

**INFLUENCE OF STRENGTHENING MATHEMATICS AND
SCIENCE EDUCATION ON PUPILS' SCIENCE PERFORMANCE IN
KENYA CERTIFICATE OF PRIMARY EDUCATION IN DONDORI
DIVISION NAKURU COUNTY**

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DECLARATION

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

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DEDICATION

This work is dedicated to my late mother Hellen Njeri,
my father Michael Maina, my elder brother Justus Karuri
and to my children Raphael and Michael.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASEI	Activity, Student, Experiment and Improvisation
CEMASTEIA	Centre for Mathematics Science and Technology in Africa
DQASO	District Quality Assurance Standards Officer
INSET	In-service Education and Training
JICA	Japan International cooperation Agency
KCPE	Kenya Certificate of Primary Education
KESSP	Kenya Education Support Sector Program
KNEC	Kenya National Examination Council
MIITEP	Malawi Integrated In-service Teacher Education Programme
MOE	Ministry of Education
OECD	Organization for Economic Cooperation and Development
PDSI	Plan Do See Improve
PISA	Programmes for International Student Assessment
PTTC	Primary Teacher Training Colleges
SMASE	Strengthening Mathematics and Science Education
SMASSE	Strengthening Mathematics and Science in Secondary Schools
TDMS	Teacher Development and Management Strategy
UNESCO	United Nation Educational Scientific and Cultural Organization
UNICEF	United Nation International Child Education Fund

WECSA Western Eastern Central and Southern Africa
ZQASO Zone Quality Assurance Standards Officer

ABSTRACT

The purpose of the study was to investigate influence of strengthening mathematics and Science Education on pupils' science performance in Kenya certificate of Primary Education in Dondori division. The study aimed to achieve this by assessing learner-centred teaching methodologies, improvisation of learning resources, PDSI approach as well as teachers' attitudes towards ASEI-PDSI strategies influence pupils' science performance in KCPE. It was based on constructive theory by Taber (2009). The study adopted a descriptive survey design and targeted 12 public primary schools with 12 head teachers, 90 science teachers and 1510 class eight pupils. Simple random sampling technique was used to sample 30% of teachers and 10% of pupils in all public primary schools. The study sample comprised of 12 head teachers, 28 teachers and 151 standard eight pupils. Data were collected using questionnaires and analysed both qualitatively and quantitatively and presented in frequencies and percentages in form of tables and figures. Learners' centred teaching methodologies on SMASE influence pupils' science performance in KCPE, the study revealed that all the pupils indicated that they attended field trips once a year. About 65.8% of the pupils noted that they did peer-training daily in their class. The teachers and headteacher questionnaires revealed that 74.1% of the teachers and 66.7% headteachers said that group discussion and individual experiences in science lessons were carried out on weekly basis. Performance of pupils was also tested against their homework, 65.8% indicating that they had homework and 62.2% of the pupils attained between 40-100 marks in their current science exam. Improvising of local learning resources on SMASE influence pupils' science performance in KCPE, 59.3% of the pupils indicated they had an average performance with the availability of learning resources on SMASE. Headteachers (83.3%) and teachers (81.5%) who indicated availability of teachings aids in their schools. On the availability of science textbooks majority of the pupils 85.2% indicated that science textbooks are available and hence had an effect of performance in science. Majority of the pupils (65.8%) indicated that they asked questions on unclear concepts daily. From the pupil's attitude, 49.0% of the pupils indicated that they enjoyed very much the science lesson. About 96.3% of the teachers agreed that there was need for immediate follow up of assignment enhance academic performance while 92.5% of the teachers agreed that evaluation is very necessary for effective teaching and learning and 85.2% indicated that it is not possible to have activities in every lesson. The following are the recommendations of the study there is need more field trips to scientific sites to enable pupils get firsthand information. There is need for the school without teaching and learning aids, science text books to avail them to enable pupils to get information which they have not learnt from other areas in school. This would enable them to complete their homework. There is need for teachers to employ PDSI to enable pupils understand concepts that they did not understand during lesson time to enable them understand it better when asking questions. Teachers should implement what they have learnt in SMASE INSETS so as to ensure that pupils understand the concepts of the lesson well. There is need for teacher's change of their attitude towards science lesson to enable change the attitude of the pupils and also to deliver it effectively.

CHAPTER ONE

INTRODUCTION

1.1 Background to the study

Teacher development programmes are central to the achievement of the Millennium Development Goals for universalising access to primary schooling and improving quality basic education (UNESCO, 2014). The Organization for Economic Cooperation and Development project (OECD, 2011), states that teacher development programmes are the educational and training activities intended mainly to improve professional knowledge, skills and attitudes of primary and secondary school teachers and principals following their initial professional certificates.

Moreover, Danahar and Umar (2010) states that, teacher development programme complements pre-service teacher training for enhancement of knowledge, skill and attitudes that align practice to reforms and visions in education. According to Fullan (2010) new knowledge formation enhances quality curriculum delivery designed to address ownership and sustainability of In-Service Education and Trainings (INSETs). Professional development that focus on practice alone without reflective practice in terms of theoretical perspectives run the risk of reinforcing traditional instructions or promoting practice misaligned with changing trends in education (Lunenburg and Irby (2011). They further state that teacher development programmes focuses on the way students learn mathematics and science concepts using designed instructions that help students to improve their conceptual understanding.

Science is an essential and fundamental subject within the curriculum as it provides students with the ability to think critically and practice methods of inquiry, develop science concepts that facilitate understanding of the biological and physical environment, and develop appropriate attitudes and skills essential for democratic leadership (Lemlech, 2010).

In Finland, high levels of quality education and competence is based on its quality in teacher education. The government supports both pre-service and in-service of teachers. This strengthens the quality of teaching and enhance student learning. Activity based teacher development courses are offered to science and mathematics teachers that mainly aims at giving fresh-up-to-date pedagogical and subject related knowledge (Asunta, 2012). Interlinkage in Finnish education is between initial and INSETs is enhanced according to lifelong learning principle.

