trend in performance – ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	607.077	4	151.769	4.415	.002
Within Groups	16326.890	475	34.372		
Total	16933.967	479			

The ANOVA results { $F=4.415$; $df=4$; 475; 479; $P=0.002$ } in Table 4.18 shows that the observed mean difference was significant at 0.05 level of significance. The students whose performance had improved significantly perceived their Chemistry teachers to have positive attitude towards them. This research findings echo the findings of Edomwonyo-out & Avaa (2011) who found during their study on challenges of effective teaching of Chemistry that teachers attitude reflects on the way they teach and this ultimately have adverse effects on students' performance. Attitude of students can be influenced by the attitude of the teacher and his method of teaching (Olatunde, 2009). Studies done by Obadara (2008) however indicated that there was no significant relationship between teachers' attitude to job (teaching) and students' academic performance.

4.5.2 Teachers' perception of their learners' ability in Chemistry.

Teachers are the most important agents that can influence change in students' attitude towards Mathematics and Sciences and therefore performance in those subjects. They are in contact with the students most of the time. Through such contacts, they communicate their view point and expectations to students and the students are likely to faithfully believe them (Kwale SMASSE, 2004). To test for Chemistry teacher's perception of their learners' abilities and thus infer its impact on performance, 8 statements were used. A summary of an analysis of teacher's perception of students' ability was done and is presented in Table 4.19.

Table 4.19 Teachers' perception of students' ability

Statement	SD (%)	D (%)	NS (%)	A (%)	S (%)
My students like coming to me with Chemistry problems for assistance.	0	33	22	22	22
Most students choose Chemistry in my school because they have no alternative.	11	11	0	22	56

Students who spend more time studying Chemistry perform well in Chemistry.	0	0	11	33	56
A committed teacher improves students' performance in Chemistry.	22	22	0	56	0
Students' English language competence affects their performance in Chemistry.	0	0	0	56	44
Student's mathematical competence affects their performance in Chemistry.	11	22	0	44	22

Table 4.19 provides a summary of an analysis of teacher's perception of students' ability. The first item analysed required teachers to classify their students based on their entry behaviour. While 22% of the respondent class teachers felt their students were of above average ability, 56% classified theirs as of average ability and the remaining 22% as of below average ability. The second item required the teachers to score against one of the factors that influence their students' choice of the subject as an area of their specialisation. In response, 56% of respondents strongly agreed with the fact that the students choice of the subject was as a result of lack of an alternative, 22% others agreed while 22% disagreed. The next item required the teachers to score against the prevalence of their students to seek assistance from them on their own volition. Against this 44% of respondents confirmed being consulted by the learners, 33% disagreed while 22% were non committal. Further, 89% of respondents were in agreement that students who spend more time studying Chemistry perform well in it.

All the respondent teachers classified the performance of their students as poor and registered their displeasure with this level of performance. One of the respondents wrote, "They perform poorly though they could perform better." Some of the reasons they proffered for the poor performance included; lack of interest by students (89% of the respondents), poor attitude towards the subject (all respondents), negative peer influence (67% respondents), inadequate support from the school community and inadequate teaching and learning facilities (33% respondents). Some of the suggested reasons however contradict this research finding

particularly as regards students' attitude towards Chemistry which this research finds to be positive. All the respondents were however in agreement that a committed teacher improves students' performance in Chemistry. All of them were also in agreement that Mathematical and English language competence affects students' performance in Chemistry. When prompted to state the competency level of their students in the two areas relative to Chemistry, 22% classified their students as good in Mathematics, 22% as average while 56% said their students were generally poor in mathematical concepts in Chemistry. In language competency, 22% teachers stated that their students' language competency was good, 33% as average and the remaining 44% as poor.

A comparative analysis of the students and teachers perception of the Kwale Chemistry teacher's attitude towards learners' ability in Chemistry yields a contradictory scenario. According to data obtained from each of the two respondent categories, while the students have a more pronounced positive attitude of their Chemistry teacher in terms of intentions for the learner, teaching and learning practices, the teacher on the other hand manifest a negative attitude their learners' abilities in Chemistry. The teachers may therefore be said to exhibit a lack of understanding of their students. They may be going about their duties mechanically with the notion that the student is incapable of performing well in the subject due to their weak background and perceived negative attitude towards the subject. This misdirected understanding of the students' attitude towards the subject may be one of the major causes of students' poor performance in Chemistry as the teachers may not be giving their best during the teaching and learning process. According to Kithinji (2007), as cited in Twoli, et al (2007), teacher's attitude and motivation play a pivotal role in the teaching and learning process. The motivation of the learner to achieve

may be enhanced or damaged by the teacher's attitude towards the students and how he or she interacts with them (Flanders, 1970; Anderson, Ryan & Shapiro 1989).

4.6 Use of resources available for teaching and students' performance in Chemistry.

This study sought to investigate availability and use of resources as a factor of performance in Chemistry in Kwale County. The overall analysis was based on students account, Chemistry teachers account and the researchers account as recorded during the observation phase.

4.6.1 Students' account of resource availability and use

A summary of the analysis of students account on availability and use of resources for teaching and learning of Chemistry is presented in Tables 4.20

Table 4.20 Resources and facility use

Statement	N	Yes (%)	No (%)			
We have a Chemistry club in the school.	482	16.8	83.2			
I am a member of the Chemistry club.	482	7.3	92.7			
There are computers in your school.	482	77.4	22.6			
Computers are being used to teach our Chemistry class	480	24.2	75.8			
Statement	N	SD (%)	D (%)	NS (%)	A (%)	SA (%)
Our school has an up to date separate Chemistry laboratory.	482	31.5	19.5	9.3	14.7	24.9
Our school has a supportive laboratory technician.	482	6.2	7.5	5.4	38.4	42.5

The apparatus and chemicals are adequate enough for our use.	482	15.6	12.9	17.0	29.0	25.5
We have adequate Chemistry text books.	482	19.5	17.8	11.2	25.9	25.5
Resource persons especially Chemistry specialists are periodically invited to come and speak to us.	482	21.5	26.8	15.6	10.6	5.6
We have adequate and supportive Chemistry teaching staff besides our Chemistry teacher.	482	24.5	21.6	12.2	23.7	18.0
Our Chemistry teacher always uses charts, models and other teaching aids during Chemistry lesson.	482	28.8	24.3	9.3	24.1	13.5
Statement	N	Always (%)	Often (%)	Occasionally (%)	Rarely (%)	Rarely (%)
Group Practicals	482	24.4	17.9	16.7	27.1	14.4
Individually	482	4.8	11.4	11.4	26.2	46.2
Teacher Demonstration	481	39.7	26.4	16.8	12.9	4.2
Statement	N					
Classroom	0					
Science room	1					
Laboratory	481					

Tables 4.20 give a summary of an analysis of resource and facilities availability and use. Starting with Chemistry club, 81 (16.8%) of the respondents said they were aware of a Chemistry club being available in their school with only 35 (7.3%) being members of the club. The picture is much better with the presence of laboratories in schools as a facility since 481 (99.8%) of the respondents alluded to taking their practicals in a laboratory. However it is 191 (39.6%) of the respondents who confirmed that the said laboratory was specific for Chemistry, 246 (51.0%) suggested that it was being shared with other subjects while 9.3% (45) of the respondents were not sure. In terms of facilities, 263 (54.5%) of the respondents classified their laboratory as being adequately equipped, 137 (28.5%) as not adequately equipped while 82 (17.0%) were not sure. Majority of the respondents, 390 (80.9%) to be precise registered the presence of a supportive laboratory technician in their school with the rest either being non committal saying that their school did not have a supportive laboratory technician.

