

**FACTORS INFLUENCING THE EFFECTIVENESS OF SMASSE PROJECT ON
THE PERFORMANCE OF MATHEMATICS AND SCIENCE SUBJECTS IN
SECONDARY SCHOOLS IN KITUI CENTRAL DISTRICT, KITUI COUNTY.**

BY

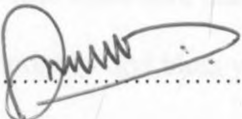
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**A RESEARCH PROJECT REPORT SUBMITTED IN PARTIAL FULFILLMENT OF
THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF
ARTS IN PROJECT PLANNING AND MANAGEMENT OF THE UNIVERSITY OF
NAIROBI.**

2012

DECLARATION

This research project report is my original work and has not been submitted or presented for examination in any other University.

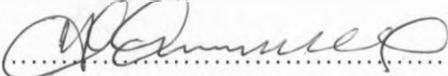
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DEDICATION

This study is dedicated to my late mother and father, who despite having had little resources encouraged me to work hard in life, my brother Alfred, his wife Catherine who educated me and always built my self esteem and confidence, my wife Susan and sons Mark and Emmanuel who made sure that I had easy time while studying.

May the Almighty God bless you abundantly.

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ABBREVIATION AND ACRONYMS

ASAL	-	Arid and Semi arid Lands.
ASEI	-	Activity, student centered, Experiment and Improvisation.
CEMASTEA	-	Center for Mathematics Science and Technology Education in Africa.
DEB	-	District Education Board
DQASO	-	District Quality Assurance Officer.
INSET	-	In-service Education and Training
JCC	-	Joint Coordinating Committee.
JICA	-	Japanese International Cooperation Agency
K.C.S.E	-	Kenya Certificate of Secondary Education
KIE	-	Kenya Institute of Education
KNEC	-	Kenya National Examinations Council.
KNEC	-	Kenya National Examination Council
KSTC	-	Kenya Science Teachers College
MOEST	-	Ministry of Education Science and Technology.
MOEST	-	Ministry of Education, Science and Technology.
MOEST	-	Ministry of Education Science and Technology
NEPAD	-	New Partnership for Africa's Development
NWC	-	National Working Committee

DPC	-	District Planning Committee.
PDE	-	Provincial Director Of Education.
PDSI	-	Plan, Do, See and Improve.
PRESET	-	Pre-service Education and Training
PS	-	Permanent Secretary
SMASSE	-	Strengthening of Mathematics and Science in secondary education.
TSC	-	Teachers Service Commission
WECSA	-	Western, Eastern, Central and Southern Africa

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ABSTRACT

The purpose of this study was to investigate the factors influencing the effectiveness of the SMASSE project in enhancing the performance of Mathematics and Science subjects in Kitui Central District, Kitui County. Just like the entire country the SMASSE project was rolled out after successful piloting in 8 districts in the year 1998 with great success. But a few years down the line after it was rolled out countrywide, the performance of the Mathematics and Science subjects that were supposed to be promoted started experiencing downward performance. The researcher set out to investigate what could be the probable cause of this drop. There were four questions put forward to guide this study. The first one was, what is the relationship between structure and effectiveness of the SMASSE project? Secondly, how is the structure of the SMASSE project affecting the performance of Mathematics and Science subjects? The third question was what is the influence of teacher training on the effectiveness of the SMASSE project. The fourth question was what was the influence of School environment on the effectiveness of the SMASSE project in Kitui Central District? The literature review focused on the structure of the SMASSE project, basically describing how the project is run from the top down to the school level. It also reviewed literature on the SMASSE INSET curriculum its guiding principles and how it should direct teachers in adopting experimentation, improvisation etc so as to create interest amongst the learners. The SMASSE curriculum was also highlighted its relevance to the teaching of Mathematics and science subjects, and its importance in promoting Mathematics and Science subjects in secondary schools. The significance of in servicing of teachers was also reviewed in relation to the SMASSE project. How in servicing should be done so as to enhance better results as highlighted. The role of the school environment was also reviewed and its relevance in promoting performance in any institution. The data was collected using questionnaires. Two questionnaires were constructed for Principals and the other for science and Mathematics teachers. Sampling was by stratified random sampling method.

Data was analyzed using the SPSS data analyzing program. Conclusions were made from the findings and recommendations made as follows; The structure of the SMASSE to involve classroom teachers more even at higher levels each drawn from all parts of the nation. The SMASSE curriculum needs to be reviewed from time to time. The SMASSE INSETs should be regularized and all teachers to attend new teachers also to be involved from the beginning of the project not just all teachers going to attend at will. The school environment should promote mathematics and science subjects.

CHAPTER ONE: INTRODUCTION

1.1 Background of the Study

In developing countries, education is thought to be panacea to poverty and developmental problems. Education is expected to bring economic development (Musvosvi, 1998). However, education changes slowly and benefits from it come after a long period of time. Modern technology is advancing on the wheels of scientific discoveries. The potential for development in agriculture, health and industries is going to depend on the development of a cadre of scientists and technologists, who can be involved in the selection and adaptation of important technologies (Musvosvi, 1998). In many U.S. states, educators must adhere to rigid standards or frameworks of what content is to be taught to which age groups. Unfortunately, this often leads teachers to rush to "cover" the material, without truly "teaching" it. In addition, the process of science, including such elements as the scientific method and critical thinking, is often overlooked. This emphasis can produce students who pass standardized tests without having developed complex problem solving skills. Although at the college level American science education tends to be less regulated, it is actually more rigorous, with teachers and professors fitting more content into the same time period.

In 1996, the U.S. National Academy of Sciences of the U.S. National Academies produced the National Science Education Standards, its focus on inquiry-based science, based on the theory of constructivism rather than on direct instruction of facts and methods, remains controversial. The Standards called for more than 'science as process,' in which students learn skills as observing, inferring, and experimenting. Inquiry is central to science learning. When engaging in inquiry, students describe objects and events, ask questions, construct explanations, test those explanations against current scientific knowledge, and communicate their ideas to others. They identify their assumptions, use critical and logical thinking, and

consider alternative explanations. In this way, students actively develop their understanding of science by combining scientific knowledge with reasoning and thinking skills.

In recent times, there has been a growing public anxiety about the teaching and learning of science in Nigerian schools. Studies showed that large numbers of students seem to learn very little science at school, learning tends to be by rote and students find learning of science to be difficult (Eyibe, 1990; Jegede, 1992; Salau, 1996). The quality of science teaching and learning has also been questioned over time by parents, science educators, and the general public and even by the government (Adepoju, 1991; Ivowi, Okebukola, Oludotun & Akpan, 1992; Okebukola, 1997). Science teaching in Nigerian schools has been criticised because of the poor performance of Nigerian students in science subjects relative to their counterparts in other countries. This is evident from the Second International Science Study in which Nigerian students came last in primary science and second to last in secondary science among the participating countries of the world (Stan, 1992).

A number of factors have been identified to be responsible for these poor performances in science from the various studies conducted in Nigeria. These include the lack of motivation for most teachers, poor infrastructural facilities, inadequate textual materials, attitude of students to learning, lack of teaching skills and competence by science teachers, and lack of opportunities for professional development for science teachers (Braithwaite & Okedeyi, 2001; Folaranmi, 2002; Okebukola, 1997; Olaleye, 2002; Olanrewaju, 1994).

Other studies mentioned that poor classroom organization, lack of management techniques and poorly co-ordinate student activities also reduced the quality of science teaching and learning (Akale & Nwankwonta, 1996). Ivowi et al. (1992) also found the shortage of funds for equipment and materials for fruitful practical work; especially in view of large class size in most schools is a problem.

Some other researchers also attribute the low percentage of students who pass examinations in science, to dissatisfaction with the syllabus, teachers' qualifications, workload, experience and disposition, general lack of teaching skills, and the ineffective style of delivery of subject matter (Adepoju, 1991; Salau, 1996). Kenya made self-help efforts towards continuous development by promoting industrialization in the education sector since its independence in 1963. The Kenyan government allocated more than its current budget to the field of education. However because of lack of textbooks, teaching materials and science teachers caused by congestion of curriculum and the tight educational budget, the level of education was lowered mainly in subjects of science and mathematics. (Riak et al 1996) Eshiwani, (1993) noted that achievement in what was offered as science and mathematics was astonishingly poor. Similarly, Birgen (2004) stated that despite the explosion of trained teachers in the last decade, the scorecard in these key subjects had persistently made depressing reading.