In Japan, education system promotes and disseminates scientific knowledge and academic research. The quality of Japanese education is maintained by mandatory and continuous teachers' development education at every level of their profession (JICA, 2014). Quality in teaching in school has made Japan to be among the best in problem solving assessment in programmes for international student assessment (PISA survey, 2012).

The Ministry of Education (MoE) of The Philippines successfully implemented teaching and learning strategies that included practical work, discussion, problem-solving, investigation, exposition, practice and cooperative learning (JICA, 2014). These strategies called for students to engage in activities with

not just their minds but also with their hands, hence 'Hands-On-Activities.' Hands-On-Activities have so far been perceived as the most effective because they have facilitated bringing students to their fullest learning capacities as they are able to depend on themselves. Cooperative learning has exposed them to opportunities where they work in groups instead of alone, hence better sharing knowledge. The development of science as a way of thinking is of primary importance in the teaching of elementary and middle school students (Lemlech, 2011). He states that greater emphasis on experimentation and inquiry-oriented teaching has made the process of teaching science as important as the content of science.

In Africa, Strengthening of Mathematics and Science Education in Western, Eastern, Central and Southern African (SMASE-WECSA, 2014) are associations which have 34 member countries formed to strengthen mathematics and science education. They form professional networks based on action research that is consistent with global trends in education.

In Malawi, the government has an Integrated In-service Teacher Education Programme (MIITEP), which has been designed to improve the quality of teaching and learning at all levels of the education system. SMASE/WECSA has been embraced to improve the quality of teacher content mastery and pedagogical skills in mathematics and science education. In Tanzania the government has an Education Training Policy that stipulates that in-service education and training for teachers is compulsory. Teacher Development and Management Strategy (TDMS, 2013), are in-service programmes that aims to address quality pedagogy and professional development to teachers.

In Kenya, teacher development programme for mathematics and science teachers has been implemented by strengthening of mathematics and science in secondary education (SMASSE) projects from a pilot phase 1998 to national phase in 2003 following consistent poor performance in science subjects over the years (SMASSE, 2003 cited in Mwangiru, 2014). SMASE project has gone through phases 1 and 2 between 1998 and 2008, during which it was called SMASSE. SMASE phase 3 started in 2009 and it had three components which were SMASE secondary education, SMASE primary education and SMASE – WECSA (SMASE project, 2013).

Implementation of the SMASE in-service programme is aimed at transforming teachers' classroom practice with the ultimate goal being to strengthen pupils' performance in science. It aims at quality curriculum delivery that enhances teachers' attitude, pedagogical knowledge and skills formation containing content mastery and skills of making and utilizing teaching/learning resources (CEMASTE, 2010). This ensured a shift from Pre ASEI (teacher centred approach) to the ASEI condition (learner centred methodology) after the programme.

The Ministry of Education (MoE) in its capacity as controller and implementer of activities in education has put into motion corrective measures to address poor performance of science. Thus in 2004, it started a centre of mathematics science and technology in East Africa as a means of institutionalizing in-service

education INSET for teachers of mathematics and science. It holds national INSETs for regional SMASE trainers (MoE Taskforce, 2010).

SMASE primary education started with a needs assessment survey conducted by Primary Teachers Training Collage (PTTC) tutors in 2009, as a bottom up approach. The findings identified teachers limited pedagogical skills, low attitude towards science, limited use of teaching and poor mastery of content as the main causes of poor performance in science (SMASE project, 2012).

Learner centred learning methodologies are organised using Activity-based Student-centred teaching/learning Experiment-based and Improvisation (ASEI). It has been modeled according to the current trends of teaching and learning science having been developed from several baseline surveys conducted by CEMASTEА. Constrictive participation of the learner in learning situation enables them to increase retention levels while serving as a bridge to cater for the development of specific skills. They construct and reconstruct meaning directly from encounters with the empirical world (CEMASTEА, 2010).

Improvisation of locally available learning resources forms critical inputs in teaching since they assist the learner to synthesize what is being learnt. Ornstein and Hunkins (2010) acknowledge that appropriate teaching methods accompanied by relevant learning resources trigger the desirable learning activities resulting to learning of concepts. Teaching and learning resources are vital in any meaningful system of education. SMASE 2013 states that, the foundation of all learning science is the first hand experience with real things. Science teachers need to work with students to come up with ways to improvise

locally available learning resources thus making students to think critically about the scientific concepts underlying the devices.

Planning, Doing (carrying out the planned activity) Seeing (evaluating the outcome of activity) Improvement (PDSI) is a process of checking the progress of an activity against its plan and answering the question of how the activity is being carried out in relation to the intended objectives (CEMASTE, 2011). The teacher must possess a thorough knowledge of the subject content. Plan its upper ranges and inner depth in order meet the varying needs and knowledge of the learner that ensures reflective practice is ongoing throughout during and after the lesson (Lunenburg and Irby, 2011).

According to Ndirangu (2013) teacher’s attitude on ASEI PDSI strategies has been identified to have a strong influence on students’ attitude towards the subject. Thus students’ attitude has a strong bearing on their achievement. SMASE 2010 teacher development programme as a result had sessions aimed at addressing teacher attitude. Torress (2010) on his research on teacher’s attitude states that low attitude among teachers towards a specific programme may adversely affect learners’ performance. Attitude of teachers has an effect on students which transcends beyond the classroom.

Table 1.1 2009-2014 KCPE mean-score for science as per divisions in Nakuru-North Sub-County

Divisions/Year	2009	2010	2011	2012	2013	2014	Average
Bahati	45.90	45.85	45.97	45.96	44.90	44.20	45.46
Solai	44.40	44.00	44.25	44.80	43.97	43.60	44.25
Dondori	41.80	40.63	41.70	40.89	40.77	39.98	40.96

Source: DEO’s Office Nakuru North Sub-County, 2015

Table 1.1 illustrates Nakuru North Sub-County KCPE science mean score as per the three divisions, which shows that the average science performance for the last six years. Dondori division recorded the lowest performance in KCPE results compared to the other two divisions in the sub-county. This is despite the government effort to upgrade science teachers consistently from 2010 to 2013 through strengthening Mathematics and Science Education teacher development. Hence this research sought to find out whether teachers are implementing SMASE approach in teaching science in public primary schools.