In terms of use of the laboratory facility, 196 (40.7%) respondents said they had a Chemistry practical once per week, 141 (29.3%) said they had a practical at least once per month, 97 (20.1%) once per term with a significant 48 (9.9%) respondents recording doing no Chemistry practical at all or at least once per year. Since there are various types of practicals, the study endeavoured to determine the most common type of practical that the students were exposed to in Chemistry. Of the three types (group practical, individual practical and teacher demonstration) advanced to the students, teacher demonstration recorded the highest tally of 318 (66.1%) followed by group practical at 201 (41.9%) while individual practical though being the most recommended scored the least in terms of its administration to students with a tally of 78 (16.2%).

Since use of resources in Chemistry is not restricted to laboratory facilities only, the study sought to investigate the presence and use of other facilities and emerging technologies. Data analysed showed that 248 (51.4%) said that they had adequate text books for their use, 180 (37.3%) said the text books were not adequate while 54 (11.2%) respondents were not sure. The use of charts however seemed not to be so common since when asked, it is only 181 (37.6%) of the respondents who said their teacher regularly used charts with the remaining 301 (62.4%) saying they did not use charts regularly or were non committal. Computers are one of the most important emerging facilities which remain critically underutilized particularly in the Kenyan classroom set up inspite of its relevance (Omwenga, 2005). In response to issues about its availability and use, 373 (77.4%) respondents answered in the affirmative for the presence of computers in their schools while only 116 (24.2%) of the respondents said the computers were being used in the classroom in the teaching and learning of Chemistry.

Finally, on the role of other Chemistry teachers in the school as resource persons and as sources of both support and motivation, 201 (41.7%) said that they had adequate and supportive Chemistry teaching staff while the rest – 281 (58.3%) were either non committal or said the other Chemistry teachers were not supportive enough. Only 78 (16.2%) of the respondents scored for Chemistry professionals periodically being invited to give motivational speeches to them. The rest of the respondents – 404 (were either not aware of such occurrences taking place in their school or that that they did not take place.

4.6.2 Teachers' account of resource availability and use

To obtain teachers account on the resources available and their use in the teaching and learning of Chemistry, total of 7 items were used. They were to determine whether there were laboratories in the institutions, the state of the laboratories in terms of apparatus and chemicals, frequency of their use and whether the schools had a trained laboratory technician. A summary of the analysis of these items were done and presented in Table 4.21.

Table 4.21 Teachers' account on resources and facilities availability and use

Statement		SD (%)	D (%)	NS (%)	A (%)	SA (%)
Our school has adequate resources for teaching Chemistry.		0	22	0	67	11
We have a separate Chemistry laboratory in our school.		33	22	0	22	22
The Chemistry apparatus and chemicals are adequate for the Chemistry practical lessons.		0	11	0	77	11
The administration involves Chemistry teacher in acquisition of apparatus and chemicals.		11	22	0	44	22
The school has a committed and supportive laboratory technician.		0	0	22	44	33
Type of practical	Once	At least	Once per	At least	Neve	

	per week (%)	twice per month (%)	month	once per term (%)	r (%)
Group Practical	0	78	22	0	0
Individually	0	11	33	44	11
Teacher demonstration	22	44	11	22	0

Table 4.20 provides a summary of an analysis of teachers' account on resources and facilities availability and use. Results show that there was a laboratory in each of the sampled schools. However, in 44% of them, the laboratory was specifically for Chemistry while in the remaining 56% of schools, it was shared with the other science subjects (Biology and Physics). Further, 89% of the respondent teachers indicated that there were adequate apparatus and chemicals for their use while only 11% teachers said that apparatus and chemicals were inadequate. While 22% of the respondent teachers could not commit themselves, 78% indicated that their schools had trained laboratory technicians. This study finding from teachers about resource availability tends to corroborate their students' observation as earlier noted in which a majority of them (54.5%) stated that their schools had adequate laboratory facilities and 80.9% indicated that there was a supportive laboratory technician in the school.

Except for 22% respondent teachers, the remaining 78% indicated that the institutions had enough resources for teaching and learning of Chemistry including textbooks and revision materials. All the respondent teachers also indicated that there were computers in their schools. It was noted from analysis as indicated by the respondents that the computers were being used to teach computer studies (44% respondents), for administrative purposes (44% respondents) and e-learning (33% respondents). The remaining respondents (22%) indicated that the computers were not being used at all. When probed further on whether their schools had considered

computer integration in the teaching and learning of other subjects apart from Computer studies and particularly if they were using them as teaching and learning resources in Chemistry, only 33% of the respondents answered in the affirmative. The remaining 56% gave various reasons why computer integration as a teaching and learning resource in their schools had not been implemented. They included lack of commitment by the school administration, lack of power (electricity), lack of requisite software and accompanying hardware such as projectors and regular breakdown of the computers.

In terms of use of the laboratory facilities, the teachers were requested to indicate the frequency with which they administered group, individual and teacher demonstration experiments to their Chemistry students. In response, 78% indicated they gave group practicals at least twice per month, while the remaining 22% indicated their students undertook group practicals at least once per month. The prevalence of individual practicals was found to be at least twice per month for 11% respondents, once per month for 33% respondents, at least once per term for 44% respondents while 11% respondents indicated having never administered this type of practical. Teacher demonstration seemed to be the most commonly administered with 33% respondents administering it per week, 44% respondents twice per month, 11% respondents once per month and remaining 11% respondents once per term.

4.6.3 Observed teaching / learning resources and facilities

Teaching and learning resources are necessary for making the learning process more effective. This item was intended to verify the adequacy and use of learning resources and facilities in

sampled schools. A summary of the analysis of availability of teaching/learning resources and facilities as was observed is represented in Table 4.22.

Table 4.22 Observed teaching/learning resources and facilities

Resources/facility	Availability (%)		Adequacy (%)		Use (%)	
	Available	Unavailable	Adequate	Inadequate	Used	Not used
Apparatus	100	0	89	11	100	0
Charts	78	22	45	56	67	33
Fire-fighting equipments	67	33	56	44	67	33
First aid box and chart	33	67	33	0	33	0
Fume chamber	33	67	33	0	33	0
Journals	0	100	0	0	0	0
Locally available materials	78	22	67	11	78	0
Mini-labs	0	100	0	0	0	0
Models	78	33	78	0	78	0
Periodic table	89	11	89	0	89	0
Projection equipments	67	33	67	0	56	11
Reagents	100	0	100	0	100	0
References	100	0	89	0	100	0
Science encyclopaedias	44	56	33	11	44	0
Text books	100	0	89	11	100	0
Improvised visual aids	89	11	89	0	89	0

Table 4.22 provides a summary of an analysis of observed teaching/learning resources and facilities. Data obtained showed that all the sampled schools had a working laboratory which was either used for Chemistry alone or shared with other science subjects. Of these laboratories, only 11% were inadequately stocked with required apparatus, all had adequate reagents and chemicals, and 78% of them had various assorted locally improvised materials. Within 89% of these laboratories were well displayed charts, periodic table and improvised visual aids for use, 78% had various models, 67% had fire fighting equipment while only 34% of them had fume chamber and first aid box. In terms of textbooks and other reference materials, all the sampled schools had at least one Kenya Institute of Education recommended class text with student to

textbook ratio of 1:1 per class for Chemistry, all had various recommended revision books though for most of the sampled schools, the student to text book ratio was very low. Further, 45% were found to have a science encyclopaedia. None of the sampled schools had any Chemistry journal.

4.6.4 Observed laboratory use in the teaching and learning of Chemistry

In Chemistry just like other practical oriented subjects, the practical skills acquired greatly determine a student's attitude and performance in the subject. The researcher therefore set out to review laboratory practices in Kwale County schools during practical lessons. A summary of the findings is represented in Table 4.23.