The 'Strengthening of Mathematics and Science in Secondary Education (SMASSE) Project was launched in Kenya in 1998, was aimed at the improvement of mathematics and science education through In-Service Training (INSET) for teachers. The project focuses on lesson improvement as its key concept and established a training system using the cascade approach at the national and district levels, which facilitated the diffusion of training effects to all participants including those who are at the lowest level of the cascade. It has also set up mechanisms by which a part of school tuition fees is used to cover the costs for the district – level training, thus ensuring the sustainability of training management and implementation. After the launch of phase II in 2003, the Kenyan government established the national training center and INSET was extended both domestically, to cover the entire Kenyan territory, and intraregional, to conduct activities to the strengthening of mathematics and science in secondary education in 30 sub-Saharan countries. The request for assistance in the field of

mathematics and science in secondary, addressed by the Kenyan government to Japan in 1996, resulted in the launch of the SMASSE project in 1998 (CEMASTE A News letter, 2008). In order to achieve sustainable social and economic development goals as outlined by Poverty Eradication Action Plan (PEAP 2004), focus must be on promoting science and mathematical education. However, performance in science and mathematics has been unsatisfactory for long as reflected by Kenya National Examinations Council (KNEC) since 1980's to date. The government has made interventions to improve the situation through building and renovating laboratories, supplying equipment, chemicals and textbooks; recruiting more science teachers, establishment of Teacher resource Centers (TRC), introducing computer science and ICT Skills to both teacher and students. The current government policy to improve science and technology for economic development, called for improvement of classroom practices in the teaching and learning of science and mathematics.

In 2005 the government of Kenya through ministry of education with technical assistance from the government of Japan through JICA, established SMASSE (Strengthening of Mathematics and Science in Secondary Education) program to enhance the quality of teaching and learning of science and mathematics through in – service education training (INSET) for secondary science and mathematics teachers. The program was then piloted in the municipalities of the country where the observed impacts that were tested by the KNEC, (2000) showed very positive results on the improved performance.

Examinations can when used properly, improve the quality of teaching and learning and because of this reason when Kenya certificate of secondary education (KCSE) results are released, the feedback is sent to schools through a report indicating not only how students have performed but also what teachers and students should do to improve on future examinations (CEMASTE A News letter, 2008).

The government of Kenya through its policy documents has outlined several strategies to be adopted in order to enhance the field of science and technology. Key among them is the strengthening of technical capabilities through training of personnel and provision of equipment's through partnership with development partners, the government has embraced several initiatives such as the strengthening of mathematics and science subjects in secondary schools (SMASSE) project. This is a joint venture between Japanese governments through the Japanese international development agency (JICA). It was established in 1998 to improve the capacity of young Kenyans in science and mathematics through in-training (inset) centre for mathematics and technology education in Africa (CEMASTEA News letter 2008).

In Kitui County the training takes place at Mulango Girl's High school and Muthale Girl's the attendance of teacher's decreases years despite the government involvement as a matter of policy. The situation is worsened by the lack of incentives for the teachers by the lack of incentives for the teachers by the respective schools. The researcher wants to find out the effectiveness of SMASSE project on the performance of mathematics and Science subjects in Kitui Central District.

1.2 Problem statement

The quality of an education system is a very crucial determinant of economic development and social stability of the nation (Mwanzia and Miano, 2007). Research reveals that while both the quality and quantity of schooling is a matter for economic growth, quality is much more important (Woessmann, 2006). Mathematics and science as a learning subject is an integral part of the Kenyan secondary school curriculum. SMASSE program has since inception had several challenges at first the idea was accepted nationally and the teachers were motivated by the new idea however, when the program was decentralized SMASSE project lost its meaning and teachers are forced by the ministry. In Kitui County the training

takes place at Mulango Girl's High school and Muthale Girl's High school the attendance of teacher's decreases year by year despite the government involvement as a matter of policy. The situation is worsened by the lack of for the teachers by the respective schools. The performance of Mathematics and Science subjects has been dismal despite the efforts put by the Ministry of Education in Kitui Central district. The researcher wants to find out the factors affecting the effectiveness of SMASSE project on the performance of mathematics and Science subjects in Kitui Central District.

This study therefore, sought to investigate the factors influencing the effectiveness of SMASSE project on the performance of Mathematics and Science subjects in Kitui Central District.

1.3 Purpose of the study

The purpose of this study was to establish the factors influencing the effectiveness SMASSE project in the performance of Mathematics and Science Subjects in Secondary Schools in Kitui Central District.

1.4 Objectives of the study

The main objective of this study was to establish the factors influencing the effectiveness of SMASSE project on the performance of mathematics and science subjects. To achieve this objective the study was guided by the following specific objectives;

- i. To examine the influence of structure on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects.
- ii. To determine the influence of the INSET curriculum on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects.

- iii. To ascertain the influence of teachers' training on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects.
- iv. To examine the influence of school environment on effectiveness of SMASSE project in the performance of Mathematics and Science subjects.

1.5 Research Questions

The study was guided by the following research questions;

- i What is the relationship between structure and effectiveness of SMASSE project on the performance of science subjects in Kitui Central District.?
- ii How is the structure of the SMASSE project affecting the performance of mathematics and science subjects Kitui Central District.?
- iii What is the influence of teachers' training on the effectiveness of SMASSE project on the performance of mathematics and science subjects Kitui Central District.?
- iv What is the influence of school environment on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects.?

1.6 Significance of the study

This study will be significant to the government of Kenya, students and parents to understand the factors influencing the effectiveness of SMASSE project in Kitui Central District. It will help education stakeholders to find ways of making SMASSE more relevant to enhance mathematics and science subjects teaching and hence better the overall performance of Mathematics and Science subjects.

It is expected that the study will be of use in creating awareness to teachers so as to be able to utilize the resources made available through the SMASSE project.

1.7 Delimitations Of The Study

This study was carried out in Kitui Central District, Kitui County. It involved public secondary schools of the district; this region has no unique socio-cultural practices similar to ASAL regions. The findings will be universal and so will be applied to neighbouring districts or even the entire county.

1.8 Limitations of the Study

Not all the respondents participate 100% in their responses as some may either lack interest or have no time. The researcher also had no control over the attitudes of the respondents. The researcher was limited by time and resources and therefore only reached purposely selected schools in the district.

1.9 Basic Assumptions

The researcher assumed that the Government of Kenya was in full support of the SMASSE project. It was also assumed that the staff establishment in mathematics and science subjects in the public and private secondary schools was satisfactory and more so in Kitui Central District.

1.10 Definition of Significant Terms.

Performance - Means or Act Of Accomplishing A Certain Task As Intended.

Effectiveness –The act of producing the intended result or successful result.

Effect A result or condition produced by a cause.

Training Processes of providing employees with specific knowledge and skills, to enable them perform specific work tasks

In-service Training Planned courses and activities in which a serving teacher, head teacher, school inspector or educational administrator may participate for the purpose of improving his/her instructional or professional knowledge, interest or skills.

Pre-service Training in a teachers' college, where a student teacher is introduced to the knowledge and skills needed to do a professional job in teaching.

Actualization A teacher preparing for a lesson and doing the actual teaching in the classroom as others in the group observe and note areas that need improvement

SMASSE Centers Schools selected as venues for SMASSE training. They had good facilities and were given more facilities and equipment for purposes of the training.

Actualization Centers Schools where aspects SMASSE training for example, ASEI and PDSI were put into practice. Prior arrangement had been made hence students were available.

Participant Schools Other schools in the district used as samples for study regarding SMASSE.

Attitudes Away of feeling or thinking about someone or something, especially as this influences ones behaviour.

CHAPTER TWO: LITERATURE REVIEW

2.1 Introduction

This chapter reviews the literature of the study based on the following sub-thematic areas; the influence of the organizational structure of SMASSE, the effect of SMASSE INSET curriculum, influence of teacher attendance and the influence of the school environment on the effectiveness of the SMASSE project the performance in Mathematics and Science. This chapter's main aim was to highlight the relevant information regarding the key areas the researcher shall be intending to centre his study on.

2.2 Structure of the SMASSE Project

Human resource development has been a top priority for the development of Kenya through education. Therefore, there has been a need for comprehensive training policy that would produce adequate manpower for development. Studies on quality of education in Kenya indicated poor quality and performance especially in mathematics and science compared with that of social science subjects. Due to resource constraints and need to improve quality of mathematics and science education, the GOK/MOE requested assistance from the development partners and the Government of Japan (GOJ) responded positively.

SMASSE INSET is delivered through a two-tier cascade system in which training is conducted at national and district levels. At national level, the national trainers facilitate INSET for district trainers, who in turn train all the other mathematics and science teachers in their respective districts throughout the country. The curriculum for the INSET is designed and divided into four cycles of ten days each year. This is to allow trainers and teachers to be free for two weeks during the school holidays and to ensure that lessons learnt are applied as soon as possible to benefit learners. Each of the four cycles has specific emphasis but cover a

wide range of relevant aspects in teaching and learning of mathematics and sciences in the classrooms.

2.2.1 Administrative Structure

The structure of administration of SMASSE Project includes three committees namely: The Joint Coordinating Committee (JCC), The National Working Committee (NWC), District Planning Committee (DPC). The JCC is chaired by the Permanent Secretary MOE. Its membership includes the following: Education Secretary; Director of Higher Education; Director of Policy and Planning, MOE; Director of Quality Assurance and Standards (QAS); Chief Finance Officer, MOE; Director, Kenya Institute of Education (KIE); Secretary, Teachers' Service Commission (TSC); Secretary, Kenya National Examinations Council (KNEC); Representative of Universities-from Kenyatta University (KU); Kenya Secondary Schools' Heads Association (KSSHA); Provincial Directors of Education (PDE); and Director, CEMASTE. SMASSE Newsletter (2001). The National Working Committee chaired by the Director, CEMASTE is responsible for: coordination of all the day-to-day activities of SMASSE INSET programmers throughout the country.

