FACTORS CONTRIBUTING TO POOR PERFORMANCE OF SCIENCE SUBJECTS: A CASE OF SECONDARY SCHOOLS IN KAWE DIVISION, KINONDONI MUNICIPALITY.

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A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF PROJECT MANAGEMENT OF THE OPEN UNIVERSITY OF TANZANIA

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CERTIFICATION

The undersigned certify that he has read and hereby recommend for acceptance to the senate of the open university of Tanzania. The dissertation entitled: Investigation of the factors that contribute to poor performance in science among students in secondary schools in Tanzania: A case of secondary schools in Kawe Division,Kinondoni municipality. This study has been submitted by King'aru James Muchwe, in partial fulfilment of the requirement for the degree of master of project management of the Open university of Tanzania.

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Dr. Salum Mohamed

(Supervisor)

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Date

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DECLARATION

I, **James Muchwe King'aru** do hereby declare that this dissertation is my original work and that it has not been presented/submitted and will not be presented to any other university for similar or any other awards.

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Signature

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Date

DEDICATION

This dissertation is dedicated to my parents, my mother Jane Nduta King'aru and my father Samwel King'aru Warui who sacrificed alot and inculcated a positive attitude towards education.

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ABSTRACT

Available evidence indicates that despite previous efforts, performance in science subjects is still very poor among secondary school students. This study sought to investigate factors that contribute to poor performance in science subjects among students in secondary schools in Tanzania. The study employed a cross-sectional research design whereby a total of 98 students from five schools in Kawe division were involved. Data collection was achieved through the use of questionnaires and structured interviews. Microsoft office excel and SPSS were the tools used to analyses the data collected.

The main findings of this study showed that among many other reasons the common reasons that contribute to poor performance are poor methodology in science education, negative attitude towards science subjects among students and lack of resources such as text books and well equipped laboratories. Teachers should regularly attend the in-service training in order to equip themselves with new and modern methodology of teaching science subjects.

It is recommended that the government and private school owners must ensure that the schools are well equipped with necessary materials, teachers should use modern methods of teaching science subjects in order to motivate and sustain students interests in science subjects.

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ABBREVIATIONS

CSOS   Civil society organizations.

ESR   Education sector Review.

FAWE   Forum for African Women Educationalists

FEMSA   Female Education in Mathematics and science.

JESR   Joint Education Sector Review.

KCSE   Kenya Certificate Of Secondary Education

MDGS   Millenium Development Goals.

MKUKUTA   Mkakati Umaskini Tanzania.

MOEVT   Ministry of Education and vocational training.

NECTA   National Examinations council of Tanzania.

O-Level   Ordinary level.

PEDP   Primary Education Development Plan.

SEDP   Secondary Education Development Plan.

SMT   Science, Mathematics and Technology.

TEN/MET   Tanzania Education Network/Mtandao wa Elimu Tanzania.

TIE   Tanzania Institute of Education.

TSC   Teachers Service Commission.

UDSM   University of Dar es salaam.

CHAPTER ONE

1.0   INTRODUCTION

1.1 Background to the problem

Tanzania follows the 7-4-2-3+ education system, including seven years of compulsory primary education, four years of ordinary secondary education after which students are expected to sit for the certificate of secondary education examination (CSEE), two years of advanced level of secondary education which is concluded by advanced certificate of secondary education examination (ACSEE) after which students are expected to join the various tertiary education institutions for specialization in various professionals. Such institutions include universities, technical and vocational institutions, health education colleges, business education institutions and teacher education colleges.

The ordinary level secondary education requires all students to study five compulsory subjects namely: Mathematics, English, Kiswahili, biology and civics and at least two other electives from science subjects, arts, commercials, foreign languages or technical subjects and information and computer studies. The education and training policy (1995) emphasizes on the need to promote science and technology education in secondary schools to be able to meet future science and technology challenges in the dynamic world.

The essence of teaching is to bring about a positive change in the behaviour, attitude and thinking of the learner. The teaching approach that the teacher adopts in order to bring about this positive change is very important. The traditional teacher-centered

lecture (chalk and talk) approach, which emphasizes the transfer of knowledge and skills and rewards memorization, is the predominant teaching format in Tanzanian secondary schools as well as most of the sub-Saharan countries (Chonjo et al, 1996). In this approach, the teacher talks most of the time, while a student jots down notes mainly for the purpose of passing exams.

This method does not allow much room for critical analysis of issues but it makes students to duplicate the notes given back to the teacher. In this teaching approach there is very little interaction between the teacher and the students or among the students themselves in the classrooms. Students hardly ask any questions and the teachers rarely provoke students by asking critical questions.

Various studies have reported outdated teaching practices and lack of basic content knowledge have resulted in poor teaching standards in secondary schools in Tanzania (COSTECH 2008). These poor standards have contributed extensively to the high number of unqualified teachers who teach in schools which lack the necessary equipment to impact knowledge to the learners. There has been an acute shortage of qualified mathematics and science teachers in secondary schools which forced the government to train form six leavers for few months in order to try and cover this gap. Performance of science in our education sector starting from the primary sector, secondary sector, tertiary sector and the university, (COSTECH 2008).

A study done to learn more about the situation of science teaching in Tanzania revealed that most teachers used transmission (chalk and talk) rather than interactive, learner-centered pedagogy (Tilya, 2003). Teachers were seen to be authoritative, dogmatic and inflexible (Chonjo et al, 1996). Their teaching emphasis in lectures

was to convey science content, and in some cases technical training for acquiring practical skills. The problem is furthered by the cultural belief system in which teachers are regarded as elders and are to be respected and not challenged by students.

In another study, (Osaki, 1999) found that in many schools, pupils read teachers notes instead of text books, and hence teachers are the main source of information and knowledge. The students may have textbooks, but choose to rely on teachers notes. These notes often encourage rote learning in order to pass examinations. The use of textbooks by pupils for reference and homework is not always effective especially for those in forms one and two (Tilya, 2003).

Although pupils bring textbooks in class; teachers rarely give any tasks requiring them to make use of the text book during the lesson. Some students may read the text books regularly but when reviewing for tests and exams they revert to reading the teachers notes (Osaki, 1999). In the classroom science is usually presented as a rigid body of facts, theories, and rules to be memorized and practiced, rather than a way of thinking about and understanding natural phenomena (Tilya, 2003).

The situational analysis study (Chonjo et al,1996) also revealed that science teaching was in a poor state with regard to necessary inputs in the schools(e.g. books, laboratory supplies, good teachers) and teaching and learning processes(classroom presentations, teacher-pupil relations, management of teaching and learning resources and professional development and support).Lack of sufficient resources in addition to poor teaching affected the learning outcomes in terms of student performance in examinations, participation in innovative science activities, and

general scientific and technological literacy of graduates. As per the current situation something needs to be done to rescue science education.

Osaki (1999) suggested professional development of the teachers as a temporary measure while a more long term solution is awaited. Professional development was recommended in order to raise teacher awareness and understanding of a variety of professional skills that are still at a low state. Among these are; the use of textbooks to promote independent learning, the use of learners existing ideas and environmental experience in teaching, effective questioning in classrooms and management of student practical work.

Prompted by persistent massive failure rates among secondary school students, especially in vital sciences and mathematics subjects, the National Audit office of Tanzania in the year 2008 conducted a performance audit of the secondary schools inspection program. Its main aim was to assess whether the programmes of the inspectorate fulfills its mission to safeguard good quality training, and whether it addresses the problem of poorly performing students in secondary school (CAG Audit report 2009). The Tanzanian education system faces a major challenge in ensuring quality education to create a competent human resource base. This is clear due to the poor performance of students in examinations, and especially in mathematics and science subjects (CAG Audit report 2009).

The annual education sector review provides an opportunity for all key stakeholders to asses and contribute to the development of education (TAN/MET, 2012). Tanzania education network acknowledges that noticeable progress has been made in education in Tanzania and that much more remains to be done to meet education for

all (EFA) goals and the millennium development vision 2025 and MKUKUTA goals and targets. Since science and technology plays a major role in any country's development, the impact of failure in science subjects will heavily affect the economy of that country.

For a clear, well-articulated competence based curriculum, adequate teaching and learning resources, and conducive learning environment that will help students develop capabilities, values and skills are needed (TAN/MET 2012). While both PEDP and SEDP have dramatically increased enrolments many children and youth are still being excluded from accessing a full education of quality. Despite the quantitative achievement gained in terms of quality teaching and learning of science and mathematics practices are hardly improved. Equality is needed in environments and other qualitative aspects, including gender sensitive, child friendly experiences in the classroom, teaching /learning materials and teachers taking responsibility for all learners in a school (TAN/MET 2012).

TAN/MET also argues that the status of the teacher and the teaching profession are in jeopardy if there are no deliberate efforts for teacher development in science, mathematics and English as well as, teaching remuneration and other incentives for quality education improvement. In order to foster the work of civil society organizations (CSO's), I would like to urge both the government and the society to take on their rightful roles. These include complementing government efforts to improve educational provision through "service provision where state provision is absent or insufficient" designing and implementing successful innovation.