Table 4.23 Laboratory practices

Statement	SA (%)	A (%)	NS (%)	D (%)	SD (%)
Experiment on topic being covered is in the syllabus	22	78	-	-	-
Instruction style appropriate for the topic	-	100	-	-	-
Large classes with about 50 to 70 students	44	11	-	44	-
Practical reports marked by the teacher during or after the practical	11	89	-	-	-
Students are involved in the teaching/ learning process.	11	89	-	-	-
Students follow scientific method in recording experiments	-	100	-	-	-
Students keep record of practical work and write	-	100	-	-	-
Teachers and students use resources during lessons	56	44	-	-	-
The teacher is present during the experiments	44	56	-	-	-
Verbal and written instructions for experiments given to the students before the experiment	11	89	-	-	-

Table 4.22 provides a summary of observed laboratory practices. In the

course of the review, it was noticed that 56% of the sampled schools had large classes of 50 to 70 students. The classes were therefore overcrowded and gave teachers difficulty in controlling. However, all the topics covered in the experiments observed were within the syllabus, the instruction styles were appropriate and the teacher gave verbal and written instructions to the

students before the experiments. Other practices observed included students involvement in the learning process through following scientific method in doing and recording the practical work in their books. The teachers moved around the class marking the practical work during the practical and collected the work books for further assessment at the end of the practical sessions.

In summary, all the three different accounts are in agreement that there is adequate equipments and facilities for teaching and learning of Chemistry in Kwale County schools though more is required. It was however noted that some of those facilities especially audio visual teaching aids such as charts were not adequately used. Also it was observed that the teachers preferred more teachers centred teaching approaches such as the use of teacher demonstration in practical work. This could be impacting negatively on the performance of Kwale County Chemistry students.

4.6.5 Effects of use of resources and facilities on performance in Chemistry.

To infer on the impacts of the use of resources and facilities on performances, a one way ANOVA test was carried out based on the Chemistry students' attitude factors and the results presented in Tables 4.23 and 4.24.

Table 4.24 Scores on use of resources and performance - Descriptive

Performance in the last test	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Less than 30	175	19.680	5.41076	.40901	18.8727	20.4873	7.00	34.00
30-44	128	20.664	5.77979	.51087	19.6532	21.6750	9.00	35.00
45-59	81	22.950	5.15970	.57330	21.8097	24.0915	11.00	34.00
60-75	66	22.893	5.71403	.70335	21.4893	24.2986	12.00	33.00
Above 75	30	22.766	7.37976	1.3473	20.0110	25.5223	9.00	33.00

Table 4.24 Scores on use of resources and performance - Descriptive

Performance in the last test	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
					Lower Bound	Upper Bound		
Less than 30	175	19.680	5.41076	.40901	18.8727	20.4873	7.00	34.00
30-44	128	20.664	5.77979	.51087	19.6532	21.6750	9.00	35.00
45-59	81	22.950	5.15970	.57330	21.8097	24.0915	11.00	34.00
60-75	66	22.893	5.71403	.70335	21.4893	24.2986	12.00	33.00
Above 75	30	22.766	7.37976	1.3473	20.0110	25.5223	9.00	33.00
Total	480	21.129	5.80080	.26477	20.6089	21.6494	7.00	35.00

Table 4.24 gives the results of a one way ANOVA (descriptive) analysis of the effects of resource availability and use and students performance in Chemistry. The results show that students who scored between 45% and 59% had the highest mean score (22.9506) on the elements of performance. This was closely followed by those students who scored between 60% and 75% (22.8939), then those who scored above 75% (22.7667) followed by those who scored between 30% and 44% (20.6641) and lastly those who scored less than 30% (19.6800) in that order.

Table 4.25 Scores on use of resources and performance - ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	949.930	4	237.483	7.437	.000
Within Groups	15168.061	475	31.933		
Total	16117.992	479			

provides the results from a one way ANOVA analysis of the effects of resource availability and use and students performance in Chemistry. The ANOVA results {F=7.437; df=4; 475; 479; P=0.000} in Table 4.12b shows that the observed mean difference is significant at 0.05 level of significance. It shows that the use of resources has some positive effects on the performance of students. This effect was greatest for average students followed by above average students

(students scoring between 45% and above) and least for below average students. This could be a contributing factor to the persistent poor performance in Chemistry particularly when it is considered that a majority of Kwale County Students most of who are in District school category fall in the average ability group. They would therefore perform better in a visual aid and hands on enriched environment. This finding is in agreement with those of Franyo (2007) who argued that most of the resources play an important role in imparting concepts and skills to the learner but is contrary to the views of Rughubir (1979) who had earlier on suggested that availability of instructional resources does not necessarily translate into effective teaching and learning of a subject and therefore better performance.

4.7 Government interventions.

This item sought to inquire from the teachers the effectiveness of some of the interventions undertaken by the Government through the Ministry of Education particularly reorganisation and restructuring of secondary Chemistry syllabus, implementation of SMASSE training and some of their key classroom practices. It also aimed at gathering their suggestions on what they considered important in improving performance in Chemistry. A summary of the analysed data on this item is represented in Table 4.26.

Table 4.26 Intervention strategies

Statement		SD (%)	D (%)	NS (%)	A (%)	SA (%)
The current Chemistry syllabus has too much content		22	22	56	0	0
I have adequate time to plan for Chemistry lessons		11	22	0	44	0
I work as a team with other Chemistry teachers		0	0	0	22	78
Training offered at our INSET centre is applicable in improvisation of Chemistry teaching/learning resources.		0	22	11	33	33
It is very easy to improvise Chemistry teaching and learning resources.		11	33	0	44	11
Teaching/ testing method	Always (%)	Often (%)	Occasionally (%)	Rarely (%)	Never (%)	
Practicals	11	78	11	0	0	
Projects	0	11	22	56	11	
Demonstration	44	44	11	0	0	
Lecture	56	22	22	0	0	
Problem solving	22	22	56	0	0	
Group discussion	0	11	78	11	0	
Beginning of term tests	44	11	0	22	22	
Weekly tests	11	0	22	56	11	
Mid-term tests	78	11	11	0	0	
End of term tests	100	0	0	0	0	
Inter School tests	0	11	11	22	56	
Revision of past internal exams	22	67	0	0	11	
Revision of past external exams	0	33	33	22	11	
Revision of past national exams	11	22	33	22	11	

Table 4.26 represents a summary of an analysis of intervention strategies. In line with restructuring of the syllabus, teachers were required to indicate whether they were able to cover the syllabus in time as well as if they had enough time to plan their lessons. In response, 56% of the respondent teachers indicated that the current Chemistry syllabus is too wide to be covered adequately in 4 years while 44% disagreed. Further to this, 67% of the respondents indicated that they usually completed the syllabus in time, 22% said it was difficult for them to complete it in time while the remaining respondent did not respond to the statement. Due to the wide scope of the syllabus, respondents listed use of group discussions and teaching extra lessons during morning, evening and at night for boarding schools as some of the measures they employed to

cover the syllabus in time. On further probing on whether they had enough time to plan for their lessons, 44% respondents indicated they had adequate time to plan, 33% respondents said they did not have enough time while 22% did not answer the question.

SMASSE is also an important strategy that was initiated to help check the poor performance in Chemistry along with the other science subjects and Mathematics. Among many of its objectives, it was to help in enhancing attitude change and provide teachers with improvisation skills particularly those working in schools with limited teaching and learning resources and facilities. This study therefore sought to determine Kwale County teachers' perception of SMASSE project and its effectiveness in checking the persistent poor performance in Chemistry. In response to whether they had attended SMASSE training, only 11% respondents indicated not having attended with the rest (89% respondents) answering in the affirmative. On aspects of relevance of the program, 67% respondents said they found the training to be applicable in the improvisation of Chemistry teaching/learning resources, 22% found the training inapplicable while 11% respondents could not commit to any of the sides. In practice, 44% respondents said they found it easy to improvise Chemistry teaching and learning resources using skill gained during INSET training while 56% said they found improvisation difficult.