The DPC is composed of; District Education Officer (DEO) as the chairperson; District Quality Assurance and Standards Officers (DQASO); chairman of principals' association (sponsor) who is also the DPC treasurer; SMASSE district trainers' representative; and INSET Centers' principals. The DPC is responsible for the following roles which include: Selection and training of district trainers in collaboration with the national office; raising funds, budgeting and general management of District INSET, preparation of training materials in consultation with the national office. SMASSE Newsletter (2002)

The activities of the SMASSE Project are aimed at changing traditional teacher-centred teaching methods and equipping teachers with necessary skills for classroom practices that put emphasis on activity-oriented ways of teaching and learning that include: Creating opportunity for learners to take responsibility for their own learning; Employing inquiry-based approach as opposed to recipe-type experiments; Encouraging improvisation not only to augment conventional equipment, apparatus/materials but also to arouse interest & curiosity among learners; Encouraging teachers to draw content and examples from the learners' real life experiences in order to capture their interest and imagination; Foster teachers' ability and appreciation for work planning; Systematic execution of the learner-centered teaching/learning process; Evaluation of the teaching-learning process against lesson objectives & outcomes; Use of feedback obtained to improve ongoing lessons and in subsequent ones. After being in-serviced, teachers are expected to use student-centeredness, activity-based teaching experiment and research approaches in their teaching. SMASSE Newsletter (2005)

The rationale for effective management of SMASSE INSET is to operate within existing educational structures. Similarly, assignment of staff whose salaries do not raise recurrent costs enhances ownership and sustainability of in-service education and training. Furthermore, in order ground professional development in classrooms, assignment of experienced and practicing teachers ensures familiarity with targeted educational contexts and professional growth through peer-mentoring, unlike if the programs were facilitated by university staff. The characteristics of staff at the national and district in-service centers enhance their confidence in facilitation of workshops and motivate them to be part of change agents in mathematics and science education.

At the beginning of the project, the MOE/TSC recruited 8 national trainers on merit, 2 each from Mathematics, Physics, Chemistry and Biology departments who were trained in Japan

and subsequently deployed as full-time staff in the project. As colleagues the 8 Kenyans worked with the Japanese personnel to develop materials, management procedure/system and activities for the INSET. Currently, the national office at the Centre for Mathematics, Science and Technology Education in Africa (CEMASTE A) is manned by 61 Kenyans and 4 Japanese. The JICA training of Kenyan personnel in Japan and elsewhere has continued since 1999 for effective implementation of SMASSE INSET and general capacity building in education. From 2002, JICA has facilitated training of SMASSE Project officials and critical stakeholders in various universities in Japan, the Philippines and Malaysia. More opportunities for capacity development of teacher trainers, education managers and teachers have made available at the CEMASTE A (national) and 106 district training centers' through the two-tier cascade system as at September, 2006. SMASSE baseline Survey (2005)

JICA also seconded short-term and long-term experts to the project to provide technical assistance on quality INSET. Capacity development of Kenyans through technical cooperation has also been effected through long-term training, short-term exchange visits, study tours, seminars, workshops, and mentoring by short-term and long term Japanese experts. There are annual stakeholders' workshops to review progress and achievements of SMASSE INSET, challenges encountered and way forward. They also provide opportunities for capacity building for SMASSE-INSET, general education and school management. The objective of the stakeholders' workshop is primarily to sensitize, deliberate and make recommendations to guide the project activities. (SMASSE Newsletter, 2008) Principals are responsible for ensuring effective and efficient implementation of curriculum at school level. The theme of Principals' Workshop has been 'Resource Mobilization, Prioritisation and Utilisation for Effective Teaching and Learning of Mathematics and Science'. The objectives of the workshop are to sensitize principals on: Baseline conditions that necessitated SMASSE as well as the intervention strategies adopted by the SMASSE Project.

The, QASOs similarly undergo SMASSE training in order to be conversant with the principles and practices of SMASSE INSET- the ASEI- PDSI Approach. This also reduces conflict between them and the SMASSE in-serviced teachers. In addition, the officers are in charge of organization and management of SMASSE INSET at district level. (SMASSE Newsletter 2008). The DEOs have to oversee the management of education activities within a district. More significantly, as the chairperson of SMASSE DPC, the DEO influences effective implementation of SMASSE District INSET activities. During the workshops the role of the DEO in the implementation of the SMASSE INSET are emphasized as he/she is responsible for sensitization of stakeholders within the district on the need for INSET for mathematics and science teachers and ensuring efficient collection and remittance of SMASSE funds by principals and their management. SMASSE Newsletter (2002)

2.3 SMASSE INSET Curriculum

In Service Education and Training (INSET) is defined by the (OECD) project as those education and training activities engaged by primary and secondary school teachers and principals following their initial professional certification and intended mainly or exclusively to improve their professional knowledge, skills and attitudes in order that they can educate children more effectively. The current SMASSE INSET is based on a curriculum, developed from the results of a Baseline Survey carried out in 1998 and findings of SMASSE Curriculum Review Committee (SCRC) which was commissioned by the Chief Inspector of Schools in September 2001 (SMASSE, 2002). This curriculum consists of general topical issues in secondary school mathematics and science education, topic areas that are of concern to both teachers and students in the four subjects that is Biology, Chemistry, Mathematics and Physics are revisited and various measures proposed on how to tackle them in classroom situations. For example, in order to address the problem of curricula transition there is

sessions on Form One Induction and Syllabus/ Textbook analysis. The subject sessions are organized to include identification of relevant resources and provide opportunities for peer-teaching by participants.

The guiding principle of SMASSE INSET is the ASEI/PDSI pedagogical paradigm. ASEI principle involves providing meaningful teaching Activities focused on Student learning mainly Experimental/practical work and Improvising resources where necessary.

PDSI approach embraces orderly steps of executing learning activity by first Planning for the activity, then Doing it while Seeing, observing with intent to evaluate and then finally Improving on the process. (ADEA, 2005; Republic of Kenya, 1988; World Bank, 2007; UNESCO, 1996). SMASSE INSET is delivered through a two-tier cascade system in which training is conducted at national and district levels. At national level, the national trainers facilitate INSET for district trainers, who in turn train all the other mathematics and science teachers in their respective districts throughout the country.

The curriculum for the INSET is designed and divided into four cycles of ten days each year. This is to allow trainers and teachers to be free for two weeks during the school holidays and to ensure that lessons learnt are applied as soon as possible to benefit learners. Each of the four cycles has specific emphasis but cover a wide range of relevant aspects in teaching and learning of mathematics and sciences in the classrooms.

2.3.1 Teaching and Learning Mathematics

Gates (2001) notes that in order to prepare mathematically literate citizens, the 21st century classrooms need to be structured so that mathematics and science subjects can be learned with understanding. Teaching for understanding has to focus on ways of creating learning environments so that students learn with understanding. When students acquire knowledge with understanding they can apply that knowledge to learn new topics and solve new and

sessions on Form One Induction and Syllabus/ Textbook analysis. The subject sessions are organized to include identification of relevant resources and provide opportunities for peer-teaching by participants.

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unfamiliar problems. When students do not understand concepts they perceive each topic as an isolated skill and they cannot apply their skills to solve problems not explicitly covered by instruction nor extend their learning to new topics. Furthermore when students learn skills in relation to developing understanding not only does understanding develop but mastery of skills is also facilitated. Gates (2001) further argues that understanding mathematics for instruction involves more than understanding mathematics taught in the university mathematics content courses. It entails understanding how mathematics is reflected in the goals of instruction and in different instructional practices.

Knowledge of mathematics must also be linked to knowledge of student thinking so that teachers have conception of typical trajectories of student learning and can use this knowledge to recognize landmarks of understanding in individuals. Teachers need to reflect on their practices and on ways to structure their classroom environment so that it supports student's learning with understanding they need to recognize that their own knowledge of mathematics and of student thinking as well as in student understanding is not static. Teachers must also take responsibility for their own continuing learning about mathematics and students. He further emphasizes that classrooms and instructions should be designed to further not only learning with understanding but also teachers 'knowledge and students' thinking.

According to Buther & Wren (1960) at every stage the teacher of mathematics is confronted with three basic problems namely:- Firstly, helping these students to develop understanding and mastering of concepts, principals, relationships and skills in mathematics, Secondly, helping them to maintain understanding and skills already attained in their real life, Thirdly, helping them to secure transfer of learning to their physical and solid environment in mathematics and science subjects. Smith B.O as cited by Perrot, (1982) suggested that a

teacher should be prepared in the four areas of knowledge: Command of theoretical knowledge about learning and human behavior.