History will judge our collective leadership and actions based on the opportunity for the children of Tanzania to receive not any education, but an education that truly enables all children to develop the capabilities, values and skills they need to thrive in the 21st century global village. This justifies the importance of ensuring that teaching science in the early years is a foundation for later education.

1.2 Statement of the research problem

Science subjects at the ordinary level in secondary schools in Tanzania are among the high profile subjects. Sciences are not compulsory for all ordinary level students except biology. Declining achievement in the subjects has elicited great concern among science educators within Tanzania and across its borders. Innumerable efforts in trying to improve the performance of science subjects have been witnessed since independence. Various efforts have been geared towards improving the pedagogical approach and in shaping of the science subjects curriculum. Such efforts include,

(i) The MOEC Science Education in Secondary Schools (SESS) project that operated between 1997 and 2001,

(ii) In-service education for science and mathematics teachers-Education II project,

(iii)Teacher Education in mathematics and science (TEAMS) run by University of Dar es Salaam, and

(iv)Science Teacher Improvement Project (STIP) which was mainly run by Christian schools.

These projects and several curriculum reviews cutting across many subjects offered at secondary school level have not been able to bring about a remarkable change in

students achievement in science subjects.

CSEE results in science subjects for many years have been showing similar trend characterized by an extremely poor performance (kitta, 2004). Among the many reasons put forward to explain the low student achievement in sciences includes:

(i)   Lack of resources such as books, equipment and classrooms (Kitta, 2004),

(ii)   Poor quality of science teachers (Chonjo et al, 1996; Sichizya, 1997),

(iii)   Low level of English language proficiency (Kitta, 1994). The implication here is that teaching and learning of science needs urgent and effective remedies. The remedies among others are; Teacher support materials and provision of the relevant resources in all the secondary schools for improved teaching and learning of sciences.

This poor performance in science subjects has raised a concern due to the fact that the country aims at achieving high technological advancement in the 21st century. This study sought to investigate the major factors that contribute to poor performance of science subjects in secondary schools.

1.3 Research objectives

1.3.1 General research objective
The general objective of this study was to investigate the causes of poor performance of science subjects in secondary schools in Tanzania, a case of schools in Kinondoni municipality, Dar es Salaam.

1.3.2 Specific Research objectives

i. To evaluate the availability of teaching and learning materials in secondary schools in Tanzania.

ii. To examine whether the teaching and learning environment is conducive for effective teaching and learning to take place.

iii. To identity the difficulties faced by teachers and students in the teaching and learning of science subjects in secondary schools.

iv. To examine whether the curriculum is developed in consideration with the level of the learners and the appropriateness of the language used.

1.4 Research Questions

1.4.1 General research question

What are the factors associated with the poor performance of science subjects in secondary schools in Tanzania.

1.4.2 Specific Research questions

i. What is the availability of teaching and learning materials in our secondary schools?

ii. Is the learning environment conducive for effective teaching and learning to take place?

iii. What difficulties do teachers and students encounter during the process of teaching and learning science in secondary schools?

iv. What is the appropriateness of the curriculum with regard to the level of the learners and is the language used suitable to the level of the learners?

1.5 Significance of the research

Science has become an integral part of the society in the current world. The quality of education in a country will determine the kind of science and technological development that the society will achieve. Science and technology is no doubt one of the most important components in the fight against poverty, it is quite obvious that science subjects are absolutely necessary for development of science and technology, which is an important component, if we have to   achieve our national goals and targets in alleviating poverty.

This study focused on identifying the major causes that contribute to the poor performance in science subjects in secondary schools and suggest the remedies to be taken in order to rescue the situation. This study also play an important role to the curriculum planners and implementers since it can guide them in identifying which areas to put more emphasis on in order to improve performance of science subjects in secondary schools. This research can also help to identify the major factors that lead to poor performance of science subjects in secondary schools in Tanzania the finding of this evaluation study will shed light on how the real situation is and give valuable recommendations according to the findings. Several research works has been reported and proposed recommendations, however the situation is getting even worse over the years meaning that the best feasible and sustainable solutions must be found.

1.6 Scope of the study

This study aimed at identifying the factors that cause poor performance among students in science subjects in secondary schools. It examined various factors which include; availability of teaching and learning materials which includes text books and other resources, frequency of practical science lessons in a well-equipped laboratory

and the availability of these laboratory equipment well trained and qualified laboratory technicians, curriculum implementation, syllabus coverage and teachers' qualification.

1.7 Theoretical framework

The study of science is not usually theoretical. A student needs to be exposed in practical activities whereby they are supposed to carry out experiments on their own and draw conclusions. The performance depends with every step in the learning process. If the teachers are not competent enough they will not be able to implement the syllabi therefore the content taught will not be what is expected and the methodology will not be appropriate hence the poor performance. It is a two way process; the wrong interpretation of the syllabus will lead to poor results and if the syllabus is not appropriate to the level of learners, they will not be able to apprehend. Lack of enough resources and materials including text books and laboratory equipment, lack of students' exposure to model examination questions which are set according to the NECTA format contributes a lot to poor performance of science subjects in secondary schools.

Among the variables measured in the study were the ordinary level science syllabi and teachers' and students' perception towards the science subjects. The resources used will also be examined which include the textbooks and the laboratory equipment, the experiments that are carried on in these laboratories and the quality of examinations administered to these students.

1.7.1 Organization of the study

This study comprises of five chapters. Chapter one contains the introduction where the background of the problem is discussed and objectives of the study stated.

Chapter two contains the review of literature where various literatures are reviewed concerning similar studies done in the past, the methodologies and findings in relation to this study. Chapter three discusses research design and methodology to be used, study population and the data collection instruments and the validity and reliability of data collection instruments. Chapter four of this study shows data analysis and discussion of the findings of the study. Chapter five gives the summary, conclusion and the recommendations of the findings. It is in this chapter the researcher gives his own recommendations.

CHAPTER TWO

2.0 LITERATURE REVIEW

2.1 Introduction

In this chapter an attempt is made to review Literature on science subjects, Literature on teaching and learning science subjects, performance, choice and selection of science students in the ordinary level. The Literature focuses on student motivation, attitude, and student level of achievement, availability of teaching and learning resources as related to the students' level of performance in science subjects.

2.2 Conceptual definitions

2.2.1 Science

The word science comes from Latin word Scientia, which means knowledge; It is a systematic enterprise that builds and organizes knowledge in a form of testable explanations and predictions. In modern usage science often refers to a way of pursuing knowledge itself. Science also refers to a body of knowledge itself, of the

type that can be rationally explained and reliably applied. A practitioner of science is known as a scientist, (Butts, D.P 1977).

2.2.2 Learning environment

The learning environment includes all the facilities, infrastructure available at the place where the school is located and all that can be found within the school surroundings. For the case of this study, the learning environment refers to the physical location, teaching delivery as well as approaches to learning whereas the term infrastructure is used to refer to things such as classrooms, furniture, laboratory and the library, (Chonjo et al, 1996).

2.2.3 Teaching materials

These are instructional materials used to support students and teachers in the whole process of teaching and learning. They include text books, schemes of work, lesson plans and other related resources responsible in facilitating the teaching and learning process, (Chonjo et al, 1996).

2.2.4 Performance

Performance is the accomplishment of a given task measured against preset standards of accuracy, completeness, cost and speed. Education performance is deemed to be the fulfillment of an objective in a manner that ensures that the performer has attained the set goals in the given level of education. Performance in education is always accompanied by an academic certificate to show that the performer has successfully completed the grade or course and has attained the stated grades, (Butts, 1977).

2.3 Theoretical literature review

Several projects have been working in trying to provide solutions to the causes of poor performance in science subjects in secondary schools, including the work by female education in mathematics and science (FEMSA) in Africa. FEMSA was a project under the forum for African women educationalists (FAWE). The project was designed to attract more women into science, mathematics and Technology (SMT).

This targeted girl's schools in special pilot areas, which included schools in Bagamoyo, karagwe, Bukoba, Ilala, Morogoro and Muleba districts .A number of publications have been produced and have presented success and recommended the following; Government should improve equity of distribution educational facilities throughout the country, it should design subject and examination syllabi taking into account the resources and facilities available in the country so that no school remain disadvantaged by having difficulties following set syllabi that call for use of materials and resources that are unavailable in their school. The drawbacks of these projects are due to the fact that they only concentrated on girl's performance whereby the conclusion was not applicable to all cases.

In his study (Siwel, 2008) revealed that there is a close relationship between subject preference and performance. On one side, preference was found to be a factor of performance while on the other hand subject performance influenced preference, so the two variables were found to be independent, each being pre disposed to become dependent or independent variable of the other. The researcher concluded that, preference and poor performance in science subjects were linked to the following factors: Students characteristics, subjects being optional, teachers' characteristics,

and lack of proper guidance and counseling for students and shortage of teaching and learning materials.

It is evident that the performance of science subjects in secondary schools in Tanzania has been on the decline, as reported by the ministry of Education and Vocational training in the recent years.

The percentage of the students who scored grade A-C has been very low in science subjects compared to non-science subjects. The performance has been on the decline since 2008 onwards especially in science subjects. This study will seek to establish the possible root causes of this poor performance in our secondary schools as well as propose solutions to this problem based on the findings. It is widely acknowledged that children's academic achievement is influenced by their home and family background. Family income, parental education and occupation, basic home amenities as well as cultural and psychological factors have all been studied for their influence on children's academic performance (Kibga , 2004).