The study further attempted to determine Chemistry teachers' account on aspects of implementing some key teaching and testing skills in Chemistry. The key teaching skills investigated included practicals, projects, demonstration, group discussion and problem solving. Teachers were required to indicate the frequency with which they used each of these skills in the teaching and learning process. In response to practicals, 11% respondents indicated its frequency

as always, 76% respondents as often and 11% respondents as occasionally. For projects, 11% admitted having never used it, 56% said they used it rarely, 22% occasionally and 11% respondents often used it. Demonstration and lecture methods appeared to be the most commonly used since 44% respondents said they always used it, 44% often used it and 11% respondent used it occasionally while 56% respondents indicated they used lecture method always, 22% often used it and 22% used it occasionally. In relation to group discussion, 11% respondents indicated using it often, 78% used it occasionally while 11% respondents used it rarely. Lastly, 22% respondents said they always used problem solving, 22% respondents often used it and 56% respondents occasionally.

For modes of assessment, end of term testing was the most commonly used with all the respondents indicating they always used it. This was followed by mid-term test in which 78% respondents said that they always used it, 11% respondents said they often used it and 1 respondent used it occasionally. Next in line is beginning of term test in which 44% of respondents indicated they always gave beginning of term test, 11% respondents often gave the test, and 22% respondents rarely gave this test while the remaining 22% admitted to never using this type of testing. Weekly and interschool tests were the least used modes of testing in Chemistry. Analysed data showed that 56% respondents indicated they had never administered interschool Chemistry tests, 22% respondents said they used it rarely while 22% used it occasionally. For weekly tests, only 11% respondents often gave weekly Chemistry tests, 22% respondents used this mode occasionally, 56% rarely and 11% respondent never used it.

Tests and assessments are only meaningful when the students get their feedback and appropriate correction and revision are made. In line with this, respondents were required to indicate their prevalence for revision of tests and assessments. In response, 22% respondents indicated they always revised past internal tests, 67% respondents said they often revised while 11% respondents never carried out revision. With external tests, the frequencies were often for 33% respondents, occasionally for another 33% respondents, 22% other respondents rarely revised such tests while 11% remaining respondents indicated never revising past external examinations with their students.

4.7.1 Observed teaching techniques/methods

Teaching techniques/methods are an essential contributor to the success of the teaching and learning process. They influence acquisition of skills, knowledge and concepts during the learning process. This item was therefore intended to confirm the teaching approaches adopted by Kwale County Chemistry teachers. A summary of the findings is represented in Table 4.27.

Table 4.27 Teaching method

Teaching technique	Teacher's preference (%)
Demonstration	89
Experimentation	89
Lecture	67
Practicals	67
Problem solving	78
Projects	11
Question and answer	78

Table 4.27 represents a summary of the findings of teaching approaches adopted by Kwale County Chemistry teachers. From observation, 89% of Kwale County teachers used demonstration and experimentation, 67% used lectures and practical methods, and 78% used

problem solving as well as question and answer method. However, only 11% used project method.

In summary, information obtained suggests that the implementation of the intervention proposed by the Government through the Ministry of Education and other stakeholders are being implemented. However, much of their anticipated benefits particularly with regard to enhanced students' performance are yet to be achieved. While a majority of the teachers appreciated syllabus review, they were still finding it difficult to cover the syllabus within the stipulated time and had to employ other mechanisms to meet the target. Further, while teachers endeavoured to adopt a more practically oriented approach which is the most suitable for Chemistry, overcrowded classroom seemed to counter any gain that could have been achieved.

4.8 Results from interview

Interviews were conducted from 9 Chemistry teachers and 9 school Principals from each of the participating schools as well as the area District Quality Assurance and Standards Officers. The interviews administered as a way of counter-checking the information given in the teachers' and students' questionnaires and to get a richer view on all the factors they considered as major contributors to students' poor performance in Chemistry within their areas of jurisdiction. The interviewer took notes in the course of the interview since most respondents were not willing to be tape recorded.

4.8.1 Chemistry teacher's interview

On the question of students' performance, 56% of the teachers said performance was average while the other 44% felt it was poor. Each of the respondent teacher submitted their school's past KCSE Chemistry results analysis for the period 2006 to 2010 to corroborate this observation and is shown in Table 4.28.

Table 4.28 KCSE Chemistry mean score of sampled schools

School	2006	2007	2008	2009	2010
Waa Boys	5.25	5.33	2.91	3.87	3.66
Matuga	4.08	6.20	3.55	3.14	4.44
Shimba Hills	2.71	3.95	2.58	2.41	3.11
Mivumoni	2.91	2.80	2.63	2.75	2.74
Lunga-lunga	2.23	2.94	2.62	3.60	2.59
Mwananyamala	4.53	3.28	2.14	2.40	2.82
Diani	2.80	2.93	2.10	2.27	2.41
Kinondo	2.61	1.54	2.06	1.95	2.08
Kichakasimba	2.06	2.40	2.24	2.33	2.09

The students admitted to the sampled schools were of varied entry behaviour. While 33% of the teachers indicated that their students were of above average entry behaviour, the other 67% classified their students' entry behaviour as average or below average. This means that the students sampled were of mixed abilities since they included students from both provincial and district schools. The students were therefore expected to post varied results in terms of performance in all the subjects and in Chemistry in particular. The results obtained from the schools, however failed to manifest this trend.

All the teachers indicated that there existed a cordial relationship between them and their respective school administration and a good professional working relationship between

themselves and their students. This therefore resulted in a conducive teaching and learning environment in which the students, teachers and the administrators interacted freely and consulted fairly well. They further said that their students were able to consult them freely.

In relation to SMASSE, 89% of the teachers interviewed indicated they had attended all the sessions of the INSET seminar. While some said the training had improved their approach to the teaching and learning process by making it more practical-oriented, others felt that the training was not relevant to the classroom practice particularly due to its focus on principles; that though seems to be relevant to classroom practice is irrelevant in the assessment of educational outcome. Most of the teachers (79%) also felt that improvisation, one of the key issues advocated for by SMASSE is not easily applicable in Chemistry which required the use of glassware and chemicals. They alleged that glass wares and chemicals could not be easily improvised. They further said that improvisation did not really contribute to good performance as the KNEC syllabus did not recognise improvisation and rarely tested such innovations.

Several challenges were listed as being faced in teaching Chemistry in rural settings such as Kwale. The challenges include:

- i. Negative attitude of the society towards education
- ii. Poor entry behaviour of students
- iii. Poor mathematical background
- iv. Poor students' attitude towards learning in general and Chemistry in particular
- v. Overcrowded classrooms due to increased student enrolment in response to the subsidised education program
- vi. Inadequate teaching and learning resources

- vii. Inadequate societal support
- viii. Inadequate human resource
- ix. Lack of role models particularly in the sciences. Due to stereotyping of Chemistry, there are few role models most of whom the students have access to.
- x. Language barrier: many students find it difficult to master the scientific language used in Chemistry

All the teachers acknowledged being computer literate. Sixty seven percent of the respondents indicated that the computers in their schools were being used to teach computer studies. Only 33% respondents indicated computer integration in teaching and learning of all subjects including Chemistry was being practiced in their schools. The teachers suggested counselling of students to have positive attitude towards Chemistry, provision of more teaching and learning resources and facilities to supplement the existing ones, increasing manpower to lighten the existing teacher workload and increased community support in school activities as issues that if implemented would help improve performance in Chemistry.