Display of attitudes that foster learning and genuine human relationships. Command of knowledge in the subject matter to be taught. Control of technical skills of teaching, which facilitates pupil learning. The National Research Council (NRC; 2001) indicates that for a mathematics teacher to be "Mathematically proficient" he/she is required to acquire five types of mathematical competences. Conceptual understanding: comprehension of mathematics concepts, operations and relations. Procedural fluency: skill in carrying out procedures flexibly, accurately, efficiently and appropriately. Strategic competency: ability to formulate, represent and solve mathematics problems. Adaptive reasoning: capacity for logical thought reflection, explanation and justification. Productive disposition: habitual inclination to see mathematics as sensible, useful and worthwhile coupled with a belief in diligence and ones own efficacy (NRC 2001)

A part from having knowledge of mathematics beyond what a teacher teaches, Maxwell (1983) indicates that teachers must also have an understanding and acceptance of students. Mathematics teaching at all levels should include opportunities for exposition by the teacher, discussion between teacher and pupils and between pupils themselves, appropriate practical work, consolidation an practice of fundamental skills and routines, problem solving including application of mathematics to everyday situations and investigating work. (Orton and Frobisher 1996) Axiah (2004) goes further to state that management of learning deals with factor that are directly under the control of the teachers, which include teaching methodology which is employed while the student sensitivity implies that there are factors that would be attributed to the students and finally mathematical challenges dealt with the level of learning.

A close examination of the SMASSE baseline findings can lead to rearranging of the challenges and identifying teacher related challenges. These are the attitude of the teachers, lack of appropriate teaching methodology that includes teacher centered methodology lack of adequate experimental skills and low frequency of experiments.

2.3.2 Teacher Related Factors That Influence The Quality Of The Teaching / Learning

Using the modified Axiah (2004) model, the teacher related factor that have an impact in teaching / learning and eventually performance of students in mathematics in secondary school can be subdivided into six categories namely: Attitude of teachers, Teaching Methodology, Adequate experimental skills and Frequency of experiments, Mastery of content, Assessment of the students by teacher and interaction opportunities among teachers.

John and Karaac (2004) state that teacher's belief about mathematics teaching / learning have a significant influence on their instructional practices. They go on to state that in some cases teachers beliefs about mathematics teaching / learning are not consistent with classroom practices and though the teachers are aware of the conflict between them, they never try to change. The assumption is usually that awareness of difference between beliefs and practices would result in some attempt to change (Lerman 2002). Wells & Joe (2005) states that most of the teacher's aims of the mathematics teaching was not to teach mathematics basically but to prepare students for examination purposes to make sure that students be able to answer the questions that they will face in the examination in the most practical and easiest way. According to SMASSE (1998) baseline report teachers were said to display a neutral attitude towards teaching of mathematics. It has been established that classroom instructions is critical factor in improving the educational outcome of students (Falk 2003). During class observations / Video recording the following problems were identified in the baseline survey (SMASSE 2001). The teaching was too much teacher centered. Teachers lacked ability to carry out experiments or demonstrations successfully and low frequency of experiments.

It is noted that traditional mathematics classrooms use lecture and textbook format, which requires students to employ rote memorization and does little to challenge students to think about the process of mathematics. However, human's possess broad range of abilities that the traditional approach to learning pays no attention to. According to Fischer and Raymond (2005) student's engagement is a complex concept that indicates scores of internal and external factors. The instructional choices teachers make and strategies they employ daily can help spark heightened engagement with the curriculum. Bersonondal (2005) and Jerald (2002) seem to be in agreement as they state that the methodology of teaching is of importance if the students have to achieve high academic standards. As per the baseline finding of SMASSE (2001) most lessons were taught using lecture methods where students were involved in note taking, doing assignment, calculations on the chalkboard and answering questions. The baseline findings concur with Bersonondal (2005) who states that traditional way of teaching mathematics is lecturing where students memorize procedures and formulae. He goes on to say that the teachers are not concerned with ability differences in the pupils and the students who perform well are the ones who respond to questions and or drill based system of mathematics education.

As for the low learners who are less adaptive to the lecture methods, their voices are rarely heard in the classroom, they are late in their class work and the teachers are usually not aware of their learning problems. In order to improve the performance in mathematics, SMASSE approach in improving the methodology was in the use of ASEI technique, which involves full involvement of the students in learning mathematics. Fischer and Raymond (2005) states that elements of student centered classroom promote heightened academic engagement. Cooperative learning strategies one-to-one instruction, accommodating students' preferences, giving students choices in instruction and assessment and independent work yield higher

levels of observable engagement. Cooperative learning involves the usage of small groups to foster effective mathematical teaching where each student is expected to participate fully in discussion while it is expected that there will be no dominance by one student in a group.

The method further enhances communication, problem solving, logical reasoning and the making of mathematical connections. He continues to say that the advantages of cooperative learning include having an academic achievement, self confidence of the learners and use of social skills. By placing students in small groups the method ensures every student contributes and takes an active role in discussing mathematical concepts. Further the teacher plays a captivating role in successful development and sustainability of group dynamics in the learning process. The role of the teacher also includes ensuring that the student realizes that the success of the group depends on the impact of each student in the group and the need for positive interdependence. Students are encouraged to listen to other's ideas, discussing over and accepting constructive comments and develop positive social skills. The teacher is also expected to monitor and intervene and should move from one group to another group, giving assistance and encouragement, should not provide readymade solutions to any call from a student instead should ask appropriate questions and encourage such a student to rethink on the method and strategy they are using and consider alternative way of proceeding.

2.3.3 Teacher Mastery of Content.

From the SMASSE survey findings of SMASSE (2001) young teachers seemed to find difficulties in determining the level of content to give their students explanations of concepts was sometimes not done satisfactorily due to lack of mastery of content. This was similar to what Jerald (2002) defines as out of field teaching which is a situation where teachers lack minimum academic qualification in the subject they taught. Bersonondal (2005) was of the opinion that the academic mastery of the subject being taught is of utmost importance if the

students are to achieve high academic standards since deep conceptual understanding leads to increased procedural fluency and confidence.

2.4 Teacher inset attendance.

Frequency of Seminars and INSET SMASSE (2001) report stated that the frequency of seminars and INSET were disapprovingly very low. Smylie (1992) notes that seminars and intellectual interactions among teachers can enhance developing curricula and new instructional programmes and planning professional development programmes for teachers related to the implementation of those programmes.

2.4.1 Role of the Teacher in Teaching Mathematics

Taiwo (1994) argues that for a teacher to be a specialist he must know his subjects well and be able to interpret the syllabus with a view of promoting mathematics learning at that level. He should keep in view the needs of the future mathematicians that would create more mathematics, the future engineers, biologists, chemists, physicists, agriculturalists and other scientists who need mathematics for their work, the intermediate level workers and the secondary level. Scopes (1973) notes that today emphasis is no longer so much on teaching by the teachers as on learning, in but to make the process of education efficient. Depending on the predetermined lesson teachers also need to be sensitive to ways in which different teaching methods foster different types of mental activity and the degree to which a particular activity brings about the desired learning. Kyriacou (1997) observes two main ways of fostering pupils learning as teacher exposition and academic work. Gachenga (2007) notes that the use of practical activities in teaching should be emphasized. This is aimed at boosting learning. Butter and Wren (1960) asserts that on its part laboratory work in mathematics and science serves not only to stimulate interest but provides a most effective means of

classifying many mathematical and science concepts and relations through experience of associating them directly with physical things.

2.4.2 In Service Education and Training

In Service Education and Training (INSET) is defined by the (OECD) project as those education and training activities engaged by primary and secondary school teachers and principals following their initial professional certification and intended mainly or exclusively to improve their professional knowledge, skills and attitudes in order that they can educate children more effectively. Greenland (1993) divides INSET into four categories: INSET for unqualified teachers which is done mainly for certification. INSET to upgrade teachers. INSET to prepare new roles such as principals, teachers, educators, quality assurance and standards and education officers.

Curriculum related INSET linked with planned curriculum change or ad hoc refresher course.

In INSET, the trainees come with hope of being strengthened in their profession. INSET planning is based on needs of pupils, teachers and Departments within the school, the school itself, the District or even the Nation. In addition the needs assessment should consider the current situation and the aspirations of the stakeholders. Fullan (1982) identified four factors as crucial for successful staff development these are redefining staff development as a process of learning, the role of leadership at the school development, organizing culture at the school level. The Ministry of Education (MOE) has the the responsibility of maintain standards in education. The efforts of in servicing teachers are done through the institution within the Ministry and with donor supported projects and non-governmental organizations. All the in – servicing courses are accredited and certified. The in – service courses are given value by the Ministry to ensure that the providers give very high quality courses (MOE, 2000), the sustainability of in service providers is based on the criteria that they have:-

The technical capacity to support MOE in developing the course, the provider has the financial base for sustainability.

2.5 School Environment

Teachers and the entire school environment have a profound effect on the learning environment of students in their classrooms. Given the great importance given to the teaching of science and inculcation of positive attitudes to science it was both timely and opportune to examine classroom environment, students' perceptions of assessment tasks, academic efficacy and their associations with attitude to science. Successful implementation of teaching strategies to teach science is likely to result in the establishment and maintenance of positive students' attitudes to science and consequently, achievement. Previous research has shown that students' perceptions of classroom environment are related to attitudes to science (Fisher & Waldrup, 1999; Klopfer, 1992). This study built on these findings by including students' perceptions of assessment tasks as a construct in a hypothesized model that predicts student attitudes to science. This affects the way students perceive mathematics and science thereby affecting their performance.