Performance measures in school authority and school plans and results reports provide information on achievement of outcomes on key aspects of the education system. This information is an essential part of accountability that enables the organization to: (i) Assess and report on progress, what is working well and what needs improvement. (ii) Determine priorities for improvement and set improvement targets. (iii) Make program and budget decisions to maintain good performance and improve performance in areas requiring improvement.

Measures typically provide quantifiable information on key aspects of education. This information is generated quantitatively through tests, surveys, and data analysis or through qualitative means, such as observation, interviews and portfolio reviews. Whether quantitative or qualitative, measures demonstrate observable change. To be meaningful, measures information is obtained regularly (e.g. annually) and is normally expressed in percentages, ratios or numbers in relation to a total, (Kibga, 2004).

2.3.1 Types of Performance Measures

Performance measures can be classified as: (i) Outcome measures: which provide information on progress toward desired results in key areas − effectiveness of programs, impacts on clients. (ii) Intermediate outcome measures: For some desired outcomes, results may not be known for several years. In such instances, it is useful to measure intermediate steps ,milestones or landmarks towards the desired

 outcome. The measures in school authority and school plans and in results reports focus on outcomes and constitute the core set of measures for assessing and reporting on progress and achievement, (Kibga, 2004)

Other types of measures, listed below, are important for managing resources, providing programs and services, and reporting contextual information are output measures where Information on number of clients served and types of services provided.

Performance measurement in education includes, (i) Process measures which provides information on activity and efficiency. These measures indicate demand for services and cost per unit of providing service. (ii) Input measures which

provides information on resources allocated to programs, such as funding, personnel, and equipment. These measures provide information on cost or numbers of staff involved in providing programs and services.

Good performance measures provide information that is, (i) Understandable, clear and sufficient to provide an understanding of the organization or system to staff, community and government. (ii) Valid, meaningful and credible (sound, defensible). (iii) Relevant and appropriate, timely, related to important aspects. (iv) Reliable , unbiased, error-free and verifiable.

(v) Comparable, show change over time and/or among similar organizations. (vi) Discrete , provides information in distinct, non-overlapping categories.

(ix) Empowering, useful for decision making, promote improvement. (viii) Practical , can be reliable assessed with reasonable effort, (Kibga, 2004).

2.3.2 Effects of lack of resources on performance

Learning resources play a paramount role in the teaching and learning of science subjects and inevitbly the students academic achievement in other subjects as well (Bologun,1982). Despite the fact that the need for meaningful science teaching, a lot of hurdles still prevent the effective teaching and learning of the science subjects. The researcher asserted that no meaningful science education programme can exist without laboratory facilities. Laboratory facilities are indespensable to good science teaching and learning. Poor capital investment in terms of provision of science lerning resources contribute to students low level of academic achievement, (Aguisibo,1998). Students and teachers believe that the performance can improve if the necessary resources are provided in their schools.

2.3.3 Negative attitude and performance

Despite the fact that science informs our thoughts and behaviours, many people do not seem to place a high value on science. Studies show that the general public (non science majors) do not generally have positive feelings towards science and scientists (Rogers & Ford 1997). A positive attitude towards science may improve students academic performance not only in science classes, but also in other subjects as well.

It is therefore in the inteests of the society, and the responsibility of educators, to improve students attitude towards science and to prepare students to live in a highly technological society. The future of our society will be determined by citizens who are able to understand and help shape the complex influences of science and technology on our world (Ungar, 2010). If the students change their attitude towards science subjects, the performance in their results will definitely improve since they will dedicate more time towards learning the science subjects.

2.3.4 Teachers' competency and performance

The impact of the teachers on performance in any subject is very high. The teachers are the facilitators who are to impact the theories and concepts into the students. The teacher is the major manpower saddled with the responsibility of imparting the concepts considered fundamental to technology through the teaching of these basic concepts in the secondary schools. This was why (Adeniyi, 1993) noted in his study that a country's manpower development depends on the quantity of her well qualified teachers.

The objectives of the education sector of any country cannot be attained when the students are taught by incompetent teachers. Such teachers would not be able to properly and adequately disseminate the concepts to the students. The professional

qualities of a well trained teracher (Ajayi, 2009) include: mastery of the subject matter, sense of organisation, ability to clarify ideas, ability to motivate students, good imagination, ability to involve the students in meaningful activities throughout the period of teaching, management of the details of learning and frequent monitoring of students progress through tests and examinations.

2.3.5 Teacher's inservice training and performance

Inservice education and training is a continous and ongoing process for teachers throughout their professional life. It may be provided at any time after joining the service and retirement. In summary, inservice training are the activities,planned and structured, engaged by professionals (teachers) during their service aimed at helping the teacher to acquire basic skills for the efficient execution of the functions for which he was employed. Science teachers are faced with the challenge of meeting with new innovations in science.This will ensure that teachers are well equipped with new developments hence their performance in delivery will improve thus improving the performance of science subjects in their respective schools, (Okhiku,2005).

2.4 Empirical analysis of relevant studies

The TEAMS project in Tanzania was established at the University of Dar es salaam (UDSM) in the mid-nineties of the last century as a response to a study, this showed a poor state of science and mathematics in the country. The project, a cooperation between science and mathematics educators at UDSM and Dutch counterparts and funded by the Dutch government, was aimed at assisting with the production of more and better qualified science and mathematics teachers specifically the project sought to help in setting up more productive and effective teachers education programs, to build a capacity at UDSM via formal masters and PhD studies of staff to develop

post graduate programs for leadership development for stakeholders in the education systems and to break the isolation of science teacher educators through international exposure

Successes have been reported in establishing new degree programs and in service training which involved research studies (Osaki, 2000). Unfortunately performance in science and mathematics is still dropping over the years. It seems their effort is not adequate enough and some additional factors need to be established and applied.

2.4.1 Empirical literature review in the World

Factors influencing students' performance in Wawason Open University (Liew & Teoh 2008) do previous Education level, age group and course load matter? The main objective of this study was to examine whether the students age or their prior formal education moderated by the semester course load could influence their performance. The sample of this study comprised of 1271 students from three different intakes in the university. The GPA of each student obtained at their first semester of studies was employed to measure their performance. Outcome of this study revealed that the number of course registered by each student from diverse academic background and various age did not impact on their GPA performance. The researcher also discovered that the combined factors of academic background and age have very little significant effect on the GPA as well. Nevertheless, independently the academic background or the student's age significantly affected their GPA. This study suggests various factors that affect student's performance and will be used to compare with the findings of the current study.

A research on analysis of factors affecting pupils' science achievement (Fabio & Laura 2010) in Italy, the aim of their study was to examine, for the Italian TIMSS 2007 data, the relationship between contextual factors at the school level and pupil level and the proficiency scores for science achievement. In their findings, in Italy 34% of the total variance accounted for is between schools and that the school and teacher factors analyzed do not significantly affect students' performance in science. In the Italian context being a non-native student and having less cultural resources negatively and substantially affects science performance and is consistent with several studies pointing out the advantages deriving from home and parental features. The researchers also found that students self confidence in learning science proved to be the most important predictor of their performance. Research into educational psychology shows that teachers can improve students' self-confidence and self-efficacy by means of specific teaching methods such as engaging students in a creative manner and using collaborative learning or inquiry-based activities (Fencl & Scheel, 2005).

Karuna (2009), a professor in the department of mathematics, Barbhag college India in his research; secondary school education in Assam (India) with special reference to mathematics, in his study he revealed that mathematics performances of schools are positively correlated with (a) the academic performance of a school indicated by school leaving pass percentage and also (b) with the performances in subjects other than mathematics. On the other hand, student teacher ratio seems not to affect the mathematics performance of the schools.

There are other academic environmental factors governing the success of secondary education to achieve its goal (Karuna, 2009). If socio-political disturbances involving youth of this region are considered as a yardstick of educational performance then analysis of the existing education system prevailing in this region is imperative. The objectives of his study were; to investigate the academic scenario of secondary schools in Assam with special reference to (i) age (ii) management (iii) teacher student ratio and (iv) result of 10th standard school leaving examination, to compare the academic performance in mathematics subject with performances in other subjects of secondary schools as reflected by the scores of students' class examination and to investigate the dependency of students' mathematical performance on some relevant academic environmental factors prevailing in secondary schools in the region. In his conclusion, the financial and managerial status of the schools seems to be the major factors influencing academic performance. Appropriate secondary school knowledge backed by perfect learning in mathematics can make the students competent for future careers.

In the USA, (Belinda, 2010) carried out a research; academic failure in secondary schools. Her research explores whether the interplay of health problems and school environment predicts academic failure. The study also investigates the connection between health and education in adolescence. The researcher aimed at determining students preferences for science subjects, establish the relationship between students' preference and performance on science subjects, identify the effect of preference on performance then suggest ways to improve such relationship in order to enhance better academic performance and reinforce students' interests on preferences in science subjects. The researcher recommends that guidance and counseling should be

offered to the students particularly to those aspects which affect the future. The government should make science subjects compulsory so as to avoid the possibility of losing some potential future scientists who might have dropped optional subjects and schools are to be guaranteed of enough teaching and learning resources like text books, laboratory equipment and other facilities to make the learning conducive (Belinda, 2010).