1.2 Statement of the problem

Quality in education is evidenced by high performance of students in national examinations outcomes. Performance in national examinations is a major determinant of future social and economic status of a candidate (MoE, 2010). Examination performance being a multi-dimensional manipulation of factors like teacher's attitude, pedagogical approaches and learning resources which influence academic performance either positively or negatively. Studies conducted by Rotich (2012) and Ndirangu (2013) reveal that performance of students in science before and after SMASSE programme has been below average; pupils' involvement during the lesson has been partially achieved; and that classroom practices have improved but have however, not translated into improved performance of the subject.

Dondori division KCPE examination results shows that pupils' performance in science has remained far below expectation compared to the other two divisions yet science teachers in the whole sub-county have been undergoing SMASE trainings for the last four years. Table 1.1 illustrates Nakuru North Sub-County KCPE science mean score as per the three divisions, which shows that the

average science performance for the last six years. Dondori division recorded the lowest performance in KCPE results compared to the other two divisions in the sub-county. This is despite the government effort to upgrade science teachers consistently from 2010 to 2013 through strengthening Mathematics and Science Education teacher development. It is important for teachers to implement the SMASE training programmes in schools to improve performance in the subject and achieve the other aims of the programme. Thus, the current study aimed at investigating the influence of Strengthening Mathematics and Science Education teacher development programme on science performance in Kenya Certificate of Primary Education in Dondori division, Nakuru North Sub-County.

1.3 Purpose of the study

The purpose of the study was to investigate the influence of Strengthening of Mathematics and Science Education on pupils' Science performance in KCPE Dondori Division in Nakuru-North Sub-County.

1.4 Objectives of the study

The study was guided by the following objectives:-

- i. To determine the extent to which learner centred teaching methodologies on SMASE influence pupils' science performance in KCPE in public primary schools in Dondori Division.
- ii. To establish the extent to which improvisation of local learning resources on SMASE influence pupils' science performance in KCPE in public primary schools in Dondori Division.

- iii. To determine the extent to which Plan Do See Improve (PDSI) approach on SMASE influence pupils' science performance in KCPE in public primary schools in Dondori Division.
- iv. To establish extent to which teachers' attitude on ASEI PDSI strategies on SMASE influence pupils' science performance in KCPE in public primary schools in Dondori Division.

1.5 Research questions

The following were the research questions for the study:-

- i. To what extent do learners' centred teaching methodologies on SMASE influence pupils' science performance in KCPE in public primary schools in Dondori Division?
- ii. How does improvisation of local learning resources on SMASE influence pupils' science performance in KCPE in public primary schools in Dondori Division?
- iii. To what extent does Plan Do See Improve approach on SMASE influence pupils' science performance in KCPE in public primary schools in Dondori Division?
- iv. How does teachers' attitude on ASEI and PDSI strategies on SMASE influence science performance in KCPE in public primary schools in Dondori Division?

1.6 Significance of the study

This study may be important in the improvement of the development and organization of Science Teacher Development Programmes, and determine their

influence on the teaching and learning situations in classroom, and hence improved KCPE performance. The researcher hopes that this study might be helpful to the SMASE INSET organisers by giving out the interventions and modifications to enhance performance of science teachers. The DQASO, ZQASO and TAC tutors may also be able to understand the needs and problems facing science teachers on implementation and hence be able to advise them better. The cluster head teachers may also be informed through the study of the seriousness of the problem at hand. The teachers themselves might be able to understand better the need to implement skills learnt during the SMASE Teacher Development Programmes.

1.7 Delimitations of the study

This study targeted twelve public primary schools in Dondori Division in Nakuru-North Sub-County. All science teachers and school heads were important in improving performance in the subject. However, it was not possible to involve all science teachers and all head teachers in the Sub-County, thus the study sampled 30% of the population in the study area.

1.8 Limitations of the study

According to Mugenda and Mugenda (2003) limitation constitutes the aspects of the study that the researcher knows may negatively affect the results generally. Some of the limitations were none cooperation by teaching staff and head teachers since they felt that the information given could be used to portray a negative image of their school or their teaching practices. To mitigate this limitation the researcher assured the respondents that the information was purely for academic purposes only.

1.9 Assumptions of the study

The researcher made the following basic assumptions with regard to this study that the gathering of information required responses to be elicited from science teachers. These respondents were objective and competent in responding to the items in the questionnaires correctly. The response that were given by respondents were correct.

1.10 Definition of significant terms

ASEI teaching strategy refers to a movement that advocates for activity focused teaching / learning student centred learning experiment and improvisation.

Attitude refers to learned predispositions to respond positively or negatively to SMASE project.

Improvisation refers to the act of creating or using resources in the absence of the ideal resources.

Learner centred teaching and learning strategies refers to Activity student centred Experiment and improvisation (ASEI).

Learner-centred refers to teaching based on the pace, motivation and participation of learners.

Learning refers to acquisition of knowledge, skills and attitude towards science that may result in better performance.

Pedagogy refers to the teaching methods employed to teach science in primary schools.

Performance refers to the grades obtained by candidates in science examination.

Plan Do See Improve (PDSI) refers to an approach that aims at helping teachers practice activity student experiment improvisation ASEI at classroom level.

Primary education refers to formal learning of eight years that should start at least the age of six years.

Resources refer to the teaching staff, physical facilities and materials that facilitate a favourable environment for teaching and learning in a school setting.

Staff development refers to the process of improving the skills of mathematics teachers in order to help them become more effective and efficient.