4.8.2 School principals' interview

The principals were required to respond to a total of 10 items. On the question about students achievements in sciences in general and Chemistry in particular, 66.7% of the respondents felt that performance in Chemistry is poor, 11.1% said it was average while 32.2% said it was fairly good. Most of them (89%) therefore said this was an area where their schools had much concern in trying to address. Data collected showed that students with varied entry behaviour were being admitted in the schools. Most of them (44%) said that they admitted students with below average entry behaviour (those who scored between 200 and 250 marks out of 500 in KCPE), 23% said

they admitted average students (with 250-300 marks) while 33% said they admitted above average students (students with over 300 marks). Those students with below average entry behaviour were said to exhibit through their entry behaviour a lack of ability to grasp/master concepts at initial stages. Since the schools admit students with varied academic abilities in terms of entry behaviour, the outcome as measured in terms of both general performance as well as individual performance in summative test should also be varied. The Chemistry mean score for the sampled schools obtained however does not manifest a clear gap between schools admitting students with low abilities, average abilities and those with above average ability.

Almost all the principals (89%) indicated that there existed peer influence among their students. The peer influence tended to have a significant negative influence on academic life particularly where girl-boy relationships are concerned. The students concerned were said to spend a lot of time on relationships at the expense of their studies. This behaviour cut across all the different types of schools whether boys' only, girls' only or mixed. The students exhibited truant behaviour, chronic absenteeism and sometimes early pregnancy which lead to school dropout among girls. Majority of the students were said to come from low or middle class families. Some of the parents were according to the Principals either illiterate or semi-literate and provide very little assistance or impetus in monitoring the students' academic progress. Such parents also found it difficult to feed their families well and provide their sons/daughters with extra learning materials.

All the principals indicated that their students learn under fairly favourable conditions with a good working relationship in which students, teachers and the administrators consulted freely.

Some of the principals (45%) said they had bi-weekly meetings with the students where the students were free to ventilate on various issues. Some of the principals (78%) said their students exhibited a lack of drive which often demotivated their teachers. On what they were doing to ensure learning of Chemistry took place under favourable conditions, the principals listed the following measures as being undertaken:

- i. Increasing contact hours between teachers and students through remedial classes.
- ii. Expansion of existing facilities such as classes and laboratories to adequately cater for increasing student population.
- iii. Improved provision of learning resources, equipment and chemicals.
- iv. Taking teachers for capacity building and provision of other incentives.
- v. Guiding students on the importance of hard work in order to improve performance.

On teacher competence of Chemistry teachers, majority of the principals said they had qualified, experienced and committed teachers who were doing their best to ensure that learning takes place as was expected with the rest saying they were forced to hire Form four leavers or college students who are not yet through with their studies due to the acute shortage of qualified teachers. This was confirmed when the researcher interviewed the teachers and some said they had just completed Form four and were waiting to join college. The DQASO also confirmed that some schools hired Form four leavers to handle Chemistry lessons though it was their considered opinion that this did not have a negative effect on students' performance since some of these schools even posted better results in Chemistry than those schools with qualified Chemistry teachers.

When the principals were asked whether their Chemistry teachers had attended SMASSE, all confirmed that there was always an INSET training each school holiday for all science teachers which their teachers had benefited from including Chemistry teachers. Few teachers (11%) had not attended since they were attending school-based graduate and post graduate programs at the local universities. There was a general consensus among the school head teachers that the program sensitised the teachers on the important role of student centred learning as well as more emphasis on practical approach which they were implementing. They however noted that any tangible returns on this investment were yet to be seen in terms of improved performance in Chemistry and other sciences in general.

Most of the principals (76%) said provision of teaching and learning facilities was a major challenge due to the increased student population in their schools. Though the government of Kenya had taken over funding of tuition programs, persistent delay in release of the funds for the program impacted negatively on provision of laboratory equipments and chemicals. The principals also complained that the amount allocated for acquisition of laboratory apparatus and chemicals was not enough to cater for both teaching practical sessions and assessing students practical competence. Lack of adequate teaching and learning resources could be a contributor to poor performance in Chemistry.

On the issue of access to and use of information technology and its integration into the teaching and learning process, all the principals of sampled schools indicated willingness to embrace computer integration. Of the respondent principals, 23% said their schools had no working computers due to lack of enough computer hardware and power supply. Another 56% said their

schools had acquired adequate computers which were being used to teach computer studies with plans to initiate integration subject to access to internet connectivity and relevant teaching software. It is only in 34% of the institutions where computers were being used in teaching of other subjects including Chemistry.

As concerns issues raised by science teachers generally and Chemistry teachers particularly, the principals listed the following:

- i. Understaffing-most of science teachers complain of being overworked due to lack of enough qualified personnel
- ii. Inadequate teaching and learning resources
- iii. Students low entry behaviour
- iv. High turnover rates of staff which impacts negatively on syllabus coverage.
- v. Attitude of learners towards science subjects
- vi. Lack of role models
- vii. Poor mastery of the English language

The principals therefore recommended that the following measures be undertaken to improve students' performance in Chemistry in their schools:

- i. Students be counselled to change their attitude towards Chemistry
- ii. Enhance the practical approach to the teaching and learning of Chemistry
- iii. Improve the use of ICT in teaching and learning

- iv. Provision of more facilities
- v. Increase of allocation of tuition funds which should be released at the beginning of each school term.

4.8.3 DQASO interview.

Two out of the three DQASOs of Kwale County were interviewed for this study. They were interviewed on educational standards within their area of jurisdiction. Both the officers stated that performance in sciences in general and Chemistry in particular had been poor over the years. They said that their districts had registered very few quality grades in Chemistry leading to overall low mean grades. The officers however were agreed that the poor performance could not be directly attributed to quality of Chemistry teachers in their districts since they said there were schools which relied on Form four school leavers but posted better results than others with qualified and experienced teachers. They mainly attributed the poor results registered to mainly attitude factors of both teachers and students and societal influence. They said most schools (over 68%) were of the district category which admitted students with average and below average entry behaviour. Such students seemed to have had poor foundation at the primary school level and usually found it difficult to adapt to the change in the mode of teaching and assessment at the secondary level. The students seemed to manifest lack of individual drive to work hard and hence post good performance.

Generally they pointed out student attitude towards science and mathematics, inadequate teaching and learning facilities, chemicals and equipments as some of the concerns that were raised by Chemistry teachers as impacting negatively on performance in Chemistry. To check the

negative trend of performance of students in Chemistry in their areas of jurisdiction, they had recommended the following measures during routine inspections to schools:

- i. Exposing students to more practical work
- ii. Adopt more practical approach to the teaching of the subject.
- iii. Organise excursions to industries that use Chemistry-based processes
- iv. Organise symposia
- v. Organise motivational talks by Chemistry professionals to address attitude.

4.9 Summary

This chapter outlined the views of various stakeholders including Chemistry students, Chemistry teachers, school Principals and the area field officers of Kwale County with regard to issues responsible for the persistent poor performance of students in Chemistry within the County. The analysis showed that background characteristics, teachers' negative attitude towards learners' ability in Chemistry and inappropriate learning environments were the main causes of persistent poor performance of Kwale County Chemistry students.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

In this chapter, an attempt is made to give a summary of the research findings, conclusions, recommendation and suggestion for further research. The main purpose of this study was to establish the key determinants of performance in Chemistry in Kwale County in an attempt to provide a way of remedying the persistent poor performance in the subject in the County and the nation at large. The study investigated students' attitude towards Chemistry and its effects on performance, students' perception of teacher's attitude towards their ability and its effects on performance, effects of students' background characteristics on performance, availability and use of teaching and learning resources and facilities and its effects on performance. Data for analysis was obtained through structured questionnaires, interview schedules and observation schedules. Chemistry students, Chemistry teachers, school principals and the area District Quality Assurance and Standards Officers were used as subjects of the study. Observations were carried out in all the nine sampled secondary schools within the County. Information obtained was analysed both qualitatively and quantitatively with the aid of SPSS computer software.