In the United Kingdom, (Sutton, 2011), in a research titled; improving the impact of teachers on pupil achievement in UK recommended that, improving the effectiveness of teachers would have a major impact on the performance of the country's schools, increasing the attainment of children across the education system. Teachers are by far the biggest resource in schools. Research has found that teachers are the most important factor within schools that policy makers can directly affect to improve student achievement. Having a very effective rather than an average teacher raises each pupil's attainment by a third of a GCSE grade.

2.4.2 Empirical literature review in Africa

A similar study has been carried out in Nigeria (Jerry, 2009) where the performance in science subjects was very poor in the secondary schools. Among the factors that contributed to this poor performance were inadequate learning facilities in the secondary schools which include science equipment and laboratories, shortage of qualified and devoted instructors, lack of ability of the scholars to do well in practical and the teaching methodology used by the teachers (Akinola, 2006).Most of the text books used in secondary schools are written by foreign authors who use complex language which is difficult for the learners to comprehend.

In Malawi, poor performance in science subjects has been in the decline due to the following factors: lack of science equipment, lack of enough and quality text books, students' perception that science subjects are hard, student's laziness and too little time allocated to practical lessons (Dzana, 2012).

A study on factors associated with high school learner's poor performance (Andile & Moses 2011) in South Africa where education and training during apartheid was characterized by the underdevelopment of human potential and that of blacks in particular. The teaching and learning of mathematics, science and technology were the hardest hit (Department of Education, DOE, 2001). The researchers classified the factors that led to poor performance into two; direct influences which include teaching strategies, content knowledge and understanding, motivation and interest, laboratory usage and syllabus non completion. The indirect influences include parental roles and language, (Thomas & Pedersen, 2003), argues that a common maxim in the educational profession is that one teaches the way he was taught .This suggests that, for example and educator who was educated in an incompetent manner will have learnt bad practice and is likely to use such in teaching others.

These factors relate to this study since the factors are similar despite the environment. Students' teachers' perception on the causes of poor academic performance in Ogun state secondary schools in Nigeria, (Asikhia, 2009). This study examined the perception of students and teachers on the causes of poor performance among secondary school students in Ogun state, Nigeria. Responses of teachers showed that teachers qualification and students environment do not influence students poor performance but teachers' methods of teaching influences poor

academic performance. Student's response on the other hand showed that teacher's methods of teaching and learning materials contributes to poor performance.

The variables that were identified in the study for research questions and data collection instruments were; student's poor or academic performance and teachers' qualifications, students poor academic performance and teachers method of teaching and students environment and poor academic performance. These factors form a basis for comparison with the factors causing poor performance among students in secondary schools in Tanzania.

The role of student-related factors in the factors in the performance of biology subject in secondary schools in Eldoret municipality, Kenya (Wabuke, 2009). The study was conducted through an ex-post facto design. He sampled a total of ten schools and the target respondents were form three students and teachers of biology. The researcher established that student-related factors affecting performance of biology in the municipality are; primary school science which provides a requisite background for biology at secondary school level, interest in biology (theory and practical) provides a force for learners to participate in the learning process, their ability to carry out the practical effectively and students' ambition and attitude towards biology. Other student related factors based on knowledge acquisition noted were availability of reading materials, student using study timetables and organizing their work, study discussion groups and attending science symposiums, field trips and exhibitions. On the contrary the study also established that absenteeism, indiscipline and truancy in students posts poor performance.

The relationship between availability of teaching/ learning resources and performance in secondary school science subjects in Eldoret municipality, Kenya, (Ambogo, 2010). In his study, he examined the relationship between availability of both human and non-human resources for teaching/ learning and performance in the science subjects in Kenya Certificate of Secondary Education (KCSE) examination. From his findings availability of text books, laboratory chemicals and equipment was higher in the high performing schools than in the low performing schools. The findings show that two out of the seven low performing schools that had a science laboratory, all the five low performing schools that had a science laboratory did not have a laboratory technician and only one was fully equipped. There were differences in the availability of teaching and learning resources. The author recommended that the ministry of Education should initiate more training programmes in provision, improvisation and utilization of teaching/learning resources and should help enhance the ongoing science programmes like SMASSE. This research established similar factors that lead to poor performance in science subjects in secondary schools even in Tanzania.

2.4.3 Empirical literature review in Tanzania

Students preferences in science subjects; does this affect their performance? (Siwel & Kizito, 2008), a case of Udzungwa secondary school, kilolo, Iringa, Tanzania.

Their study sought to investigate factors influencing students' preferences on science subjects. The study aimed to determine students' preferences for science subjects establish the relationship between students' preference and performance on science subjects, identify the effect of preference on performance then suggest ways to

improve such relationship in order to enhance better academic performance and reinforce students' interests or preferences in science subjects.

The researchers concluded that guidance and counseling should be offered to the students particularly to those aspects which affect their future and should not be given too much freedom to opt on the issues that affect their future ,the government should make science subjects compulsory so as to avoid the possibility of losing some potential future scientists who might have dropped optional subjects and schools are to be guaranteed of enough teaching/learning facilities like books, laboratory tools and other facilities to make learning conducive. These factors are related to the factors being investigated in the current study that are most likely going to cause poor performance in science subjects in secondary schools in Tanzania.

Factors influencing students' academic performance in community and government built secondary schools, (Mlozi & Nyamba, 2008), a case of Mbeya municipality, Tanzania. The research assessed the adequacy of school inputs, examined the learning processes in schools, compared students' academic performance in form 2 and 4 national examination results in 2006-2008, and explored people's perceptions on community funded secondary schools.

In their findings, there were no enough teaching and learning materials, teaching and learning processes were poor especially in the community funded secondary schools. Availability of facilities in the schools did not match with the number of students. Teaching was dominated with a mixture of English with Kiswahili whereas the exam was set in English language.

Their findings showed that academic performance of community funded secondary schools were poorer than government built secondary schools in form 2 and form 4 national examinations from 2006 to 2008. The researchers recommended that the government should increase the number of teachers, provide teaching / learning materials such as text books, laboratories and classrooms. Their findings are relevant to this research since the factors identified are similar to the factors that contribute to poor performance in science subjects in secondary schools in Tanzania.

In a case of selected schools in Moshi district, Tanzania (Cyril & Lucas, 2010), in their research: factors influencing academic performance in ward secondary schools. The focus of their study was the link between education providers, facilitators and learning environment, which includes all facilities and infrastructure, availability of materials and performance of ward secondary schools at the district level.

The study found out that there was no impressive performance among ward secondary schools in the district. Some of the challenges that limit their performance include: limited number of teachers per subject compared to the number of students, lack of conducive teaching and learning environment and shortage of teaching and learning materials. Other factors that were associated with this performance was lack of well stocked libraries and laboratories, poor communication between teachers, parents and students and poor classroom attendance by teachers and students as well. According to their findings they concluded that there is need to collect more information in order to have a good generalization and better understanding of factors affecting academic performance in the ward secondary schools in Tanzania.

In the department of Education psychology and curriculum studies UDSM, (Mkumbo, 2010), and Haki Elimu Tanzania, carried out a research; Relationship between examination practice and curriculum objectives in Tanzania. Tanzania follows a competency based curriculum where use of textual materials (poor or low) is a problem to the implementation of this kind of curriculum. The researchers used the following tools to collect data; Content analysis of curriculum materials and examination papers to establish the linkage and synergies between the two aspects of education processes in Tanzania. Focus group discussions, this was done with teachers who have been involved in setting, invigilating and marking examinations as well as subject teachers.

The focus group discussions explored how these informants perceive examination processes in Tanzania and how these are linked to the implementation of the curriculum. A questionnaire was used for the purpose of soliciting views and opinions of teachers on the linkage between curriculum practice and examination performance. One interview was conducted with a senior official working with NECTA. According to the study, the resources used to implement the competency based curriculum should be effective; textbooks, modules and manuals, reference books, charts and maps, newspapers and journals. Teachers should be encouraged to use ICT facilities in schools, use of scientific and creative teaching facilities such as samples and actual materials, prototypes and laboratory apparatus. These results are relevant to this study since they are similar factors being investigated believed to cause poor performance among students in science related subjects in secondary schools.

Students' preferences on science subjects: Does this affect their performance? A case of Udzungwa secondary school, Kilolo, Iringa, Tanzania, (Siwel & Kizito, 2012). Their study arose from the fact that over the years students have shown marked differences on their interest to study science subjects. Specifically, they aimed at determining the students preferences for science subjects, examine both teachers and students perception on students preferences on science subjects, establish the relationship between students' preference and performance on science subjects, identify the effect of preference on performance then suggest ways to improve such relationship in order to enhance better academic performance and to reinforce students' interest or preferences in science subjects.