Strengthening of Mathematics and Science Education refers to a teacher development programme for primary school teachers of Mathematics and Science.

1.11 Organization of the study

This study has five chapters. Chapter one presents the background to the study, the statement of the problem, purpose of the study, objectives of the study, study questions, significance, limitations, and delimitations, basic assumptions, definition of key terms and organization of the study. Chapter two presents the literature review, the concept of SMASE in-service programme, Influence of SMASE teacher development programme, on learner centred teaching methodologies, learning resources, Plan-Do-See-Improve and teachers attitudes change, as well as the summary, theoretical and the conceptual frameworks for the study. Chapter three presents the research methodology detailing the research design, target population, sample and sampling procedures, data collection instrument, validity and reliability of the instruments, procedure for data collection and data analysis methods. Chapter four consists of data presentation, findings and discussions, where tabular presentation and narrative discussions of the data was done. Chapter five consists of the summary, conclusions and recommendations of the study which were drawn from the data analysis in chapter four.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter presents the related literature pertaining to influence of Strengthening Mathematics and Science Education on science performance. It is organized into the following themes; the concept of Strengthening Mathematics and Science Education (SMASE), Influence of learner-centred teaching methodologies, improvisation of locally available learning resources, Plan Do See Improve (PDSI) approach and teachers' attitude towards Activity Student Experiment and Improvisation (ASEI) PDSI strategies on SMASE. It also presents the summary of the reviewed literature, theoretical framework and the conceptual framework adopted for the study.

2.2 The concept of strengthening mathematics and science education

Scientific, mathematical and technological literacy are central in our changing society. If knowledge in these three areas is not the cause of change, it certainly is helping to shape the character of society (Lemlech, 2011). Provision of quality basic education is a fundamental human right as stipulated by all recognized international conventions. According to Dunahar and Umar (2010) teacher development programmes provide teachers with specific knowledge skills and attitudes enabling them perform teaching tasks efficiently and effectively while aligning their practice to the vision in education and having goals that are being aimed at.

Kenya Education Sector Support Programme (KESSP 2010) report asserts that continuous improvement in the quality of education should entail continuous skill upgrading for teachers through teacher development programmes. The significance of mathematics and science in stimulating socio-economic development is documented in most educational policies such as Millennium Development Goals Report (2012). The Strengthening Mathematics and Science Education Primary Teacher Development Programme was prompted by the need expressed by principals of primary teachers training college during a workshop in 2006. The principals requested for SMASSE to be extended in training of students and secondary school teachers in PTTCs and eventually to teachers in primary schools. Some challenges facing the teaching and learning of mathematics and science in secondary emanated from primary school level SMASE project (2009) strengthening of mathematics and science secondary education (SMASSE) phase 1 and 2 had been ongoing first as a pilot project 1998 and nationally in 2002. SMASE phase 3 started in 2009 and had three components. These were SMASE secondary education, SMASE primary education and SMASE-WECSA.

Strengthening of Mathematics and Science Education 2010 primary teachers' recruitment for cluster training used a cluster select system thus obtaining the title cluster trainers (SMASE 2010). SMASE cluster trainers 2010-2013 had thematic cycle with sessions aimed at addressing attitude change, ASEI-PDSI lesson planning, hands-on activities reflective practice and actualization of the sessions trained. The trained teachers had to hold similar training sessions in their respective schools. This way all teachers gained knowledge attitudes and skills in SMASE.

SMASE cluster teacher development programme are structured for teachers to share experience in science with authentic class room actualization practice as reflective practitioners through peer mentoring and autonomy in professional networking and training it provides this beyond the traditional boundaries of classroom (Van Drich, Beijard & Vevlop, 2011). According to (SMASE 2013) cluster in teacher development programme should build bridges across clusters sharing a while enhancing collaborative practice and capitalizing on sharing knowledge skills attitudes and training on diverse speculum.

Strengthening of Mathematics and Science in Western Eastern Central and Southern Africa (SMASE WECSA 2012) has a similar school of thought as a cluster system but at regional level. According to (SMASE 2012) networking of professional reference groups that share similar profession experiences, knowledge of good classroom practices alongside inculcation of principles of profession action is quite vital. There is importance of professional networking and base instruction on student understanding and conception among professionals. This is relevance and consistency with global trends in education designed to address ownership and sustainability of teachers development programmes (SMASE – WECSA 2006) currently (SMASE – Africa 2012).

2.3.Influence of learners-centred teaching methodologies on pupils' performance

Activity Student Experiment and Improvisation (ASEI) lesson design considers the quality of classroom activities as critical to achieving effective teaching and learning (SMASE, 2010). Teachers are the main agents of curriculum

implementation and therefore, the learner should be at the centre of the process. This is done through arranging the learning process systematically.

According to SMASE (2010) ASEI is activity based teaching which implies active meaningful and constructive participation of the learner. Learners learn better as active participants rather than passive recipients of information which entails hand-on (manipulative), minds-on (intellectual), mouths-on (discussion) and hearts-on (learners' interest and feelings are stirred). Retention of what had been learnt depend to a large extent on the learning approach or combination of approaches used.

Dewey (2011) observed that poor performance of students in science has often been regarded as symptomatic of poor learning approaches. The ASEI pedagogical shift focus of lesson is on the learner, while the lessons' objectives are geared to improving the learners' academic achievement and quality of learning. Emphasis help learners construct and reconstruct meaning directly from their encounters with the empirical world. Learning activities enable science practical subjects to build a bridge between the realm of objectives and observable properties on one hand and the realm of ideas on the other.

Learners engage in experiment activities where they manipulate variables. Many educationists advocate for this approach in teaching and learning process (Danahar & Umar, 2010). This school of thought advocated not to the teaching of knowledge itself but to teaching the learner skills by which he/she can generate knowledge that can be applied. The learner centered teaching methodologies as advocated by SMASE 2010 has been supported by several

scholars since they are based on positive self-concept and self-reliance in students.