2.5.1 Conflict Resolution

Conflict may have either a positive or a negative effect on organizational performance, depending on the nature of the conflict and how it is managed Armstrong (2009). For every organization, an optimal level of conflict exists which is considered highly functional as it helps to generate good performance. When the conflict level is too high (dysfunctional), performance suffers. Consequently, innovation and change may become unmanageable and the organization may not adapt to change in its environment (Beardwell and Claydon, 2007). According to Advisory, Conciliation and Arbitration Service (2004) the informal resolution of dissatisfaction is an essential part of effective day-to-day management. Most difficulties

can be resolved as they arise but more formal arrangements are necessary when dissatisfaction in the employment relationship becomes unresolved conflict.

For a group to be effective, individual members need to be able to work in a positive conflict environment. If conflict is well managed, it adds to innovation and productivity (Murthy, 2006). Bricoe and Schuler (2004) have offered procedures for turning dysfunctional conflict into functional conflict, stating that too many organizations tend to take a win-lose, competitive approach to conflict or at worst avoid conflict altogether. Such a negative view of conflict ensures that a group is ineffective and the activity within it becomes destructive. However, a positive view of conflict leads to a win-win solution. Within a group, the member can take any one of the three views of conflict: dysfunctional conflict, conflict avoidance and functional conflict.

2.5.2 Physical Resources

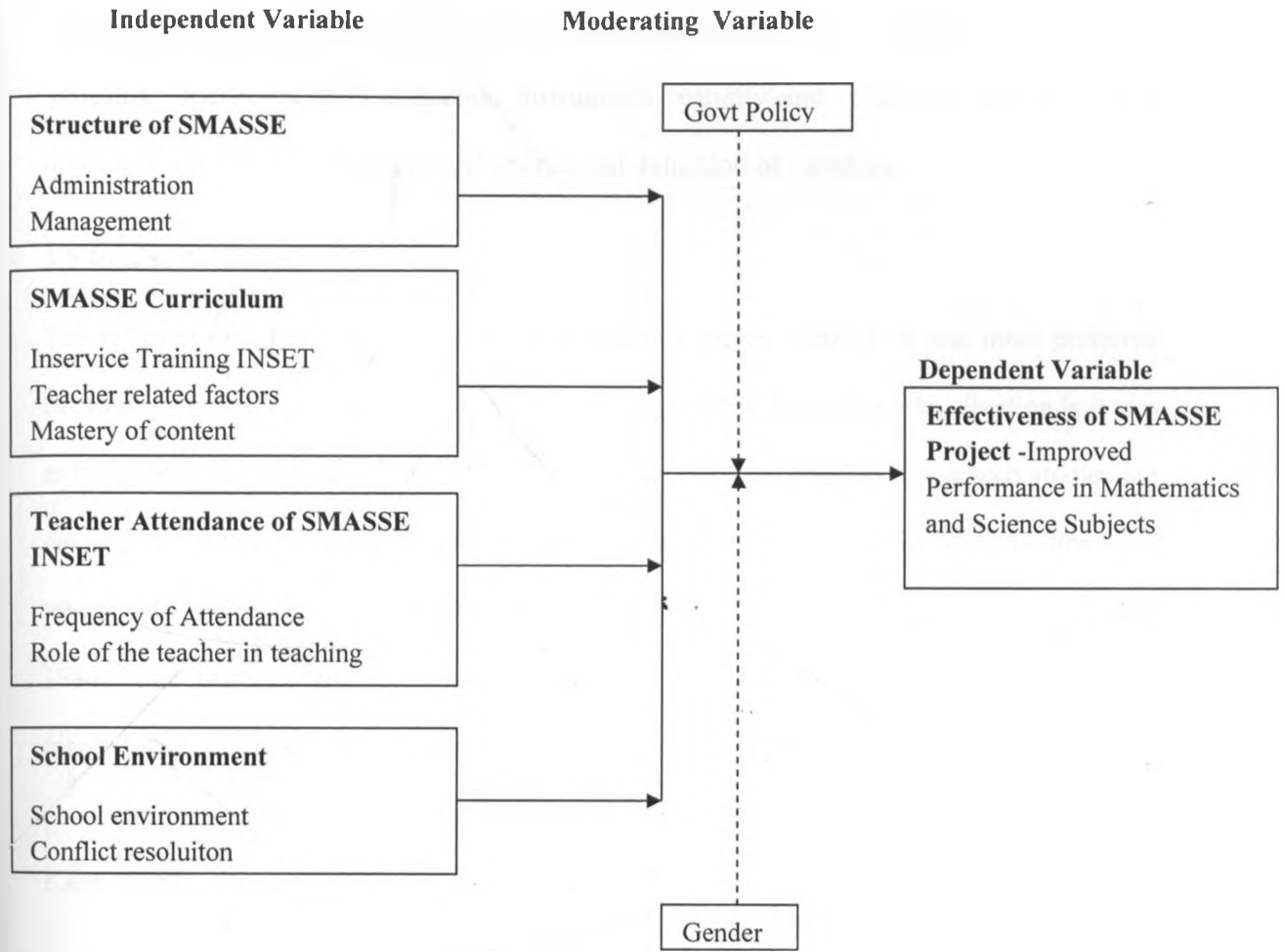
Since the very beginning humanity has done a lot to facilitate their lives with all physical facilities of the world. The first need aroused for the human beings was the physical comfort, physical facilities provide, maintain safe, clean and relate educational environments that are conducive to high achievements of the students. Heynemann (1980) supports the idea that the developing countries have low levels of learning among children can be partly attributed to poor and inadequate facilities in schools. Instructional materials which are educational inputs are of vital importance to the teaching of any subject in the school curriculum. Wales (1975). Wales had the opinion that, the use of instructional materials would make discovered facts glued firmly to the memory of students. Savoury(1958) added that a well planned and imaginative use of visual aids aids in lessons should banish apathy, supplement inadequacy of books as well as arouse students interests and by giving them something practical to see and do at the same time helping them to train them to think things out by themselves.

Savoury (1958) said that selection of materials which are related to the basic contents of a course or a lesson. It helps in depth understanding of a such a lesson by the students in that they make the lesson by the students in that they make the lesson interesting to them. This not only arrests their interest but also motivates them to learn more about such a subject area. In enumerating the factors that could be responsible for varying intra and inter school/academic achievement, Coombs(1970) listed four important factors including the acute shortage of instructional resources which he said constrained educational systems from responding more fully to new demands. He claimed that in order do their part in meeting the crisis in education systems will need a fuller share of the nations' manpower not merely to carry on the present work of education but also raise its quality, efficiency and productivity . They will need buildings, equipments and more learning materials in order to achieve educational goals and objectives.

2.6 Summary of the literature review

A lot has been said but little study has been researched on the factors influencing the efficiency of SMASSE project on the performance of mathematics and science subjects. While the structure of SMASSE is meant to increase its efficiency little study has however been done to establish the relationship between the structure and effectiveness in delivering satisfactory results in both mathematics and science subjects. The SMASSE curriculum is substantive and extensive yet there is little known about studies done linking the SMASSE curriculum and performance of mathematics and science subjects.

2.7 CONCEPTUAL FRAMEWORK.



Intervening variable

CHAPTER THREE: RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the research design, target population, of the study, sample size and sampling procedures, data collection instruments, validity and reliability, data collection procedure, ethical considerations and operational definition of variables.

3.2 Research Design

The research design for this study was a descriptive survey method. It was most preferred because it enabled data collection from a large sample. This determined the situation is it was at the ground in terms of opinions or attitudes.(Gay, 1976). Descriptive research studies are designed to obtain pertinent and precise information about current status of phenomena and whenever possible to draw valid general conclusions from the facts discovered.(Lokesh 1984). The methods are non experimental as they deal with relationships and are non manipulated variables. Since the events or conditions have already occurred or existed the researcher only selects relevant variables for their analysis of their relationships (Best and Kahn,1998).

This was a descriptive study of the current situation in secondary schools in Kitui Central District regarding the factors influencing the effectiveness of the SMASSE project in the district. The respondents were required to rate their level of satisfaction as relates to the various items listed.

3.3 Target Population

A target population is defined as a complete set of individuals' cases or objects with common observable characteristics. Mugenda (1999).

The study targets secondary school principals, science teachers in secondary schools. According to the District Education Officer's office the district has 26 registered public secondary schools and 2 private schools. The study will focus on 25 secondary schools with a population of one hundred and twenty five mathematics and science teachers and twenty five principals. There were 3 girls only schools, 3 boys only schools and 21 mixed day schools. The schools that met the conditions of the study were those which had presented candidates for KCSE for at least the last five years.

3.4 Sampling Procedure and Sample Size

3.4.1 Sampling Procedure

In order to obtain the sample of the schools the researcher used the stratified random sampling technique to select. The researcher used 33% of each category to select in each category to select the number of schools to be used in the study.

3.4.2 Sample Size

Borg and Gall (1996) defines a sample as a small portion of a target population selected for analysis. Kitui Central District secondary schools are shown in APPENDIX II. For the purpose of this study the schools are categorized as boys, girls, mixed day and private schools. Two schools were selected from each category. The researcher sampled eight principals out of the possible twenty five which comprised 30% of the sample. The researcher also sampled 126 mathematics and science teachers in Kitui Central district.