The researchers found out that the common reasons for student's preference and poor performance on science subjects at ordinary level in secondary schools included: age of learners, sex, ignorance, shortage of learning materials, gender bias by subject teachers and lack of guidance to students on the future importance of science. The researchers recommended that secondary schools be guaranteed of enough teaching/learning facilities like books, laboratory tools and other facilities to make learning conducive. These are similar factors that contribute to the current trend in science subjects in secondary schools currently.

2.5 Research Gap Identified

Poor performance of students in science subjects in secondary schools is an issue that has been well known and discussed by many people for so long in Tanzania. Many

research findings have been carried out but performance seems to be dropping in our secondary schools. There have been complaints by the public that the students are

performing badly in science and worse in mathematics, the prime minister acknowledged this fact in his 25th April 2008 speech to the members of parliament (Pinda 2008). He concluded that in the past three years there has been a decrease in performance in science subjects with worse drop in mathematics performance. There need be research findings to identify the major reason contributing to this problem and come up with permanent solutions to resolve the matter.

2.6 Conceptual framework

Factors ——————Effects————————→Performance	
(**Independent variables**)	(**Dependent variables**)
(i) Lack of resources (textbooks) (ii)Lack of laboratory equipment (iii)Students' negative attitude (iv)Lack of competent science teachers (v)Lack of in-service training	(i) poor results (ii) Incompetent graduates (iii) Declining development in science and technology
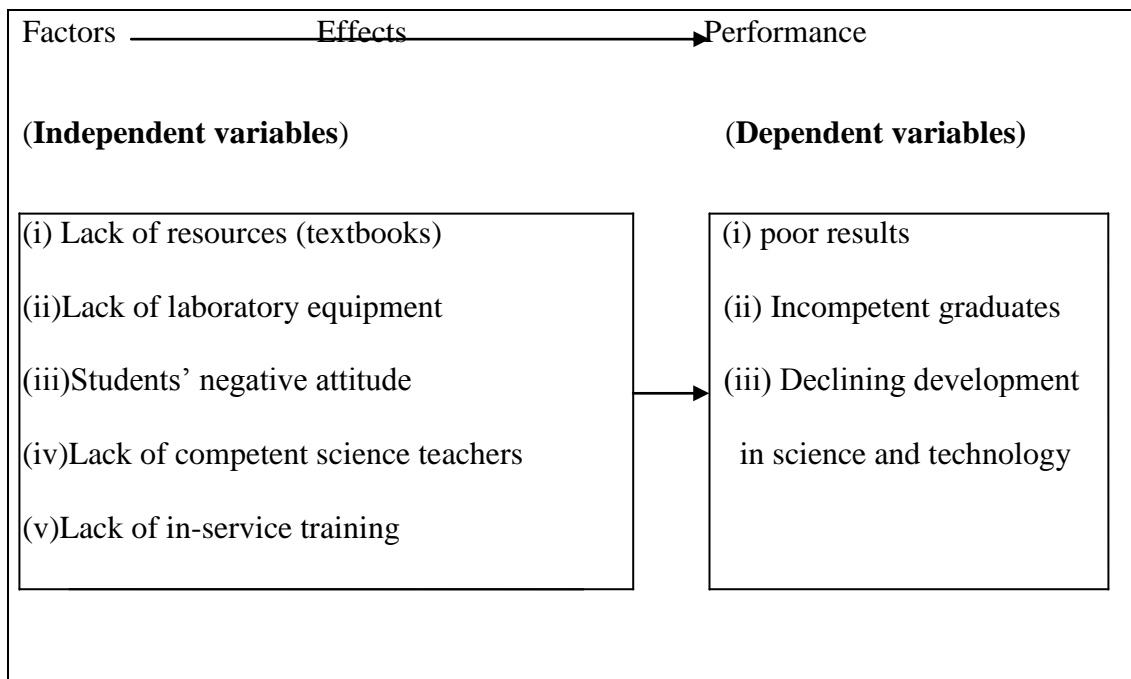
Figure 2.1 : Conceptual framework

CHAPTER THREE

3.0 RESEARCH METHODOLOGY

3.1 Introduction

This chapter discusses the methodology and procedure that will be deployed in sampling, collecting and analyzing data. It also focuses on how the sample size was selected and the instruments used in data collection as well as the data analysis procedure.

3.2 Research design

This study used both primary and secondary data. Primary data was obtained through the questionnaires while secondary data was obtained from other sources like NECTA which is the National examinations body and the ministry of education and vocational training.

The study was designed with the objective of establishing the causes of poor performance in science subjects with Tanzanian secondary schools as a reference. The study involved designing of students questionnaires which were answered by the science students in the selected secondary schools. Teachers were also given questionnaires and interviews were conducted with the heads of science departments of the sample schools. The same questionnaires were given to other three selected schools outside the study area and were filled by science students of the same level and their teachers and interviews were conducted with the heads of the science departments of the selected schools. The interview notes and questionnaires were analyzed and the results are shown in chapter four.

Investigative research approach (an inquisitive method of knowledge generation) was adopted where science students and science teachers were involved. The strength of investigative research in this study lies on its applicability in curriculum implementation in a secondary school context. In addition, investigative research will give the researcher an opportunity to realize the appropriate structuring and organization of effective teaching and learning of science subjects in secondary schools. This approach will therefore go a great length in improving the teachers' methodologies in teaching and learning process of acquiring skills in science. Findings in an investigative research act as guidelines for future development of teaching materials based on similar settings, (Frank, 2003).

3.3 Area of the research

This research was conducted in an urban setting specifically in Kawe division, Kinondoni Municipality in Dar es Salaam region. The research was conducted in an urban setting since we have a mixture of schools; both public and private secondary schools out of which can be grouped into low versus high performing secondary schools, government and non-government secondary schools.

3.4 Study Population

The Participant schools were drawn from five schools; Mbezi beach secondary school, St Mary's secondary school, Mtakuja secondary school, Jordan secondary school and Esacs secondary school which were selected through random sampling taking into consideration the availability of science laboratories and other learning materials in these schools. The population included the ordinary level students following the Tanzania national curriculum. Cluster sampling was used to provide the researcher with a cross sectional population study which might have influenced

the findings due to availability of extra learning materials like text books at home.

3.5 Sampling design and sample size

Sampling design covers all aspects of how the samples in the study was specified and selected. Sample size determination is the act of choosing the number of observations to be included in the statistical sample. A cross sectional research design was used to collect data at a single point of time. The study population involved forms four and form three science students, science teachers and the heads of science departments in the selected schools as shown in table 3.1

Table 3.1 : Sample size

Name of the school	Number of students	
	Boys	**Girls**
Mbezi Beach s.s	12	10
St Mary's s.s	10	10
Mtakuja s.s	10	11
Jordan s.s	10	10
Esacs s.s	7	
Total	49	49

Source: Field data

Kawe Division has a total of 50 Secondary schools; 41 are private secondary schools and 9 are public (government and ward) secondary schools.10% of the private secondary schools and 5% of the public schools will be selected to comprise the sample of the whole population. The selected students were involved in this research through answering a questionnaire. The science teachers and the heads of science

departments from these schools answered a questionnaire and the heads of science departments were interviewed.

3.6 Data collection methods

This study required both secondary and primary data. The secondary data was obtained from the ministry of education and vocational training on the analysis of quality of performance of all school candidates in the basic science subjects. The primary data was obtained from the sample population after they answered the questionnaires and participated in the interviews.

3.7 Data collection tools

This study employed two major tools to collect the relevant data; structured interviews and questionnaires; science teachers and heads of science departments in the various schools were interviewed while the students answered the questionnaires.

3.7.1 Structured interviews

A structured interview is essentially a questionnaire which is mediated or administered by the researcher. In this study the structured interview was used to increase response rates and to help the researcher get an in-depth understanding of the student's responses in the questionnaires. Interview schedules were conducted with the participants of the sample group. This helped the researcher to determine the motivation level that makes students opt for science subjects instead of other art related subjects.

This study aimed at interviewing science teachers and heads of science departments of the selected secondary schools within the municipality. The aim of these interviews was to establish the main cause of poor performance of science subjects

and get their views regarding what should done in order to improve the performance. Some of the advantages of interviews are; they enabled the researcher to obtain useful information about personal feelings, Perceptions and opinions, they also gave room for more detailed questions to be asked, they enhanced a high respond rate, the respondents own words were recorded, and it was easy to clarify ambiguities and follow the incomplete answers. The disadvantages include; they at time consume a lot of time; setting up interviewing, feedback and reporting is a long process, they tend to be costly and the interviewer may understand and translate the interview in a different way.

3.7.2 Questionnaires

Questionnaires were prepared for the participants to collect data on the students and teachers feelings towards the causes of poor performance and reasons that contribute towards the poor performance in the science subjects. Questionnaires were preferred since they are not time consuming and are easy to administer to a large population. They also simplified the task of categorizing, tabulating and summarizing reactions or responses from the respondents. Questionnaires contained both open ended items and closed ended ones (likert type items).

3.8 Reliability and validity of data

3.8.1 Reliability of data

Reliability is the degree to which an assessment tool produces stable and constant results. The idea behind reliability is that any significant results must be more than a one off finding and be inherently repeatable. Other researchers must be able to perform exactly the same experiment under the same conditions and generate the same results (Moskal et al, 2000). While reliability is necessary, it alone is not

sufficient .For a study or a test to be reliable it also needs to be valid (Moskal et al, 2000).