5.2 Summary

From data analysis in chapter four, the study isolated some factors which were found to be contributing to the persistent poor performance of students in Chemistry in Kwale County. The contents of the analysis can be summarised as follows:

a. Students' background characteristics

Most of the respondents (90.7%) were found to have had public primary school background, the population of the respondents was almost even (males= 51.2%; females= 48.8%) signifying a condition of near gender parity.

A significant proportion of the respondents (31.1%) were over age (their age were above the MOE stipulated age of 16 to 17 years for this level of education), the respondents studied in over populated classrooms (their classroom had more than the 45 students per stream recommended by MOE). The factors found to affect students' performance in Chemistry in Kwale County under background characteristics include classroom population and primary school science background.

b. Students' attitude towards Chemistry

Majority of the students responded positively to ten out of eleven items which were used to test for students' attitude towards Chemistry in Kwale County. The results showed that the students generally had a positive attitude towards Chemistry.

Results from one way ANOVA analysis showed that those who scored highest in the previous test had the highest score on the elements of attitude. This therefore could be interpreted to mean that positive attitude towards Chemistry affects performance in Chemistry positively.

c. Teacher's attitude towards learners' ability in Chemistry

Kwale County students generally considered their teachers' perceptions of their abilities to be positive. Inferentially, students who scored highly on the elements of attitude in ANOVA analysis showed significant improvement in performance in Chemistry. This means positive attitude towards the subject teacher has a positive influence on performance in the subject.

Kwale County Chemistry teachers' attitude towards their learners' ability on the other hand was found to be negative. The negative attitude towards their learner ability could be affecting the Chemistry teachers output and therefore the performance of the students negatively.

d. Resource availability and use

Though there were adequate resources for teaching Chemistry, the score for use was relatively low in Kwale County particularly with regard to audio visual instructional materials.

Inferentially, use of resources and facilities was found to impact positively on students performance in Chemistry particularly performance of average students since students who scored between 45% and 59% registered the highest scores on the elements of attitude scale.

e. Teachers account of their teaching and learning practices and effectiveness of intervention strategies

The teachers reported using various teaching methods with demonstration and lecture method being the most commonly used teaching technique. End term and midterm tests were found to be the most commonly used modes of testing in Chemistry. The teachers also reported carrying out regular revision of the tests and work covered.

f. Results from observations carried

In the course of observation, it was observed that the Chemistry classes were unusually large. There was however adequate laboratory facilities, adequate textbooks and the teachers used various teaching and learning methods.

g. Results from interviews

There were three different interviews carried out - Chemistry teacher's interview, Principal's interview and the area education officer interview. From Chemistry teacher's interview, the teachers reported and provided proof of poor performance in Chemistry in their schools. The results showed inconsistent trend in performance for the period between 2006 and 2010. The teachers also reported being demoralised due to several challenges they listed as facing in teaching Chemistry in their respective schools.

The principals reported admitting to their schools a significant population of students with poor entry behaviour and the prevalence of negative peer influence among their students. Most schools reported having qualified Chemistry teachers and an ever increasing student

population due to the government subsidised education program which put pressure on the available facilities. Most of the schools were yet to embrace integrated use of information technology in the teaching and learning process. The principals also reported not having recorded any tangible results on the effects of SMASSE training of their teachers on performance in Chemistry.

The area District Quality Assurance and Standards Officers interviewed acknowledged the poor performance in Chemistry over the years. They singled out low number of quality grades registered by Form four candidates as a major cause for worry. With most schools in the area being district category, they singled out students' poor entry behaviour and teacher and students' attitude factors as the major causes of poor performance.

5.3 Conclusion

From the foregoing summary, it can be concluded that the poor performance of students in Chemistry in Kwale County can be attributed to students' background characteristics; attitude factors particularly the teacher's negative perception of their learners' abilities, inappropriate learning environment, inadequate use of resources in the teaching and learning process and negative socio-cultural effects.

5.4 Recommendations

From the observations made in the course of this study, the following stakeholders should consider putting in place the recommended steps to check the poor performance in Chemistry.

1. The Ministry of education either directly or through its agents should:

- Enhance primary school pupils' Chemistry background through inclusion of more introductory Chemistry concepts in the primary science syllabus.
- Enhance supervision of schools to help improve the students' general secondary school entry behaviour and particularly their background in English and Mathematics as they are important in explaining concepts in Chemistry.
- Increase the tuition fund to enable schools acquire more and better teaching and learning equipments and facilities.
- Release the allocated funds in good time to enable acquisition of teaching and learning materials and services be done in time for curriculum implementation.

2. The school management/administration should:

- Expand existing facilities like classrooms to lower the class population and hence enhance subject teacher class control.
- Provide more teaching and learning facilities to adequately cater for the large student population.
- Provide for innovative ways to help motivate Chemistry teachers like taking them for more capacity building courses and providing them with other incentives.
- Hire more teachers with the help of the government to help reduce teachers work load and enable the teachers have increased contact hours with their learners' hence meaningful teacher-student interaction.

- Organise more motivational talks by Chemistry professionals to help change negative attitude of students towards the subject.
- Work closely with the teachers and parents in counselling the students to help counter the existing negative peer influence

3. The Chemistry teachers should:

- Organise excursions to Chemistry-based industries and Chemistry symposia as a way of motivating the students to have positive attitude towards the subject.
- Adopt a more practical approach to the teaching and learning of the subject particularly improve in the use of charts and other instructional resources in the teaching of the subject.
- Expose their students to more practicals particularly group/individual student based practicals.
- Enhance their testing policy by giving the students more Chemistry tests and assignments apart from the school controlled midterm and end of term tests.

4. All stakeholders in concert should:

- Work for targeted intervention mechanism to improve performance in Chemistry in mixed and girls' only schools. This is the responsibility of all the stakeholders.
- Devise a system that would enable creation of more study time for learners in days school.

5.5 Suggestion for further research

The following areas are suggested for further study:

- i. A comprehensive study on the causes of Chemistry teachers' negative perception of their students' abilities in Chemistry.
- ii. A comprehensive study of effects of students' primary school science background on performance in Chemistry.
- iii. A study of the impact of socio-cultural factors on performance of students in Chemistry.

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APPENDICES

Appendix I: Kwale County public secondary schools.

1. Diani Secondary	2. Franz Joseph Secondary
3. Golini Secondary	4. Kaya Tiwi Secondary
5. Kichaka Simba Secondary	6. Kikoneni Secondary
7. Kinango Secondary	8. Kingwede Secondary
9. Kinondo Secondary	10. Kwale Girls
11. Kwale High	12. Lukore Secondary
13. Lunga lunga Secondary	14. Matuga Girls
15. Mazeras Girls	16. Mazeras High
17. Mivumoni Secondary	18. Mkongani Secondary
19. Mnyenzeni Secondary	20. Msambweni Secondary
21. Mwaluphamba Secondary	22. Mwananyamala Secondary
23. Mwavumbo Secondary	24. Ndavaya Secondary
25. Ng'ombeni Secondary	26. Ngozi Girls
27. Ramisi Secondary	28. Samburu Secondary
29. Shimba Hills	30. Taru Secondary
31. Waa Girls	32. Waa High

Appendix II: Questionnaire for students

Introduction

The statements below are intended to gather information on factors that might be contributing to performance of students in Chemistry in your school. Suggest to the best of your ability your opinion against each of the statements. Thanks for accepting to take part in this programme.

Section A: Background characteristics.

1. What is the name of your school? _____
2. What is the category of your school? Girls Only Boys Only () Mixed ()
3. Which type of primary school did you attend? [Tick only one]
Public Private
4. What is your age _____
5. Are you a boy or a girl? (tick one) Boy Girl
6. What is the average number of students in your present class [stream]? [Choose one]
0 – 10 () 11 – 20 () 21- 30 () 31- 39 () 40-44 () Above 45 ()
7. What is your residential status as a student? Boarder Day scholar

8. What was your grade in Science in KCPE? A B C D E

Section B

For **MOST** statements in this section, the abbreviations **SA- Strongly Agree, A- Agree, NS- Not sure, D- Disagree, and SD- Strongly Disagree** appear. Please respond to all the statements by ticking the one you consider most appropriate.