3.5 Data Collection Instruments

The main data collection instrument is a questionnaire. The questionnaire was most preferred because a large number of respondents could be reached within a limited time. It also ensured

confidentiality and thus gathered more candid and objective responses. The questionnaires had been prepared for principals and science teachers. (Appendix VI, VII).

3.6 Instrument Validity.

Kothari (2003) defines validity as the degree to which an instrument measures what it is intended to measure. The researcher shall ensure there is no ambiguity on the part of the questions in the questionnaire and also by consulting experts with vast experience in fieldwork. The researcher shall also use the split half method on the target population in order to ensure clarity of the instrument.

3.7 Instrument Reliability

Mugenda (1999) defines reliability as the measure or degree to which a research instrument yields consistent results or data after repeated trials. Ary(1979) defines reliability of a measuring instrument as the degree of consistency with which it measures whatever it is meant for. Reliability is affected by random error. Random error is the deviation from a true measure due to factors that have not been adequately addressed. As random error increases reliability decreases. These errors may arise from inaccurate coding, ambiguous instructions to the respondents, interview fatigue and interview bias.

3.8 Data Collection Procedure

Data was collected using the questionnaires, which had both closed and open ended questions. These allowed for the researcher to obtain information in depth. The respondents' opinions were catered for in some open ended questions concerning key issues. The researcher also visited the various schools and collect data filled in questionnaires. The respondents were assured of strict confidentiality on the information filled in the questionnaires. The visits were made early in the morning and filled questionnaires collected in the evening.

3.9 Ethical Considerations

Ethics has been defined as that branch of philosophy which deals with one's conduct and serves as a guide to one's behavior, and so, most professions have ethical guidelines which govern their profession. Kovacs(1987).

In the same light Dooley (2007) asserts that, ethics involves the study of right and wrong conducts hence the concern for ethics may be seen as part of the historical trend in civil and human rights. Great care was taken to assure respondents that all information will be treated with a lot of confidentiality. This research was aimed at producing knowledge beneficial to the Ministry of Education, The Government of Kenya concerning the factors influencing the effectiveness of the SMASSE project on the performance of mathematics and Science subjects in Kitui Central District.

3.10 Operational definition of variables

Operational definitions are specific ways in which real cases can be classified into categories of the concept researcher wants to use in his/her research. Operational definition helps one to measure the variables appropriately. There may be several given indicators for any given concept. Operational definition is a description of a variable, term or object in terms of the specific process or set of validation tests used to determine its presence and quantity.

The table below shows how the variables were operationalised so as to have them measurable.

Table 3.1 Operational definition of variables.

The variables used in this study were operationalised as shown in the table below;

Objective	Variables	Indicators	Measurement Scale	Tools of Analysis	Types of Tools
To examine the influence of the structure on the effectiveness of the SMASSE project in the performance of Mathematics and Science subjects.	<p><u>Independent Variable</u> Administrative structure.</p> <p><u>Dependent Variable</u> Effectiveness of SMASSE project on the performance of mathematics and Science subjects.</p>	Enhanced efficiency of the mathematics and science teachers.	Ordinal	Measures of Central Tendency	Mean, Mode, Frequencies.
To determine the influence of INSET curriculum on the effectiveness of SMASSE project in the performance of mathematics and Science subject.	<p><u>Independent Variable</u> SMASSE Curriculum</p> <p><u>Dependent Variable</u> Effectiveness of SMASSE project on the performance of mathematics and Science subjects.</p>	High involvement of students in teaching learning activities	Ordinal	Measures of Central Tendency	Mean, Mode, Frequencies.
To ascertain the influence of teachers on the effectiveness of the SMASSE project in the performance of Mathematics and science subjects	<p><u>Independent Variable</u> Teachers' SMASSE INSET attendance.</p> <p><u>Dependent Variable</u> Effectiveness of SMASSE project on the performance</p>	High turn over for INSETS.	Ordinal	Measures of Central Tendency	Mean, Mode, Frequencies.

	of mathematics and Science subjects.				
To examine the influence of the school environment on the efficiency of the SMASSE project on the performance of mathematics and science subjects.	<p><u>Independent Variable</u></p> <p>School environment</p> <p><u>Dependent Variable</u></p> <p>Effectiveness of SMASSE project on the performance of mathematics and Science subjects.</p>	High mean scores in Mathematics and science subjects	Ordinal	Measures of Central Tendency	Mean, Mode, Frequencies.

CHAPTER FOUR: DATA ANALYSIS,PRESENTATION AND INTERPRETATION.

4.1 Introduction

The main purpose of this study was to investigate the factors influencing the effectiveness of SMASSE project on the performance of mathematics and science subjects. Data was collected using the questionnaires as the main instrument. The questionnaires were administered to total of 75 respondents comprising of 8 principals and 67 Mathematics and Science teachers were used in the study. Data was analyzed using. The data collected were analyzed using frequency tables with percentages followed by an explanation.

In order to achieve this objective the study was guided by the following specific objectives;

- i. To examine the influence of structure on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects.
- ii. To determine the influence of the INSET curriculum on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects.
- iii. To ascertain the influence of teachers' training on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects.
- iv. To examine the influence of school environment on effectiveness of SMASSE project in the performance of Mathematics and Science subjects.

4.2 Instrument Return Rate

Data collection instrument was the questionnaire for the principals and for the science teachers. As per the sample design a total of 75 respondents comprising of 8 principals and 67 Mathematics and Science teachers were used in the study.

Table 4.1: Respondents Instrument Return Rate

	Responses	Percent
Principals	8	10.7
Maths and Science teachers	67	89.3
Total	75	100

According to the table 1, principals interviewed formed 10.7% of the respondents while Mathematics and Science teachers formed 89.3%.

4.3 Science and Mathematics teachers demographic data.

The respondents were required to provide their demographic information about themselves. The aim of this was to establish respondents characteristics and also help in investigating various factors that influenced the factors affecting the effectiveness of SMASSE project in their respective schools.

Table4.2: Distribution by Gender

Gender	Teachers		Principals	
	Frequency	Percentage	Frequency	Percent
Male	40	59.7	5	62.5
Female	27	40.3	3	37.5
Total	67	100.0	8	100

According to this table there are more male teachers (59.7%) of both Mathematics and Science teachers than their female counterparts who formed 40.3% of the respondents.

According to this table there are more male teachers (62.5%) of both Mathematics and Science teachers than their female counterparts who formed 37.5% of the respondents.

Table4.3: Distribution of Mathematics and Science Teachers by Age

Age	Frequency	Percent
25 years and below	6	9.0
26-35	43	64.2
36-45	17	25.4
Above 46	1	1.6
Total	67	100.0

Majority of Mathematics and Science teachers were aged 26-35 years (64.2%) followed by those aged 36-45 years(25.4%), those 25 years and bellow were 9% and lastly the least group was those aged above 46 yearsat1.6%.

Table 4.4: Distribution of Mathematics and Science Teachers by Academic

Qualifications

Qualification	Frequency	Percent
Diploma	11	16.4
Degree	51	76.1
Others	5	7.5
Total	67	100.0

The teachers academic qualification has a profound effect on the degree of interaction with students and therefore the researcher requested the teachers to provide information on their academic qualifications. Those who had degrees formed 76.1%, those that held diplomas 16.4% while those with certificate were 7.5% of the respondents.

Table 4.5: Distribution of Principals by Age

Age	Frequency	Percent
26-35	1	12.5
36-45	3	37.5
Above 45	4	50.0
Total	8	100.0

Majority of Principals were aged above 45 years and they accounted for 50%, those aged between 36 to 45 years were 37.5% while those aged between 25 to 35 years were 12.5 % of the respondents in this study.

4.4 The influence of structure on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects.

The first objective for this study was to examine the influence of structure on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects. To achieve this objective, respondents were to give their responses on whether the structure was effective, discriminative, it needs to be changed in order to enhance performance, or it is an impentiment to performance plays an important role in the overall performance of the SMASSE project. The responses regarding to how much the respondents strongly agree (SA), agree (A), disagree (D), or strongly disagree (SD) to the given statements were shown below. Several tables were used to show the responses.

Table 4.6: Structure of SMASSE makes it more effective

Response	Frequency	Percent
SA	9	13.4
A	33	49.3
D	10	14.9
SD	15	22.4
Total	67	100.0

Majority of the respondents 49.3% agreed that the structure of the SMASSE project makes it more effective while 13.4% strongly agreed. 22.4% strongly disagreed while 14.9%disagreed with the statement that the structure enhances effectiveness.

Table 4.7: The structure of SMASSE makes it more effective at all levels

Response	Frequency	Percent
SA	23	34.3
A	26	38.8
D	5	7
SD	13	19.4
Total	67	100.0

Majority of the respondents 38.8% agreed that the structure of the SMASSE project makes it more effective at levels while 34.3% strongly agreed. 19.4% strongly disagreed while 7% disagreed with the statement that the structure enhances effectiveness.

4.5 The influence of the INSET curriculum on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects.

The second objective for this study was to assess the influence of the INSET curriculum on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects. Respondents were required to agree or disagree to the statement that the SMASSE curriculum helps to improve content delivery. The responses were shown on the table below.