According to KNEC (2013), report on performance of 2012 Kenya Certificate of Primary Education (KCPE), the root cause of poor performance in science included students failing to answer questions that require constructed, scientific and multidimensional knowledge. Quality pedagogical approach through SMASE teacher development programmes when used and applied will contribute to better outcome in examinations. CEMASTE A (2011) acknowledges that active students' participation in learning is key in quality education.

2.4 Influence of improvisation of local learning resources on pupils' performance

Improvisation of locally available resources helps science teachers who often do not have access to the resources needed to optimally perform experiments. Innovative teachers can use cheaper products to simulate experiments. Therefore teachers can also help students learn improvisation as an important life skill to help them think critically about the scientific concepts underlying the devices (Ndirangu, 2013). According to CEMASTE A (2012) noted that teaching and learning from knowledge based teaching to activity-based learning, teacher-centred teaching to student-centred learning theoretical (chalk and talk) to experiment and research based approach, and recipe type of scaled down experiments with improvisation.

The components (A) of ASEI, aims at helping teachers appreciate the benefit of active learner involvement in the teaching and learning process. A variety of effective lessons were guided on how to use the activities. UNICEF (2011) argue that without instructional resources no learning can take place since learning takes place where learners are actively involved in the learning process through the use of proper and variety of instructional materials. Limited and lack of teaching and learning resources were sighted by the baseline survey conducted in 2009 and 2010 as a cause that lead to poor performance in science (SMASE, 2009 - 2010).

Dewey (2011) observed that teaching resources enhanced retention of cognitive skills to about 80% of what is learnt and they not only enhance communication between teachers and learners but also facilitates child centred learning. Nyawamu (2010) established that lack of teaching equipment in most schools discouraged teachers from doing their best. Teachers are motivated by well-equipped schools. The use of learning resources involves the use of more than one of the human senses at the same time during learning process. Studies by psychologists like Vygotsky and Bruner found out that different human senses account for varying percentage of learning. It is estimated that touch accounts for 6%, hearing 11% and sight 83%, hence, the need for teaching aids in the facilitation of learning science and other subjects.

Ndinda (2011) in his study on impact of teaching and learning in secondary school performance stated that learning resources play a great role in influencing good performance his study demonstrated that most of the performing schools in Kisumu municipality made use of teaching and learning

resources. Inadequate teaching and learning resources affect effective curriculum implementation leading to poor performance. Mobilizing of resources should be ensured for teachers to effectively implement curriculum implementation curriculum. Since adequate resources boost efficiency in curriculum.

Teaching and learning resources are key elements in the effective delivery of the curriculum (CEMASTE, 2013). Lack of these resources leads to teacher centered learning and hence leads to passive learning. Learning resources are critical inputs in the teaching because they assist learner to synthesize what is learnt and thus improve performance. According to Gituthu (2014) only 30 percent of teachers in secondary schools improvise resources in experiment while 70 percent rarely do. This denies the students a chance to raise their interest and curiosity.

2.5 Influence of plan do see improve approach on pupils' performance

Many educationists such as Lunenburg and Irby (2011) advocate teacher's preparation as being key for effective teaching and learning activity. According to SMASE (2013) PDSI (Planning, Doing (carrying out the planned activity) Seeing (evaluating the outcome of activity) followed by Improvement is a process of checking the progress of an activity against its plan and answering the question of how the activity is being carried out in relation to the intended planned objectives. Through planning entry behaviour which is background knowledge, skill and attitudes are facilitated and incorporated into teaching and process. Planning and using systematic approach to teaching the entry behaviour

or prerequisite knowledge and skills which is one of the contributing factors that determine the outcome of good or poor performance.

Planning also involves teachers utilizing the guidance gotten during SMASE. This may include teachers' introduction of interactive and innovative options such as games, role play, storytelling and skits instead of the old methods of answers and questions to introduce the next lesson (CENASTEAM, 2012). Another observation made was on designing the lesson having sufficient and varied interest of the learner activities to motivate and engage the learners and facilitate meaningful experiences. This may provide an opportunity for learner growth in knowledge through discussions, reporting, asking and answering questions, and process skills through manipulating, observing and drawing. This would assist the teacher to deal with learners questions and misconceptions (Mwangi, 2014).

Mwangi (2014) argues that involvement of pupils in planning activities and lessons objectives may include monitoring the lesson process against the planned activities and lesson objectives. Teachers should be guided to focus on lesson evaluation both as lesson process and end. This would enable them monitor the learner process through their ability to answer and ask questions and also explanations made. Evaluation and making sense of the outcome of the lesson in order to integrate the feedback from pupils is necessary. This would enable teachers evaluate teaching and learning process and also reflect on performance and effectiveness of the lesson objectives (Migwi, 2012). On the other hand CEMASTEAM (2012) argues that teachers make use of feedback to

modify the lesson as it continues to remove misconceptions as well as improve on their teaching methodology.

An effective teacher has sufficient knowledge of subject matter, skills in varied methodology, PDSI approach enables the teachers to plan instructions based on knowledge of subject matter, learners, the community and curricular goals while ensuring that the topic objectives are SMART (Specific, Measurable Achievable, Realistic and Time bound) (CEMASTEPA, 2013).

According to SMASE (2010) the principle in PDSI ensures planning against the activities in relation to the intended objectives while ensuring that reflective practice by the teacher is on-going throughout and after the lesson. Thus attaining the quality in teaching and learning and maximize the potential of each student. Reflective practice enables the teacher plan for effective lessons because it gives constructive feedback.

2.6 Influence of teacher attitude towards ASEI PDSI strategies on pupils' performance

Attitude is perception that attempts to make observations on the individual behaviours. According to Torress (2010) on his research on teachers attitude he states that low attitude among teachers towards a specific program may adversely affect it. Attitude of teachers has a great effect that expands beyond the classroom. Improving student learning depends on its teaching force with appropriate knowledge and attitude towards teaching and learning the formation has its foundation on content and pedagogical knowledge. Attitude is mental

images that individuals have about their perceptions. Teachers being important resources should play an active role on attitude formation.