STATEMENT	SA	A	NS	D	SD
9. Chemistry is useful in my future life.					
10. I do not like Chemistry.					
11. I enjoy Chemistry theory lessons.					
12. I enjoy Chemistry practical lessons.					
13. Chemistry is a difficult subject.					
14. I like my Chemistry teacher.					
15. I often study Chemistry on my own.					
16. My friends influenced me to choose Chemistry.					
17. My Chemistry teacher influenced me to choose Chemistry.					
18. I enjoy doing other Science subjects (Biology & Physics) more than Chemistry.					
19. I like studying Chemistry most of my free time.					
20. Our Chemistry teacher allows us to participate in the learning of Chemistry.					
21. Our Chemistry teacher is friendly and supportive.					
22. Our Chemistry teacher usually promptly marks and returns the practical work done before the next one.					
23. Our Chemistry teacher usually gives us assignments and marks them promptly.					
24. Our Chemistry teacher usually insists that we do correction and remarks them.					
25. Our chemistry teacher gives us group tasks which he/she ensures is done.					
26. My chemistry teacher believes that I can perform well in Chemistry.					

27. We have a Chemistry club in the school. Yes No

28. I am a member of the Chemistry club. Yes No

29. Where do you perform your Chemistry practicals?

Classroom Science Room Laboratory

30. Indicate the frequency with which you perform the following types of experiments:

	Always	Often	Occasionally	Rarely	Never
Group practicals					
Individually					
Teacher demonstration					

31. Are there computers in your school? Yes No

32. If your answer is yes, are the computers being used to teach your class Chemistry?

Yes No

STATEMENT	SA	A	NS	D	SD
33. Our school has an up to date separate Chemistry laboratory.					
34. Our school has a supportive laboratory technician.					
35. The apparatus and chemicals are adequate enough for our use.					
36. We have adequate Chemistry text books.					
37. Resource persons especially Chemistry specialists are periodically invited to come and speak to us.					
38. We have adequate and supportive Chemistry teaching staff besides our Chemistry teacher.					
39. Our Chemistry teacher always uses charts, models and other teaching aids during Chemistry lesson.					

40. How often do you perform Chemistry practical in the Chemistry laboratory?

Once per week Once per month Once per term

Once per year none

41. What was your performance in the last Chemistry end of term exam? [Tick one].

Above 75% 60- 74% 45 – 59% 30 – 44%

Less than 30%

42. Are you satisfied with your performance in Chemistry?

Very Satisfied Fairly Satisfied Satisfied

Slightly Satisfied Not Satisfied

43. How often do you undertake the following Chemistry tests?

	Always	Often	Occasionally	Rarely	Never
Beginning of term tests					
Weekly tests					
Mid-term tests					
End of term tests					
Inter School tests					
Revision of past internal exams					
Revision of past external exams					
Revision of past national exams					

44. Considering your performance in the last 3 end of term exams, how would you describe

your trend of performance? Improved significantly Improved slightly

Remained the Declined slightly

Declined significantly

45. Are you satisfied with your school's past performance in Chemistry in the KCSE exams?

Very Satisfied Fairly satisfied Satisfied

Slightly Satisfied Not Satisfied

46. To help improve the performance of Chemistry, what do you consider the following should do:

- i. Your fellow students _____
- ii. The Chemistry teacher _____
- iii. The School administration _____
- iv. Yourself _____

THANK YOU

END

Appendix III: Teachers' questionnaire

Introduction

The following statements are intended to obtain factors that contribute to students' performance in chemistry in your school. The statements in section A are open-ended. Statements from section B onwards are both open-ended and closed. Please respond to all of them accordingly. All the information given is confidential and will be used for the purposes of this study only. Thanks in advance for accepting to participate in this study. Your cooperation is highly appreciated.

Section A: Background characteristics.

1. What is your gender? (*Tick the most appropriate*) Male Female
2. What is your level of education? (*Tick one*) Certificate Diploma
Dip. In Education Untrained Graduate Trained Graduate
Trained Post Graduate
3. Besides academic qualifications, are there any refresher courses you have attended?
Yes No If yes, please specify _____
4. Term of service. (*Tick one*) Temporary Contract Permanent
5. How long have you been teaching Chemistry? _____
6. Name of current station _____
7. Years of service in the current station. (*Tick one*)

Below 5 yrs 5-10 yrs 11-15 yrs Over 15yrs

8. Work load in terms of number of lessons per week _____

9. How many Chemistry teachers are there in your current station? _____

10. Apart from teaching, do you have any administrative responsibilities? (**Tick one**)

Yes () No () If yes, please specify _____

11. What is the total number of students in your present form three Chemistry classes/streams?

[**Choose one**]. 0 – 10 11 – 21- 30 31- 40 41-45
 ve 45

Section B

Against some statements in this section are abbreviations **SA –Strongly Agree, A – Agree, NS – Not sure, D- Disagree, and SD –Strongly Disagree**. Please respond to all of the statement by ticking against the box you feel is the most suitable as per your opinion.

STATEMENT	SA	A	NS	D	SD
12. My students like coming to me with Chemistry problems for assistance.					
13. Most students choose Chemistry in my school because they have no alternative.					
14. Students who spend more time studying Chemistry perform well in Chemistry.					

15. How do you classify the performance of your students in Chemistry examination particularly in KCSE? Poor () Average () Good () V. Good ()

16. Are you happy with the performance of your students in Chemistry examination particularly in KCSE? *(Please explain your answer.)*

17. What influences your choice of a teaching and learning technique?

18. In your opinion, what contributes to poor performance in Chemistry?

19. (a) In your opinion, what is the ability of your students?

Very Brilliant Above Average Average Below Average

(b) What is the competency level of your students in?

Mathematics V. Poor () Poor () Average () Good () V. Good ()

English V. Poor () Poor () Average () Good () V. Good ()

20. For the following items, indicate your preference.

STATEMENT	SA	A	NS	D	SD
i. The current Chemistry syllabus has too much content to be covered in the four years.					
ii. A committed teacher improves students' performance in Chemistry.					
iii. Students' English language competence affects their performance in Chemistry.					

iv. Student's mathematical competence affects their performance in Chemistry.					
v. I have adequate time to plan for Chemistry lessons.					

21. Using 1 for most important and 5 for least important, rate the following according to their importance in influencing student's performance of Chemistry in your school.

Factor	Rating
Teaching techniques/methods	
Student's entry behaviour	
Teacher's qualification, commitment and experience	
Instructional resources and facilities	
Nature of Chemistry curriculum	
Class size and school administration	
Mode and frequency of assessment	

22. Does your school have computers? If yes, what are they being used for?

23. Has your school considered integration of computers into the teaching and learning of sciences- (including Chemistry)? If no, why _____

24. What do you do to cover Chemistry syllabus adequately? If yes, what are the strategies you use? If no, what are the reasons? _____

25. In terms of facilities respond to the following:

STATEMENT	SA	A	NS	D	SD
i. Our school has adequate resources for teaching Chemistry.					
ii. We have a separate Chemistry laboratory in our school.					
iii. The Chemistry apparatus and chemicals are adequate for the Chemistry practical lessons.					
iv. The administration involves Chemistry teacher in acquisition of apparatus and chemicals.					

v.The school has a committed and supportive laboratory technician.					
--	--	--	--	--	--

26. i. Have you attended Strengthening of Mathematics and Science in Secondary Education (SMASSE) training? Yes

ii. Has the training affected your approach to the teaching and learning process?