Table 4.8:: The SMASSE curriculum helps to improve content delivery

Response	Frequency	Percent
Yes	54	80.6
No	13	19.4
Total	67	100.0

Majority of the teachers 80.6% felt that the SMASSE curriculum helps them to improve their content delivery while 19.4% were not contented with the fact that SMASSE helps them perform better in classroom.

4.6 The influence of teachers' training on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects.

The third objective for this study was to ascertain the influence of teachers' training on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects. To achieve these objective respondents were to respond to the question, "Do you think the SMASSE training has enhanced the performance of your candidates in KCSE?" by Yes or No. The results were shown below.

Table 4.9: Responses on the influence of teachers' training on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects

Response	Frequency	Percent
Yes	57	85
No	10	15
Total	67	100.0

Majority of the teachers 85% felt that the SMASSE training helps them to improve their content delivery while 15% were not contended with the fact that SMASSE helps them perform better in classroom.

4.7 The influence of school environment on the effectiveness the SMASSE project on the performance of Mathematics and Science subjects.

The last objective for this study was to examine the influence of school environment on effectiveness of SMASSE project in the performance of Mathematics and Science subjects.

To achieve this objective respondents were to state whether they strongly agree (SA), agree (A), disagree (D), or strongly disagree (SD) with the statement, "The school environment is an impediment to SMASSE". The results were shown in the table below.

Table 4.10: The school environment is an impediment to SMASSE

Responses	Frequency	Percent
SA	24	35.8
A	29	43.3
D	24	14.9
SD	4	6.0
Total	67	100.0

Majority of the respondents 43.3% agreed that the school environment is an impediment to SMASSE. While 35.8% agreed. 14.9% disagreed while 6% strongly disagreed.

CHAPTER FIVE: SUMMARY OF THE FINDINGS, DISCUSSIONS , CONCLUSIONS AND RECOMMENDATIONS.

5.1 Introduction

The main purpose of this study was to investigate the factors influencing the effectiveness of SMASSE project on the performance of mathematics and science subjects. Data was collected using the questionnaires as the main instrument. The questionnaires were administered to total of 75 respondents comprising of 8 principals and 67 Mathematics and Science teachers were used in the study. The data collected were analyzed using frequency tables with percentages followed by an explanation.

5.2 Summary of the findings

This study investigated the factors influencing the effectiveness of SMASSE project on the performance of mathematics and science subjects. It was to examine the influence of structure on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects. It was observed that the structure of the SMASSE project makes it more effective leading to improvement in performance of mathematics and science.

The study was also to determine the influence of the INSET curriculum on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects. It was established that the SMASSE INSET curriculum has been relevant to the various subject areas though it needs to be amended from time to time in order to suit to the needs of the teachers.

The study was also to ascertain the influence of teachers' training on the effectiveness of SMASSE project in the performance of Mathematics and Science subjects. The study

indicated that SMASSE training helps teachers to improve their content delivery leading to improved performance in Mathematics and sciences.

5.3 Discussion of the findings

This study investigated the factors influencing the effectiveness of SMASSE project on the performance of mathematics and science subjects. It was observed that the structure of the SMASSE project makes it more effective leading to improvement in performance of mathematics and science. The structure of SMASSE is not discriminative since it has an ascending the hierarchy. The structure therefore does not need to be changed. It was established that the SMASSE INSET curriculum has been relevant to the various subject areas though it needs to be amended from time to time in order to suit to the needs of the teachers and also enhance efficiency. The study indicated that SMASSE training helps teachers to improve their content delivery leading to improved performance in Mathematics and sciences. This is because it brings teachers from different places together enhancing interaction which makes teachers to learn more from each other.

The study showed that the school environment is a major impediment to SMASSE project. This is because the training policies required learning to be practical which is no very easy with big enrolment against teacher shortage in the country. The school environment therefore needs review so as to enhance better performance of Mathematics and Science subjects. More support is required from the school in order to enhance better performance in Mathematics and Science subjects. The laboratories where science subjects are taught were also highlighted as being poorly equipped to enable better learning of science subjects and eventually enhance better performance of these subjects.

5.4 Conclusions

From the above research findings it can be concluded that the structure of the SMASSE project has made tremendous success so far but it should be tailored to fit specific needs of the teachers in each district and that way the teachers will own the project and support its activities directly promoting the performance of Mathematics and Science subjects. The teachers should be involved more in making its structure from the lowest levels.

The SMASSE INSET curriculum has not made great success since its adoption therefore it should be reviewed from time to time so as to be relevant to enhance the performance of mathematics and science subjects. This is because the findings of this study show that the teachers need the curriculum to address their needs in classroom teaching. The findings of this study show that teacher's attendance of INSET cycles has not been satisfactory i.e.100%. This could be one of the major setbacks to enhanced performance of the SMASSE project. There has been no strict follow up on attendance of these INSETs therefore the disparities in conformance. The school environment has been cited as one of the major causes of failure to adapt to the SMASSE pedagogy. This has been either through poorly equipped laboratories, unfavorable timetabling and lack of support from the school.

5.6 Recommendations

From the research findings the researcher made the following recommendations:

- i The structure of the SMASSE should involve classroom teachers more even at higher levels each drawn from all parts of the nation.
- ii The SMASSE curriculum needs to be reviewed from time to time.
- iii The SMASSE INSETs should be regularized and all teachers to attend new teachers also to be involved from the beginning of the project not just all teachers going to attend at will.

- iv The school environment should promote mathematics and science subjects.

5.6 Suggestions for further study

Considering the limitations and delimitations of this study, the researcher would like to make the following suggestions for further study;

- i Assessment of the impact of the SMAASE project in enhancing the performance of Mathematics and Science subjects in Kitui Central District.
- ii Evaluation of the effectiveness of the SMASSE project in enhancing the performance of Mathematics and Science subjects in Kitui Central District.

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APENDICES

APPENDIX I:LETTER OF INTRODUCTION

Dear respondent,

I am a postgraduate student currently pursuing a masters degree in project planning and management at the University of Nairobi.I'm conducting an academic research on the "factors influencing the effectiveness of the SMASSE project in the performance of mathematics and Science subjects in Kitui Central District".

The questionnaire is aimed at obtaining more information about your opinions, perceptions,experience and particular issues.This will later result to valuable recommendations on how the SMASSE project in général can be improved.

My request is that you try and answer the questions as comprehensively as possible by using the available space provided.If you need additional space kindly add the same as an attachement.

Your response will be treated with utmost the confidentiality that it deserves and no name will be disclosed without your consent.

Thank you in advance.

Your faithfully,

Godfrey Issika Maithya

Reg.No:L50/65913/2011

Phone No:0722 991 770, 0735 442 484.

Email:godfrevissika@yahoo.com

APPENDIX II: SCHOOLS IN KITUI CENTRAL DISTRICT

NO	SCHOOL	TYPE OF SCHOOL
1	St Thomas Aquinas Kalawa Sec School	Boys
2	Kitui High School	Boys
3	Kwa Ngindu Sec. School	Mixed Day
4	Kasyala Sec. School	Mixed Day
5	Ivaini Sec School	Mixed Day
6	St Angelas' Girl's Sec School	Girls only
7	St Patrick's Sec.School	Mixed Day
8	Katyethoka Sec school	Mixed Day
9	Mutendea Sec School	Mixed Day
10	Mulutu Girls Sec	Mixed Day
11	Tiva Sec school	Mixed Day Mixed
12	Kyamathyaka Sec school	Mixed Day
13	Ithiiani Sec school	Mixed Day
14	Kaliakakya Sec School	Mixed Day
15	St Charles Lwanga Sec school	Boys only
16	St Ursula Girl's sec school	Girls only

17	Engineer Ngilu Sec School	Mixed Day
18	Muslim sec School	Mixed Day
19	Kwa Ukungu Sec School	Mixed Day
20	Mutukya Sec School	Mixed Day
21	Kamandio Sec School	Mixed Day
22	St. Mary's Miambani Sec School	Mixed Day
23	Mutula Sec School	Mixed Day
24	Kitui SDA Sec School	Mixed Boarding
25	ACK Archbishop Nzimbi Sec School	Mixed Day
26	St Phillip's Sec School	Mixed Boarding
27	Mutulukuni Sec School	Mixed Day
28	Kabaa Sec School	Mixed Day
29	Mulundi Sec School	Mixed Day

APPENDIX III: QUESTIONNAIRE FOR THE PRINCIPAL

Please answer all the questions by ticking appropriately after carefully reading through them.

The questions are seeking your opinion on the factors influencing the effectiveness of the SMASSE on the performance of Mathematics and Science subjects in Kitui Central District, Kitui County. The answers you give will be treated with confidentiality and will only be used for the purpose of this study. Do **not** write your name anywhere on this questionnaire

PART I: Personal Details

1. Please indicate your gender Male () Female ()
2. What is your age bracket? Below 25 years () Between 25- 35 years ()
35-45 years () Above 45 years ()
3. Please state your highest professional qualification. Diploma () B/Ed ()
M/Ed () Any Other.....

PART II. This section relates to the importance of the SMASSE project organizational structure on the effectiveness of the SMASE project. Please use a tick (✓) or a cross (×) where appropriate .

4. Do you know how the SMASSE project is organized? Yes () No ()
5. Is there a level in the structure that in your opinion feel that it should be done away with?
Yes () No ()
6. If yes, above state the level.....
7. Does the structure make the SMASSE project more relevant? Yes () No ()

The statements below describe the importance of the SMASSE project structure.