According to Ndirangu (2013), teachers' attitudes towards ASEI PDSI strategies had a strong influence on students' attitude towards the subject consequently the student attitude had a strong bearing on their achievement. ASEI PDSI forms a framework of concepts that are the basis for continuous practice of effective content delivery that forms the ingredients of effective delivery of curriculum. Teachers are thus designed to develop suitable teaching activities in all lessons.

Mwangi (2014) argues that attitude is seen as different factors such as cognitive, affective and behavioural. This can be towards something or an object and it helps one to make decision on whether it is good or bad, harmful or beneficial, pleasant or unpleasant. Teacher attitudes towards learner-centred strategies were generally found to be neutral. This is because teachers are reluctant to perform experiments during science lesson. This may have a negative impact on the pupils' point of view towards experiments given during a lesson.

According to Kebaso (2012) the attitude of teachers may be characterized by teachers' inability to carry out experiments and demonstrations successfully, low frequency of experiments, chalk and talk thus become content driven and knowledge based which impacts negatively on students. He noted that poor attitude towards learner-centred strategies is both on the part of learner and the teachers. He points out that while students think sciences are generally harder than

languages and humanities; teachers might tend to think the same right from their school days or may have lost hope in their students' performance.

Another study by Njiru (2012) shows that teachers negative attitudes towards learner-centred strategies may encourage a tendency of low scores, and pupils refusal to participate in experiences. This would lead to poor performance in KCPE because pupils will assume the subject to difficult. A negative attitude may develop hence shielding the learners from achieving high grades in their exams. A positive attitude towards science may lead to a positive commitment to science hence influencing pupils life, interests and learning of sciences.

Fairbank et al (2010) state that theoretical knowledge about human learning behaviour demonstrate a repertoire of teaching skills that are believed to facilitate students learning. When displaying attitude that foster learning and genuine human relationships possess knowledge of the subject matter. Thus teacher's attitudes correlated to their behaviour in accordance to teaching achievements, teacher-student relationship and discipline. Attitude enhancement should precede all so that positive results are to be realized.

2.7 Summary of reviewed literature

The literature review is presented in the following sections; concept of Strengthening Mathematics and Science Education teacher development programme; influence of learners-centred methodologies, improvisation of local learning resources, Plan Do See Improve approach and teacher attitude towards ASEI PDSI strategies on pupils' performance, while other studies on the influence of SMASE in-service training include a baseline survey conducted by

CEMASTE (2013) that reviewed that lack of adequate teaching and learning resources cause poor performance in science and mathematics subjects. Lunenburg and Irby (2011) advocate that teacher's preparation as being key for effective teaching and learning activity. Ndinda (2011) in his study on impact of teaching and learning in secondary school performance stated that learning resources play a great role in influencing good performance his study demonstrated that most of the performing schools in Kisumu municipality made use of teaching and learning resources. KNEC (2013), report on performance of 2012 Kenya Certificate of Primary Education (KCPE), state that the root cause of poor performance in science included students failing to answer questions that require constructed, scientific and multidimensional knowledge.

While Dunahar and Umar (2010) state that teacher development programmes provide teachers with specific knowledge skills and attitudes enabling them perform teaching tasks efficiently and effectively while aligning their practice to the vision in education. PDSI approach enables the teachers to plan instructions based on knowledge of subject matter, learners, the community and curricular goals while ensuring that the topic objectives. It is thus evident that different factors interplay on the influence of SMASE on pupils' performance in national examinations. Some of these factors that influence SMASE on science in secondary schools emanated from primary school level and hence the purpose of this study.

However most of the scholars (Ndirangu, 2013; Gituthu, 2014; Ndinda, 2011; & Nyawamu, 2010) have based their studies on Strengthening of Mathematics and Science Secondary Education in secondary schools while the current study was

based on influences of Strengthening of Mathematics and Science Education in public primary schools.

2.8 Theoretical framework

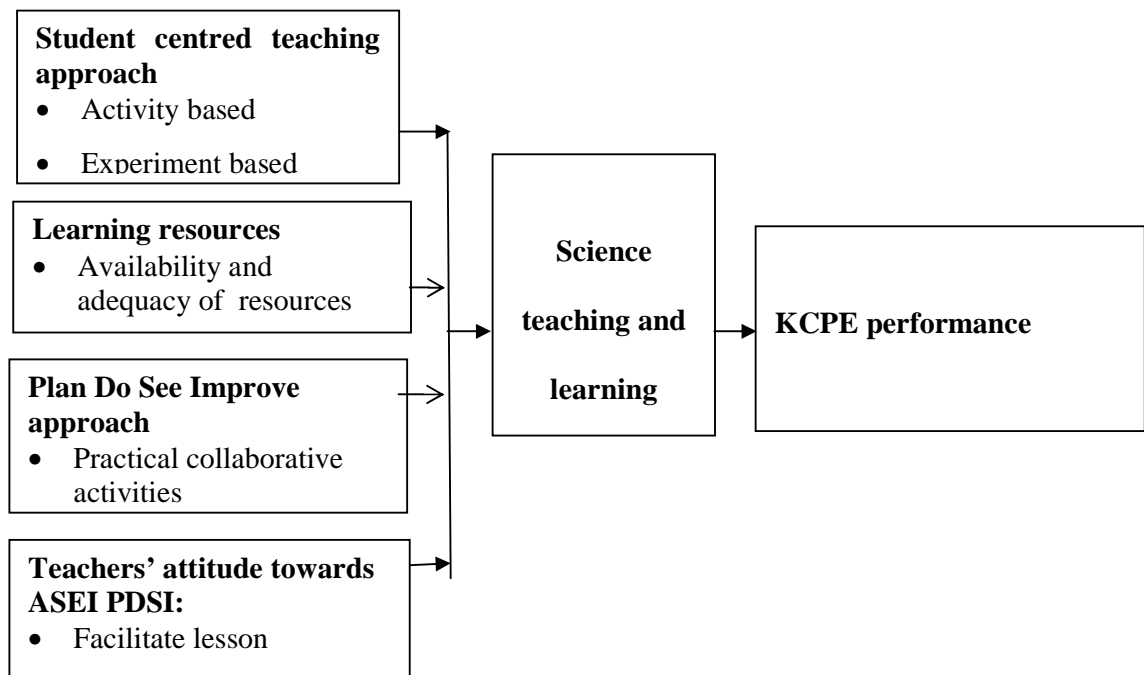
This study was based on constructivist theory by Taber Keith S. (2009). The theory postulates that active involvement of the learner is crucial since it enables them to construct concepts based upon their current or prerequisite knowledge. In constructivist approach instructors adapt the role of facilitators. The learners are actively involved to enable them discover the principles, concepts and facts for themselves. Through collaborative activity and discussion the learners provide. Scaffolding support that enables them to assimilate the concepts. The learner centred teaching methodology contains the ASEI principle that advocates for activity filled learning environment where the learners' interest, understanding and retention is enhanced. The cognitive scheme provides meaning and organization based on new learning experiences.