3.8.2 Validity of data

Validity refers to how well a test measures what it is purported to measure. Validity encompasses the entire experimental concept and establishes whether the results obtained meet all the requirements of the scientific research method. To test the reliability and validity of the data, the same questionnaires were taken to other three selected schools, outside the research area. The students and teachers filled the questionnaires and the results were compared to ensure that the results were replicable if applied elsewhere. This was in order to ensure that there is consistency with the results if a similar methodology is used elsewhere. The three schools were; Kenton secondary school (kinondoni), Benjamin William Mkapa (Ilala) and Dr. Didas Masaburi secondary school (Temeke)

3.9 Data processing and analysis

Qualitative data analysis was used to analyze the data collected. Statistical analysis and calculations were done through the computer programme of SPSS and MS-Office excel data analysis package. The next chapter presents detailed data analysis and discussion of the findings.

CHAPTER FOUR

4.0 DATA ANALYSIS AND DISCUSSION OF THE FINDINGS

4.1 Introduction

This chapter presents the data analysis and discussion of the findings of the study on investigation of the factors that contribute to poor performance in science subjects among students in secondary schools in Tanzania.

4.2 The analysis of data

Qualitative data collected through the questionnaires and the structured interviews was analyzed through the computer program of SPSS and MS-Office Excel data analysis package.

4.3 Students perceptions on poor performance on science subjects

The students' questionnaire was developed by the researcher to investigate the reasons that contribute to poor performance in science subjects. The questionnaire had 10 closed items which used 1 to 5 rating Likert scaling. (1-strongly disagree, 2-disagree, 3-no opinion, 4-agree, 5-strongly agree). The responses of the students were analyzed through the computer programme SPSS and the students' responses are shown below.

Table 4.1 : Availability of teaching and learning resources

Rating	Frequency	Percent
Strongly disagree	12	12.2
Disagree	18	18.4
No opinion	16	16.3
Agree	22	22.4
Strongly agree	30	30.6
Total	**98**	**100**

Source: Field data

The highest percentage (30.6%) of the students who answered the questionnaires strongly agreed that the poor performance which is being experienced now is due to lack of resources. The laboratories are not well equipped and the books are also not enough. The teachers also cited this as a major factor since students and teachers lack the relevant information they require in order to enable them perform well in their examinations. The text books are not enough and the supplementary books were not available even in the schools that had a library.

Table 4.2 : Students response on effect by other subjects

Rating	Frequency	Percent
strongly disagree	17	17.3
Disagree	21	21.4
no opinion	11	11.2
Agree	21	21.4
strongly agree	28	28.6
Total	**98**	**100**

Source: Field data

Science subjects are adversely affected by other subjects. This is due to the fact that science subjects are not given extra lessons in the timetable as compared to subjects like English. Therefore the curriculum designers should adjust this in consideration of the practical part of these subjects. This really affects the performance in the fact that students do not get ample time to study these subjects in order to improve their performance. Students and the science teachers had a feeling that the time allocated to languages per week, the same should be done to science subjects since the subjects requires more time for them to practice more. Given more time on the school general time table will also enable the science teachers to finish their syllabi early enough and have time for revision.

Table 4.3 : Students' attitude towards science subjects

Rating	Frequency	Percent
Strongly disagree	19	19.4
Disagree	13	13.3
No opinion	18	18.4
Agree	24	24.5
Strongly agree	24	24.5
Total	**98**	**100**

Source: Field data

The highest percentage (24.5%) of the students who were involved in the research agreed that the attitude that students have towards science subjects is seriously affecting their performance in the science subjects. Most students believe that science subjects are always very tough and they require a lot of time and hard work for one to pass, the practical part of it makes many run away from them. Students

always believe that sciences are very difficult and they shy away from them. Other students do not devote their time for learning science due to the fact that they believe it's tough. This really affects their performance in the internal and national examinations. Therefore teachers, parents and the society should educate the children on the importance of science subjects in today's world.

Table 4.4 : Students' responses on examination set up and the content taught

Rating	Frequency	Percent
strongly disagree	29	29.6
Disagree	24	24.5
no opinion	14	14.3
Agree	16	16.3
strongly agree	15	15.3
Total	**98**	**100**

Source: Field data

15.3% of the students responded that the examination set for them was not in line with the content taught, 16.3% thought that the examination was set out of syllabus. On science teachers' contribution towards poor performance in the science subjects, 38.8% strongly disagreed that teachers are the major causes. Instead they were for the point that students are the ones who are not playing their part well; they are lazy and are not ready to go an extra mile on their own to look for extra materials except what is taught by the teachers in class. When students were asked on the competency of the science teachers, 29.6% said that the teachers are competent enough and they really teach well. The teachers always give assistance to the students where need be.

The students strongly believe that it is themselves who are not doing their part as required.

When students responded on whether they receive any support from parents, teachers and the society, 36.7% disagreed. Students believe that more support should come from their parents, teachers and the society at large. The society must appreciate their efforts by giving them guidance as well as the necessary equipment they require in the learning process. Parents ought to provide enough resources which include text books and any other relevant materials that their children might require. When asked whether there is a bright future for them, 49.9% strongly agreed by looking at highly recognized and well-paying careers ahead like doctors, pilots and engineers. Students who have opted to study sciences have a great hope of becoming doctors, surgeons, engineers and even pilots. They believe that as science students if you perform well they become important people in the society.

4.4 Teachers' responses on poor performance in science subjects

Appendix 2 shows the teachers' questionnaire which was developed by the researcher to investigate the reasons that contribute to poor performance in science subjects. The questionnaire had 10 closed items which used 1 to 5 rating Likert scaling. (1-strongly disagree, 2-disagree, 3-no opinion, 4-agree, 5-strongly agree).The responses of the teachers were analyzed through the computer programme SPSS and the teachers responses are as shown in table 4.5.

Table 4.5 : Teachers' response on availability of resources

Rating	Frequency	Percent
strongly disagree	2	33.3
Disagree	2	33.3
Agree	2	33.3
Total	**6**	**100**

Source: Field data

The teacher's response on the availability of resources was all equal. This was due to the fact that some schools had enough and variety of text books, a well-equipped laboratory and a laboratory technician while other schools had a laboratory and few books and no laboratory technician and other two schools had few books a laboratory with little equipment and no laboratory technician. Lack of these resources results to students not preparing well for their examinations hence poor results.

Table 4.6 : Teachers' response on the teaching and learning environment

Rating	Frequency	Percent
strongly disagree	2	33.3
Disagree	2	33.3
no opinion	1	16.7
Agree	1	16.7
Total	**6**	**100**

Source: Field data

The teachers' response on the teaching and learning environment shows that the highest percentage (66.6%) disagreed that despite the environment being conducive

the student can still perform well in science subjects. The teachers argue that as long as the student has the relevant resources he or she can perform well despite the environment that that the student is in. The teachers also felt that parents and the society must create a conducive environment for the students to learn. Students hardly concentrate in a noisy environment or in an environment where they do not get the prerequisites they need for learning to take place, this will affect their concentration hence poor results.

Table 4.7 : Teachers responses on difficulties faced in teaching and learning science

Rating	Frequency	Percent
strongly disagree	2	33.3
Disagree	2	33.3
no opinion	1	16.7
Agree	1	16.7
Total	**6**	**100**

 Source: Field data

The difficulty that teachers are facing is the negative attitude that the students have towards the science subjects. The students have a feeling that the science subjects are too hard for them and also the language used is too hard to understand hence the teachers encounter difficulties when teaching. Another difficulty that the teachers face is lack of enough resources in terms of text books and other laboratory equipment. During the examination period the students get to see the equipment for the first time hence poor results since they have never practiced or had a chance to handle them.

Table 4.8 : Teachers response on science curriculum

Rating	Frequency	Percent
Strongly disagree	1	16.7
Disagree	2	33.3
No opinion	2	33.3
Agree	1	16.7
Total	**6**	**100**

Source: Field data

The highest number of the teachers interviewed had no idea about the curriculum design while others agreed that the curriculum design caters for the needs of science learning. Most of the science syllabi were last updated in the year 2010 and four years down it has not yet been revised. The teachers had a feeling that the syllabi should be revised regularly in order to improve on some areas which might be having problems in implementation. The curriculum should regularly be updated in order to cater for the changes in technology. This will ensure that the teachers are always updated and given ample time to prepare and this will lead to improvement in the science subjects.

When the teachers were asked to respond on the status of science subjects in their schools, half of the teachers admitted that it is very poor. The reasons were more or less the same ranging from students attitude towards science subjects to lack of teaching and learning resources. On the preparedness of the teachers, they agreed that science teachers are always prepared to teach both theory and practical. In some of the schools, the teacher acted as the laboratory technician whereby he or she was

expected to prepare and demonstrate as well as guiding the students through the practical lessons. When the teachers responded on the appropriateness of the teaching methodology, three teachers agreed that the methodology used is appropriate while three others disagreed and argued that teachers are still applying the chalk and talk methods of teaching instead of using the modern methods of teaching where computer based methods can be used to demonstrate some concepts in a clear and easier way for the learners to understand the concept easily. According to the response given by the science teachers of the selected schools, half of the teachers interviewed agreed that performance of science subjects affects other subjects. They argued that a good student who does well in science subjects will most likely do even better in other arts related subjects. When responding on whether science subjects are given special attention, three teachers agreed that in their schools the science subjects are given preference compared to other subjects. This was due to the fact that the science subjects are usually allocated more time as remedial classes and at time s taught during the weekends. Science teachers are at times rewarded highly if their students score good grades in the final examinations.