Indicate the extent to which they are agreeable to you.

SA means Strongly Agree, A stands for Agree, D means Disagree SD means Strongly Disagree.

	SA	A	D	SD
The structure of the project makes it more effective.				
The structure enhances efficiency at all levels of the project				
The structure discriminative as one ascends the hierarchy.				
The structure needs to be changed to enhance more efficiency.				
The structure is an impediment to the efficiency of the project at all levels.				

PART II: This section relates to the SMASSE INSET curriculum on the effectiveness of the SMASSE project.

8. Do you think the curriculum of SMASSE is relevant?. Yes () No ()

9. Do you think the curriculum delivered helps teachers to improve on content delivery in their respective subject areas? Yes () No ()

The statements below relate to the influence of the SMASSE INSET curriculum on the effectiveness of SMASSE project. Indicate the extent to which they are agreeable to you.

SA means Strongly Agree, A stands for Agree, D means Disagree SD means Strongly Disagree .

	SA	A	D	SD
The curriculum needs an overhaul for better results.				
The curriculum needs to be amended to suit the needs of teachers.				
The curriculum should remain as it has been since it is adequate.				

PART III: This section relates to the influence of SMASSE teacher training on the effectiveness of the SMASSE project on the performance of mathematics and science subjects.

10. Indicate the subject area which your teachers have been attending INSETS.

Mathematics () Physics () Biology () Chemistry ()

11. Do you think the SMASSE training has enhanced the performance of your candidates in KCSE? Yes () No ().

PART IV: This section relates to the influence of school environment on the efficiency of the SMASSE project on the performance of Mathematics and Science Subjects. Indicate the extent to which they are agreeable to you.

SA means Strongly Agree, A stands for Agree, D means Disagree SD means Strongly Disagree .

	SA	A	SD	D
The SMASSE training has no impact on the performance of Mathematics and Science subjects.				
The frequency of attendance of SMASSE INSETS enhances performance.				
The SMASSE training is more beneficial to some subject areas only.				
The SMASSE training is a motivator to better performance in classroom teaching.				

PART V: This section deals with the influence of the school environment on the effectiveness of the SMASSE project on the performance of Mathematics and Science subjects.

15. Does your school facilitate your attendance? Yes () No ()

16. Does your school have separate laboratories for each science subject?

Yes () No ()

17. Does the school block timetable allow for separate times for science subject lessons?.

Yes () No ()

PART VI: The statements below relate to the influence of the school environment on the effectiveness of the SMASSE project in the performance of mathematics and Science subjects. Indicate to what extent they are agreeable to you.

SA means Strongly Agree, A stands for Agree, D means Disagree SD means Strongly Disagree .

	SA	A	D	SD
The school timetable needs to be reviewed to accommodate the time required for the teaching of the science subjects.				
The laboratories are inadequate and poorly equipped to enhance better performance of Mathematics and Science Subjects.				

APPENDIX IV: QUESTIONNAIRE FOR SCIENCE TEACHERS.

Please answer all the questions by ticking appropriately after carefully reading through them.

The questions are seeking your opinion on the factors influencing the effectiveness of the SMASSE on the performance of Mathematics and Science subjects in Kitui Central District, Kitui County. The answers you give will be treated with confidentiality and will only be used for the purpose of this study. Do **not** write your name anywhere on this questionnaire

PART I Personal Details

1. Please indicate your gender. Male () Female ()
2. What is your age bracket? Below 25 years () Between 25- 35 years ()
35-45 years () Above 45 years ()
3. Indicate your teaching subject(s).....
4. Please state your highest professional qualification.
Diploma () B/Ed () M/Ed () Any Other.....

PART II. This section relates to the importance of the project organizational structure on the effectiveness of the SMASSE project. Please use a tick () or a cross () where appropriate .

5. Do you know how the SMASSE project is organized? Yes () No ()
6. Is there a level in the structure that in your opinion feel that it should be done away with?
Yes () No ()
7. If yes, above state the level.....
8. Does the structure make the SMASSE project more relevant? Yes () No ()

APPENDIX IV: QUESTIONNAIRE FOR SCIENCE TEACHERS.

Please answer all the questions by ticking appropriately after carefully reading through them.

The questions are seeking your opinion on the factors influencing the effectiveness of the SMASSE on the performance of Mathematics and Science subjects in Kitui Central District, Kitui County. The answers you give will be treated with confidentiality and will only be used for the purpose of this study. Do **not** write your name anywhere on this questionnaire

PART I Personal Details

1. Please indicate your gender. Male () Female ()
2. What is your age bracket? Below 25 years () Between 25- 35 years ()
35-45 years () Above 45 years ()
3. Indicate your teaching subject(s).....
4. Please state your highest professional qualification.
Diploma () B/Ed () M/Ed () Any Other.....

PART II. This section relates to the importance of the project organizational structure on the effectiveness of the SMASSE project. Please use a tick (✓) or a cross (×) where appropriate .

5. Do you know how the SMASSE project is organized? Yes () No ()
6. Is there a level in the structure that in your opinion feel that it should be done away with?
Yes () No ()
7. If yes, above state the level.....
8. Does the structure make the SMASSE project more relevant? Yes () No ()

The statements below describe the importance of the SMASSE project structure.

Indicate the extent to which they are agreeable to you.

SA means Strongly Agree, A stands for Agree, D means Disagree SD means Strongly Disagree .

	SA	A	D	SD
The structure of the SMASSE project makes it more effective.				
The structure of the SMASSE project enhances efficiency at all levels of the project				
The structure of the SMASSE project is discriminative as one ascends the hierarchy.				
The structure needs to be changed to enhance more efficiency.				
The structure is an impediment to the efficiency of the project at all levels.				

PART III. This section relates to the SMASSE INSET curriculum on the effectiveness of the SMASSE project.

6. Do you think the curriculum of SMASSE is relevant?.

Yes () No ()

7. Do you think the SMASSE curriculum should be reviewed from time to time?

Yes () No ().

8. Does the SMASSE curriculum address the needs in your subject area?

Yes () No ().

9. Do you think the curriculum delivered helps teachers to improve on content delivery in their respective subject areas? Yes () No ()

10. Indicate your teaching subject area below. Mathematics () Biology ()

Chemistry () Physics ()

11. How many SMASSE INSETS have you attended? All Four Cycles () Three Cycles ()
Two Cycles () One Cycle () None ()

The statements below relate to the influence of the SMASSE INSET curriculum on the effectiveness of SMASSE project. Indicate the extent to which they are agreeable to you.

SA means Strongly Agree, A stands for Agree, D means Disagree SD means Strongly Disagree.

	SA	A	D	SD
The SMASSE curriculum needs an overhaul for it to enhance better results in Mathematics and Science.				
The SMASSE curriculum needs to be amended to suit the needs of teachers.				
The SMASSE curriculum should remain as it has been since it is adequate.				

12. This section relates to the influence of the school environment on the effectiveness of SMASSE project on the performance of Mathematics and Science subjects. Indicate the extent to which they are agreeable to you.

SA means Strongly Agree, A stands for Agree, D means Disagree SD means Strongly Disagree.

	SA	A	D	SD
The school environment needs to be reviewed to accommodate the time required for the teaching of the science subjects				
The school environment is an impediment to the SMASSE effectiveness.				
More support from the school should be forthcoming so as to enhance the performance in science subjects.				
The laboratories are not adequately equipped to enhance the performance of science subjects.				

APPENDIX V: FUNCTIONS OF SMASSE NATIONAL PLANNING COMMITTEE.

(NPC)

The national planning committee performs the following functions:

- Act as an advisory body to MOEST/JICA on technical, administrative and formulation of policy matters concerning the SMASSE project.
- In-service science and mathematics teachers and conduct sensitization workshops and seminars for administrative personnel and other stakeholders.
- Act as a National mathematics and Science Education Resource Center
- Perform daily administrative and secretarial work in the project
- Plan, implement, organize, coordinate, supervise, guide, monitor and evaluate the project activities at all levels.
- Communicate to all stakeholders involved in the project on important decisions and guidelines about the project from time to time.
- Make and submit any reports to MOEST and JICA
- Develop, administer and review suitable monitoring and evaluation instruments and analyze and publish results of the same as stipulated in the project design matrix
- Perform any other duties spelt out in the Project Design Matrix

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APPENDIX VI: FUNCTIONS OF SMASSE DISTRICT PLANNING COMMITTEE

(DPC)

These are the functions of the DPC;

- Collect funds for SMASSE activities in the district
- Prepare and implement a budget for the district.
- Sensitize stakeholders in the district on project activities.
- Prepare financial expenditure and SMASSE training programme reports and submit the same to the National office and district heads association.
- Organize and coordinate implementation of district SMASSE programmers
- Recruit and sponsor district trainers for national training
- Recommend district INSET Centers
- Ensure updated records of SMASSE activities are kept
- Shall vet district trainers for certification and appraise them for their performance
- Invite teachers for training at district level.
- Monitor and ensure attendance by the teachers for the training
- Prepare lists of successful teachers for certification
- Give feedback to TSC on district training.