(Please explain) _____

27. I work as a team with other Chemistry teachers in my school.

SA A NS D SD

28. Indicate the frequency with which you administer the following types of practicals to your Chemistry students.

	Once per week	At least twice per month	Once per month	At least once per term	Never
Group practicals					
Individually					
Teacher demonstration					

29. In light of the SMASSE project indicate your preferences to the following statements;

STATEMENT	SA	A	NS	D	SD
i. Training offered at our INSET centre is applicable in improvisation of Chemistry teaching/learning resources.					
ii. It is very easy to improvise Chemistry teaching and learning resources.					

30. Indicate your preference in usage during your teaching for the following techniques,

Teaching method	Always	Often	Occasionally	Rarely	Never
------------------------	---------------	--------------	---------------------	---------------	--------------

Practicals					
Projects					
Demonstration					
Lecture					
Problem solving					
Group discussion					

31. How often do you provide the following types of assesment to your Chemistry students?

	Always	Often	Occasionally	Rarely	Never
Beginning of term tests					
Weekly tests					
Mid-term tests					
End of term tests					
Inter School tests					
Revision of past internal exams					
Revision of past external exams					
Revision of past national exams					

32. To help improve the performance of Chemistry in your institution, what do you consider to be the role of the following?

- i. Your Chemistry students _____
- ii. Your fellow Chemistry teacher(s) _____
- iii. The School administration _____
- iv. Yourself _____
- v. The laboratory technician. _____

Thank you

End

Appendix IV: Interview schedule for the Chemistry teacher

This interview aims at obtaining information on factors that contribute to students' performance in chemistry in your school. The information you provide will be highly confidential and will only be used for the purposes of this study. Your cooperation is highly appreciated.

1. In your opinion, how do you rate the performance of sciences in your school? [Probe: Chemistry]
2. What is the nature of students in your school i.e. based on entry behaviour, societal background, and peer influence e.t.c.?
3. What is your comment about the conditions under which students learn in your school? [Probe: your relationship with both the students and teachers]
4. What is your school doing to ensure learning takes place under favourable conditions?
5. Have you attended SMASSE training? [Probe: Has the training affected your approach to the teaching and learning process? Do you feel that the training is relevant?]
6. What are the challenges of teaching chemistry in the rural setting such as Kwale?
7. SMASSE advocates for improvisation. How easy is it to improvise chemistry materials/glassware?

8. Information technology is revolutionalizing education systems the world over. Are there computers in your schools? [Probe; are the computers being used in the teaching and learning of chemistry?]
9. In your opinion, what do you think should be done to improve students' performance in chemistry?

Appendix V: Interview schedule for school principal

This interview aims at obtaining information on factors that contribute to students' performance in chemistry in your school. The information you provide will be highly confidential and will only be used for the purposes of this study. Your cooperation is highly appreciated.

1. In your opinion, how do you rate the performance of sciences in your school? [Probe: Chemistry]
2. What is the nature of students in your school i.e. based on entry behaviour, societal background, and peer influence etc.?
3. What is your comment about the conditions under which students learn in your school? [Probe: your relationship with both the students and teachers]
4. What is your school doing to ensure learning takes place under favourable conditions?
5. How does the teacher's training and qualification influence students' performance?
6. Have science teachers in your school attended SMASSE training? [Probe: Has the training affected their approach to teaching and learning process in your school?]
7. How do availability and use of facilities/ resources contribute to learners' performance in Chemistry in your school? [Probe: about Chemistry teaching and learning resources/facilities]
8. What are some of the concerns raised by Science teachers in your school and how does your administration handle them?
9. Information technology is revolutionalizing education systems the world over. Are there computers in your schools? [Probe; are the computers being used in the teaching and learning of Chemistry?]
10. In your opinion, what do you think should be done to improve students' performance in Chemistry in your school?

THANK YOU

End

Appendix VI: Interview schedule for the DQASO

This interview aims at obtaining information on factors contributing to students' performance in chemistry in your district. All the information given is highly confidential and will only be used for the purposes of this study. Your cooperation is highly appreciated.

1. In your opinion, how do you rate the performance of Sciences in your district? [Probe: Chemistry]
2. Comment briefly on the previous Chemistry performances in your district.
3. Is there any intervention measure that has been organised by your district team?
4. In your opinion, how does the teachers' training and qualification influence students' performance? [Probe: competency of Science teachers and pedagogical practices in your district]
5. i) How can you comment on the nature of students in your district?

ii) Why is it that students particularly in your area have not been performing well in Sciences?
6. What are some of the concerns that teachers in your district have in regard to the teaching of Sciences? [Probe: in Chemistry]

7. In your opinion, what can be done to improve students' performance in Chemistry?

Thank you

End.

Appendix VII: Observation checklist

Generally, learning environment, availability, adequacy and effective use of resources and facilities influence achievement in science subjects. Against each item are the words: Availability (Available, Unavailable); Adequacy (Adequate, Inadequate); and Usage (Used, Not used) for section I and SA- Strongly Agree, A- Agree, UD-Undecided, D- Disagree and SD- Strongly Disagree for section II. The researcher will tick the most appropriate column.

Section I

Availability			Adequacy		Used	
Resources/Facility	Available	Unavailable	Adequate	Inadequate	Used	Not used
Apparatus						
Charts						
Fire-fighting equipments						
First aid box and chart						
Fume chamber						
Journals						
Locally available materials						
Mini-labs						
Models						
Periodic table						
Projection equipments						
Reagents						
References						
Science encyclopaedias						
Text books						
Improvised visual aids						

Section II

Statements	SA	A	NS	D	SD
Experiment on topic being covered is in the syllabus					
Instruction style appropriate for the topic					
Large classes with about 50 to 70 students					
Practical reports marked by the teacher during or after the practical					
Students are involved in the teaching/ learning process.					
Students follow scientific method in recording experiments					
Students keep record of practical work and write					
Teachers and students use resources during lessons					
The teacher is present during the experiments					

Verbal and written instructions for experiments given to the students before the experiment					
---	--	--	--	--	--

The teacher preferred the following teaching techniques:

Teaching technique	Teacher's preference
Demonstration	
Experimentation	
Lecture	
Practicals	
Problem solving	
Projects	
Question and answer	

The following teaching aids were commonly used by the teachers during lessons:

Type of teaching aids
Charts
Wall pictures and cuttings
Models
Projector and film slides
Locally available materials

Appendix VIII: Budget

	Item	Estimated cost
1.	Stationery	7,000/=
2.	Travelling	40,000/=

3.	Subsistence	20,000/=
4.	Proposal – typing	2,000/=
	- Photocopying	1,000/=
	- Binding	1,000/=
5.	Thesis - typing	2,000/=
	- Photocopying	2,000/=
	- Binding	5,000/=
6.	Miscellaneous	<u>10,000/=</u>
	TOTAL	95,000/=

Appendix IX: Time Schedule

	Event	Deadline
1.	Proposal writing and submission	March 2011
2.	Proposal correction and submission	April 2011
3.	Proposal defence	August 2011
4.	Data collection [Fieldwork]	September 2011
5.	Data analysis	October and November 2011
6.	Thesis writing and submission	January 2012

MINISTRY OF EDUCATION



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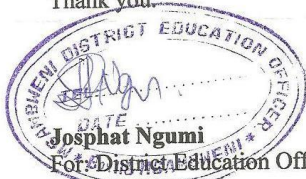
DATE: 07/10/2011

THE HEADTEACHER,

RE: PERMISSION TO CONDUCT RESEARCH IN SCHOOL

The purpose of this letter is to request you to allow the holder of this letter Mr. Ogembo John Otieno, Tsc no. 420859 to conduct a research in your school for his masters' degree.

Thank you.



Josphat Ngumi
For District Education Officer
MSAMBWENI