The researcher has adopted this theory because strengthening of mathematics, science Education teacher development programme advocates plan to see improve paradigm which posits that teachers should plan learner centred approach based on ASEI that ensures resources integration within the learning activities. Thus enabling all the learners senses are actively involved to enable them construct new experiences by applying what they know to assimilate, accommodate to match knowledge being gained. According to CEMASTEIA (2010) active involvement of the learner through learning resources assist the learner to synthesize what is learnt and thus improve science performance.

2.9. Conceptual framework

Orodho (2009) defines conceptual framework as a model of representation where a researcher conceptualizes or represents relationship between variables in the study and shows the relationship graphically or diagrammatically.

Figure 2.1 Factors influencing SMASE teacher development programme on science performance



The conceptual framework shows the interaction between the variables affecting SMASE pedagogical paradigm approach. The factors including student centred teaching approach, learning resources, plan do see improve teaching approach and teachers' attitude change are the independent variables. According to Lemlech (2011) once change is initiated there are intervening factors which affect the outcomes. In this case the influence of SMASE teacher development programme affects science performance in KCPE.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter describes the methodology which was used to collect data; research design, target population, sample size and sampling procedure, research instruments, instrument validity, instrument reliability, the data collection procedures, data analysis techniques and ethical considerations.

3.2 Research design

A research design is a plan or blue print of how you intend to conduct the research Strydom et al, (2005). Best and Kahn (2006) states that the descriptive survey design involves a clearly defined problem and definite objectives, questions and development of generalization of principles and theories that have universal validity. Mugenda and Mugenda (2003), state that survey is an attempt to collect data from member of a population with respect to one or more variables. Descriptive survey design secures evidence and describes situation on the way they are thus helping to determine the steps to solve societal problems.

Descriptive survey design was used in this study because it enables the researcher to obtain information that describes existing phenomena by asking individuals about their perceptions, attitudes, behaviour and values. This design was therefore, deemed appropriate, as it enable the researcher to explore opinions, attitudes, incidences and relationships between variables. The teachers' variables such as learners centred teaching methodologies, learning resources; Plan Do See Improve (PDSI) approach and attitude were surveyed to

evaluate how they influence science performance in Kenya Certificate of Primary Education examinations.

3.3 Target population

According to Mugenda & Mugenda (2003), in order to provide an accurate and reliable description of characteristics, attitude and behavior of its members a sample of the population to be studied is sufficient. Therefore, this study targeted subject teachers who represent informed specialists and students who are direct consumers. According to Nakuru North DEO's office (2015), there were 12 public primary schools in the division, 90 science teachers who have attended SMASE teacher development programme. A population of 1510 standard eight pupils, 90 teachers and 12 head teachers in these primary schools were targeted. The whole target population is 1612 respondents.

3.4 Sample size and sampling techniques

A sample is a small proportion of a population selected for observation and analysis (Best & Khan, 2006). According to Kothari (2012) ten percent to thirty percent (10% to 30%) of the population can be picked from a large population, though when the target population is less than 20 the whole population can be used. Therefore all twelve public schools in the division participated in this study. Hence purposive sampling was used to select all the head teachers in the schools that participated in the study. Simple random sampling was used to sample 30% of the science teachers who have attended SMASE teacher development programme and 10% of standard eight pupils in the division. Thus, the total sample for the study comprised of 12 head teachers, 27 teachers, for the 12 schools 13 pupils were selected to make a total of 156 pupil

Table 3.1 Sample Frame of the Study

Category	of	Target population	Sample size
respondents			
Head teachers		12	12
Science teachers		90	27
Students		1510	156
Total		1612	190

Source: **DEO's Office Nakuru North Sub-County**

3.5 Research instruments

Mugenda and Mugenda (2003) define research instruments as instruments with which to collect the necessary information. According to Kombo and Tromp (2006) questionnaires are the most suitable research instrument for data collection in descriptive research design. The data were collected through use of questionnaires. Questionnaires for head teachers, teachers and standard eight pupils were used to collect data. A questionnaire enables the researcher to collect information that can easily be analyzed. They also allow for anonymity of respondents (Mugenda & Mugenda, 2003). Questionnaires comprised of two section; section A and Section B. Section A consisted of respondents' demographic information while section B consisted of information on the influence of Strengthening of Mathematics and Science Education teacher development programme on science performance in KCPE.

3.6 Validity of data collection instruments

Validity refers to the degree to which a method, a test or a research tool actually measures what it is supposed to measure. Kothari (2012), instrument validity refers to accuracy and meaningful inferences made based on the results obtained. Expert judgment from the university supervisors was used to assess the extent of the items in the instruments, address the objectives as well as whether the format of the instruments gives the correct impression. Split half technique was used to check for the validity of the research instrument using two schools that were not used for the final study, four teachers and twenty students to identify items that were inadequate in measuring the variable to either improve or discard the items.