4.5 Response of heads of science departments on the performance of science subjects

Interviews with the heads of science department of the selected schools was conducted whereby the researcher prepared ten questions and provided an answer where teachers were to select. In this study, six heads of science departments from the selected schools participated in the interview. Three of them said that the status of science performance in their schools was good while three others said it was poor. This was due to reasons like availability of resources like books and laboratory

facilities. On the other hand four heads of science departments said that science subjects are given special attention compared to other subjects in their schools while two said that the science subjects are not given any preference in their schools.

The attitude of students towards science subjects had four of the HOD's saying its negative while two said it was positive. This is due to the students' perceptions that science subjects are always hard and involve a lot of time. When the heads of departments were asked whether they face any difficulties when teaching science subjects, all of them agreed that they are faced with difficulties. Among the reasons given was due to lack of enough resources, students attitude and lack of enough resources to enable them implement the science curriculum fully. Four heads of departments responded positively that the science curriculum is well designed to cater for the needs of students and that the examination body NECTA follows the curriculum while setting the national examinations while two said it's not well designed. When asked whether they have enough resources in their school to facilitate the process of teaching and learning science, two said yes while four said no.

It was noted that some schools did not have a laboratory technician and the science teachers were doing all the teaching and preparation of the practical lessons. Lack of current science textbooks and other related material were also lacking in some of the schools. Three out of the six schools sampled had trained laboratory technicians while the rest had none. When asked whether the laboratories were equipped, two teachers said yes while four said no. The reasons given included having malfunctioning equipment and some being too old to carry out and experiment and

give out accurate results. Three of the teachers said that they usually get support from parents and their school administration when it comes to teaching science subjects while three said no support is given. At some schools the teachers said that some parents were not even following up how their children perform at school.

When asked whether science subject performance affects other subjects, five said yes while one said no. The teachers said that a student who performs well in science subjects is most likely to excel in other non-science subjects and vice versa.

4.5 Discussion of the findings

Poor performance in science subjects among secondary school students in Tanzania is due to various factors among them negative attitude towards science subjects, lack of exposure of both teachers and students , lack of the necessary materials required during the process of teaching and learning sciences, lack of laboratories and laboratory equipment and well trained laboratory technicians. Science students are not well equipped with the relevant knowledge they require in order to pass their examinations and even practice science related activities after graduating.

Various studies cited similar reasons as causes of poor performance in science subjects (Dzana, 2012) said that students fail science due to lack of enough and quality textbooks, their perception on science subjects that sciences are hard and too little time which is allocated to practical lessons. The findings of this study compared to other previous studies done in different areas of the world, it is evident that students attitude towards sciences contributes a lot to their success or failure. The quality and availability of the materials and text books also contributes a lot to the performance of the learners. Many researchers have also found out that the

instructional time allocated to the science subjects should be adjusted in order to give the teacher's ample time so that they can complete their syllabus.

Teachers are by far the biggest resource in schools (Sutton, 2011), improving the teachers effectiveness would have a major impact on the schools performance hence increasing the attainment of children across the education system. This is similar to the results of this study where the researcher found that the students fail science subjects due to lack of competent science teachers. A teacher is the most important factor within schools that policy makers can directly affect to improve students' achievement.

Schools which have text books, laboratory equipment and other necessary resources perform much better than schools which do not have these resources (Ambogo 2010, Cyril & Lucas 2010). In this study, the schools which do not have these resources were found to be performing poorer than the schools which had the resources in place. The teachers and students strongly agreed that if provided with the necessary materials and equipment they require they will definitely post good results in the national examinations in science subjects.

There are marked differences in the students interests in science subjects (Siwel & Kizito, 2012). Some of the students have a feeling that the science subjects are tough for them hence they shy away and do not select them. In this study, the responses showed that students' negative attitude towards science subjects really affects their performance. They feel that those who take sciences are doomed to fail. Students need to have a positive attitude and this will make them change the perception

towards science subjects which will eventually lead to them liking the subjects, devote some extra time for revision and discussions hence better results.

CHAPTER FIVE

5.0 SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This study set out to investigate the factors that contribute to poor performance in science subjects in secondary schools in Tanzania. This chapter presents a summary, conclusion and recommendations of the researcher. The summary of the main findings are discussed in section 5.2, section 5.3 presents implications of the findings while 5.4 presents the conclusion. Section 5.5 presents the recommendations, 5.6 presents the limitations of the study and the suggested areas for further studies is presented in section 5.7.

5.2 Summary of the main findings

Sciences are high profile subjects at secondary school level in Tanzania. At the ordinary level it is only biology which is compulsory while physics and chemistry are optional subjects. Despite the innumerable efforts geared towards improving the pedagogical approach and in shaping of the shaping of the science curriculum, the failure rate in science subjects in the recent past has been dramatically high and among the many reasons put forward to explain the failure include :-

(i)   Poor pedagogy in science education

(ii)   Negative attitude towards science subjects among students

(iii)   Lack of resources such as books, and well equipped laboratories.

The remedies of these shortcomings include, among others ensuring that the required materials and resources are availed to all the schools, both public (ward and

government) and private secondary schools. The chalk and talk method of teaching science is still dominant in science education in Tanzania. It's also important to note that some science subjects are compulsory to all students including some with very poor background due to poorly trained science teachers.

The performance is still poor and the teaching and learning process is still dominated by chalkboard teaching with most science teachers exhibiting a lot of pedagogical limitations due to poor training. Recent researches findings indicate that most science teachers still hold on to the instrumentalists view that: Science is looked upon as consisting of an unrelated collection of facts, rules, skills and processes to be memorized. This theory explains the underlying assumptions of most science teachers and further gives us insights on why teachers treat science learning as a passive reception of knowledge and the consequent unreasonable demands placed on learners to be submissive and compliant in the learning process.

Science learning should be viewed as an active process of construction of knowledge as a meaningful whole. This implies that the teacher will engage in classroom behaviour that aims at developing autonomy and the learner's own interest in science. Several studies carried out in the recent past indicate that, for student to construct meaningful knowledge in sciences, the teaching approach should be inquiry oriented. Designing of hands-on materials that are inquiry oriented have shown great potentials in assisting teachers change their attitudes, beliefs and classroom behaviour in the teaching learning process. This study focused on investigating the causes of poor performance in science subjects in secondary schools with a view of investigating from teachers and students whether the teaching methods used are

appropriate or not. The study was based on the premise that the greater the knowledge of different learning resources and methodology, the more freedom the teacher had in the chosen teaching approach. Methodologies which involve use of computer aided instruction have a great potential in developing interactive teaching and learning. Example of such studies includes the use of MBL in activity based teaching in physics by Tilya, (2003).

5.3 Implications of the findings

The findings of this investigative study imply that a lot has to be done in our secondary schools in order to raise the performance standards of the science subjects. To begin with, the government, parents and the society at large must ensure that schools are well equipped with the necessary materials that they require for effective implementation of the curriculum. The government should provide incentives to encourage more teachers to train as science teachers. In-service training for teachers should also be carried out regularly throughout the country so as to equip the teachers with modern teaching methodologies and train them how to modify the locally available materials to be used as teaching aids.

Good and well equipped laboratories should be constructed in all secondary schools. Some schools have opted for alternative to practical due to lack of these facilities. Science students require knowledge in practical since they are a prerequisite for their future careers. Schools should also establish the office of guidance and counseling to advice the students in order for them to change their attitude towards science subjects. This should be done by a well-trained and qualified counselor. The curriculum developers must incorporate the views of all the stakeholders in the

whole process. The syllabi should be revised regularly instead the current span of five years in order to incorporate the current changes in technology.

5.4 Conclusion

The findings of this study indicate that there is significant effect of performance in science subjects due to lack of enough teaching and learning resources. The science performance in our secondary schools can be improved if students are involved in practical lessons under the guidance of well trained and qualified personnel. This will increase their motivation hence change their attitude towards science subjects hence raise the performance.

The main conclusions drawn from this study are:

(i) Availability of teaching and learning materials generally affects the performance of students. These materials should be made available and they should be of good quality in order for them to produce accurate results during a practical session. Other schools had no equipment at all and they opted for alternative to practical which is not applicable since these students require this knowledge for their future careers as scientists.

(ii) The teaching and learning environment in some of the secondary schools was found to be unfit for science lessons. Some had no laboratories and the practical lessons were done in the classroom. Parents, the government and the society at large should ensure that the environment is conducive for learning to take place effectively.

(iii) The findings of this study indicated that one of the major difficulties that the teachers face while teaching science subjects is the students' negative attitude towards science subjects. They have a perception that the sciences are always

very tough compared to other subjects which discourages them hence affecting their performance.

(iv) The curriculum developers must always involve the curriculum implementers in the process of revising the curriculum. The syllabus should be revised regularly despite the current trend of revising them after every five years. This will ensure that the views of the implementers and other stakeholders are incorporated well.

5.5 Recommendations

It is therefore recommended that in this study,

(i) The low achievement level in science subjects at secondary level demands for revolutionary ideas to motivate students in learning the science subjects. Teachers should use modern methods of teaching including use of computers in teaching science subjects in order to motivate and sustain students' interest in sciences as far as possible and in most science topics.

(ii) The government, parents, school administration and the society at large should work together to ensure that the teaching and learning environment is conducive to the teachers and students for effective learning to take place. They should give support by providing the necessary materials and equipment required which includes well equipped laboratories.

(iii) Teachers should be more innovative in preparing teaching and learning materials to help them modify their teaching strategies in order to embrace the benefits of interactive teaching, including longer and increased students' conceptual understanding.

(iv) Comprehension, enhanced learning and easy remembering is enhanced by inquiry and interactive teaching approach. Therefore, science educators should employ computer, modeling and animations through technological innovativeness while preparing educational materials. Curriculum material preparation principles should also be observed while preparing these materials.

5.6 Limitations of the study

Knowledge on the importance of sciences in the society should be well disseminated in order to sensitize more students to study sciences in secondary schools. This requires more practical and theoretical knowledge, at this stage some schools had no laboratory facilities at all and they opted doing alternative to practical in their national examinations. Thus, the students in these schools had no idea on practical since they had never stepped or done any experiment in a science laboratory. When responding to the questionnaires they had a definite answer since they had not had an experience to handle the equipment.

5.7 Suggested areas for further studies

Following this study we suggest the following areas for further studies,

(i) Similar studies focusing on performance of science subjects topic wise in order to diagnose the specific areas that need to be given more attention and this will enable the educators to know the areas which are not well covered.

(ii) The causes of failure apart from science subjects should also be investigated. This could be extended to non-science subjects like Geography, English, History or other arts subjects.

(iii) Use of computer based materials should be developed and tried out in order to study their impact on modifying student motivation and attitude towards science subjects. We recommend the use of these materials if improvement on performance on science and other subjects is needed.

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Appendix 1 : Students Questionnaire

Directions

1. This questionnaire asks you to answer the questions in respect to the way you

    view Science subject performance in your school.   It is not a test and there is

    no right or wrong answer.

2. Please tick your most appropriate answer.

    Strongly disagree - SD, Disagree – D, No opinion – N

    Agree – A, strongly Agree - SA

	SD	D	N	A	SA
	1	2	3	4	5
1. The Science teachers contribute towards the poor Performance					
2. The Science teachers are not competent enough					
3. The teaching methods are not appropriate					
4. The examination does not correspond with the content taught.					
5. The resources are not sufficient.					
6. Science performance is not affected by other subjects.					

7. There is no support from parents, teachers and the Society.					
8. Negative attitude towards science subjects, Contributes to the poor performance.					
9. The language used in teaching science is difficult to Understand.					
10. There is a bright future for science students after graduating.					

Appendix 2 : Teachers Questionnaire

Please tick the appropriate box

Strongly Disagree – SD, Disagree – D, No Opinion - N, Agree – A

Strongly Agree - SA

	SD	D	N	A4	SA
	1	2	3	4	5
1. The status of Science subjects performance in The School is still very poor.					
2. The Science teachers are always well prepared in teaching both theory and practical.					
3. The teaching methods used are appropriate.					
4. The examination set by NECTA corresponds to the content in the syllabus.					
5. The resources available are enough.					
6. Poor performance in Science subjects affects other subjects.					
7. Science subjects are given special attention Compared to other subjects.					

8. The Science Curriculum is well designed to cater for the needs of Science learning.					
9. Attitude towards Science affects performance.					
10. Parents, teachers and the society supports the Science students fully.					
11. Language used in teaching Sciences is appropriate for the students to understand.					
12. There is a bright future for Science graduates					

Appendix 3 : Teachers' structured interview questions

(Please tick the appropriate answer)

1. What is the status of science performance in your school?

     Good ☐   Poor ☐

2. Are the science subjects given special attention compared to other subjects in your school? Yes ☐   No ☐

3. What is the attitude of students towards science subjects?

     Positive ☐   Negative ☐

4. Do you face any difficulties when teaching science subjects in your school?

     Yes ☐   No ☐

5. Is the science curriculum designed to cater for the needs of science learning, are national examinations (NECTA) set according to the curriculum?

     Yes ☐   No ☐

6. Do you have enough resources in the school to facilitate the process of teaching and learning science? Yes ☐   No ☐

7. Does the school have trained laboratory technicians who assist in the preparation of practical's?   Yes ☐   No ☐

8. Are there well equipped laboratories in the school? Yes ☐   No ☐

9. Do you get any support from the parents and school administration when it comes to teaching science subjects? Yes ☐   No ☐

10. Does the performance in science subjects affect the performance of other subjects in your school? Yes ☐ No ☐

Appendix 4 : The performance of all school candidates with credit passes (a, b and c) in the basic science and arts subjects – mainland and Zanzibar.

Summary of credit passes of school candidates in Arts and Science subjects, CSEE 2010 – 2013

SCIENCE SUBJECTS			2010	2011	2012	2013	ARTS SUBJECTS			2010	2011	2012	2013
Physics	Sat	Girls	17987	23324	34,312	35,390	History	Sat	Girls	67814	11229	158,687	143,025
		Boys	32321	42558	59,025	62,846			Boys	83291	130732	186,426	189,414
		Total	**50308**	**65885**	**93337**	**98236**			**Total**	**151105**	**141961**	**345,113**	**332,439**
	Grade A – C	Girls	2886	3996	4173	2765		Grade A - C	Girls	9663	9605	7179	4163
		%	16.04	17.13	1216	7.81			%	14.25	85.54	4.52	2.91
		Boys	10361	13992	14068	10647			Boys	23979	26811	23205	13180
		%	32.06	32.88	23.83	16.98			%	28.79	20.51	12.45	6.96
		Total	**13247**	**17988**	**18241**	**13412**			**Total**	**33642**	**30416**	**30384**	**17343**
		Total %	**26.33**	**27.30**	**19.54**	**13.65**			**Total %**	**22.26**	**25.65**	**8.80**	**5.22**
C	Sat	Girls	30151	42706	57131	56100	Geograp	Sat	Girls	69505	11830	16515	145820

Chemistry			1	2	3	4
		Boys	44318	61643	81944	85296
		Total	74469	104349	139075	141396
	Grade A – C	Girls	5649	7318	7587	5588
		%	18.74	17.14	13.28	9.96
		Boys	18840	19469	20422	16677
		%	42.51	31.58	24.92	19.55
		Tot al	24489	26787	28009	22265
		Total %	32.88	25.67	20.14	15.75
Biology	Sat	Girls	69121	113315	160886	144728
		Boys	85510	133040	189712	191763
		Total	154631	246355	350601	336491
	Grade A – C	Girls	6927	8348	6193	8977
		%	10.02	7.37	3.85	2.67
		Boys	16485	19436	16993	22556
		%	19.28	14.61	8.96	6.70
		Total	23412	27784	23186	31533

hy			1	2	3	4
		Boys	86002	113740	190466	192658
		Total	155507	247570	351981	338478
	Grade A - C	Girls	11264	5213	4356	6896
		%	16.21	4.58	2.7	4.75
		Boys	23952	13807	11845	17527
		%	27.85	10.32	6.22	9.10
		Total	35216	19020	16201	24423
		Total %	22.65	7.68	4.60	7.22
Kiswahili	Sat	Girls	69512	113897	161638	145928
		Boys	86158	134301	191027	193222
		Total	155670	248198	352665	339150
	Grade A - C	Girls	30788	19722	21066	11147
		%	44.29	17.37	12.70	7.64
		Boys	34498	23104	24226	15497
		%	40.04	17.20	12.68	8.02
		Total	65286	42826	45292	26644

		Total %	**15.14**	**11.28**	**6.92**	**9.37**				**Total %**	**41.94**	**17.25**	**12.84**	**7.86**
B a s i c M a t h s	Sat	Girls	69214	113865	161578	145860			Sat	Girls	69522	113899	161557	145860
		Boys	85625	134275	190940	193113				Boys	86158	134325	190810	192862
		Total	154839	248140	352518	338973				Total	155680	248224	352367	338722
	Grade A – C	Girls	3535	4590	5582	4572		English	Grade A - C	Girls	17023	19257	12801	12239
		%	5.11	4.03	3.45	3.13				%	24.49	16.19	7.92	8.39
		Boys	10690	15247	17679	15194				Boys	26386	27414	20720	16512
		%	12.48	11.36	9.26	7.87				%	30.63	20.41	10.86	8.56
		Total	**14225**	**19837**	**23261**	**19766**				**Total**	**43409**	**46671**	**33521**	**28751**
		Total %	**9.187**	**7.994**	**6.60**	**5.83**				**Total %**	**27.88**	**18.80**	**9.51**	**8.49**

Source: Ministry of Education and Vocational Training 2010-2013