3.7 Reliability of data collection instruments

Mugenda & Mugenda (2003) define reliability as a measure of the degree to which a research instruments yields consistent results or data after repeated tests when administered a number of times. The aim of pretesting is to gauge the clarity and relevance of the instruments. The test-retest technique was used to test the consistence of the instrument. This is where the instrument was administered to the same group twice. If the instrument is reliable, the individuals taking the test are supposed to score the same or similar scores in the second test as they did the first one (Best & Kahn, 2006). To ensure reliability of the findings, there was a time lapse of two weeks between the first test and the second test for within this short period of time, the respondents were in a position to remember what they wrote in the first test. A correlation coefficient shows the size and direction of a relationship between two sets of

scores. The scores from both testing periods were then correlated to determine correlation coefficient using the Pearson Product moment formula indicated below:

$$r = \frac{n\sum xy - (\sum x)(\sum y)}{\sqrt{n\sum x^2 - (\sum x)^2} \sqrt{n\sum y^2 - (\sum y)^2}}$$

The range of coefficient between -1 to +1 is deemed that the research tools have a very high degree of reliability (Gay, Mills & Airasian, 2000). For this study the research instruments score a coefficient correlation of 0.78 which was satisfactory for the study.

3.8 Data collection procedures

A permit was obtained from the National Council for Science, Technology and Innovations (NACOSTI) after clearance from the University. The first letter was presented to the Sub-County Education Office with copies for the various schools that were sampled. The researcher explained the purpose of the study, create rapport and assure the respondents of their confidentiality of their identities. Data collection took twenty working days. The questionnaires were handed to individuals within the sampled schools. The researcher picked the questionnaires immediately they were filled. This discouraged the respondents discussing on the answers to give when they are left with the research tools for a long time. According to Mugenda and Mugenda (2003) administering the questionnaires personally gives the researcher time to establish rapport, explain the purpose of the study and the meaning of items that may not be clear to the respondents.

3.9 Data analysis techniques

Data analysis refer to a variety of activities and processes that a researcher administers to make certain decisions regarding the data collected from the field, in order to get meaning and be able to explain various features from raw materials (Mbwesa, 2009). The data were edited first to identify the errors made by the respondents. Statistical Package for Social Sciences (SPSS) was used to tabulate and process data to enable handle large amount of data. Data collected were analyzed both qualitatively and quantitatively. Quantitative data were analyzed by use of descriptive statistic technique and presented in frequency distribution tables and percentages that display systematically and meaningful report that provided adequate report to the findings. Qualitative data were analyzed and interpreted by organizing data into themes or content guided by the objectives of this study then established the relationship among these themes or topics to provide the study findings.

3.10 Ethical consideration

Cohen, Manion and Morrison (1994) point out that ethics are matters of principled sensitivity to the rights of others. In regard to professional conduct in any scientific action, there is need to observe competence, integrity, scientific responsibility, respect for people's rights, dignity, diversity and social responsibility (American Sociological Association's (ASA) Code of Ethics (2008). Mugenda (2013) ascribes that in research process, ethics focus on the application ethical standards in the planning of the study, data collection and analyses, dissemination and use of the results. The study was conducted in an ethical manner. The purpose of the study was explained to the respondents and assured that the information given would treated confidentially and their names

were not to be divulged. Informed consent forms were sought from all the participants that agree to participate.

CHAPTER FOUR

DATA ANALYSIS, INTERPRETATION AND DISCUSSION

4.1 Introduction

This chapter presents a descriptive analysis of the data gathered on the influence of strengthening mathematics and science education on pupils' science performance in Kenya Certificate of Primary Education in Dondori Division. The study was guided by the following specific objectives. To determine the extent to which learner centred teaching methodologies on SMASE influence pupils' science performance in KCPE in public primary schools in Dondori Division; To establish the extent to which improvisation of local learning resources on SMASE influence pupils' science performance in KCPE in public primary schools; To determine the extent to which Plan Do See Improve (PDSI) approach on SMASE influence pupils' science performance in KCPE ; To establish extent to which teachers' attitude on ASEI PDSI strategies on SMASE influence pupils' science performance in KCPE

Descriptive analysis technique was used to organize, summarize and interpret quantitative information. Data was then presented in form of frequency tables and charts where applicable. This presentation is based on the questionnaire administered.

4.1.1 Questionnaire return rate

Completion rate is the proportion of the sample that participated as intended in all the research procedures. The returned questionnaires were from 149 pupils, 27 teachers and 12 headteachers primary school in Dondori Division. Analysis and data interpretation was based on these returns. The results are as presented in Table 4.1.

Table 4.1 Questionnaire Return Rate

Respondents	Sample size	Return
Headteachers	12	12(100.
Teachers	27	27(100.
Pupils	156	149(95.

From Table 4.1, all the headteachers and teachers and 95.5 percent of the pupils returned their questionnaires as sampled. Mugenda and Mugenda (2003) stated that 50 percent return rate was adequate, 60 percent good and 70 percent very good. The return rate was hence considered good to provide required information for the purpose of data analysis.

4.2. Background characteristics of the respondents

This section presents the characteristics of personal attributes of individual respondents. Pupil's attributes included their gender, age, class marks for last term and current score for science. The head teachers' attributes included their gender, age and highest professional qualifications. The rationale behind inclusion of these attributes in the analysis is that they help to shed some light

on how the characteristics have influenced on the Strengthening Mathematics and Science Education on pupils' science performance.

4.2.1 Pupils demographic data

The pupils were asked to indicate their gender, age, class marks for last term and current score for science. The results for pupil's gender and age are as shown in Table 4.2.

Table 4.2: Gender versus Age of the Pupils

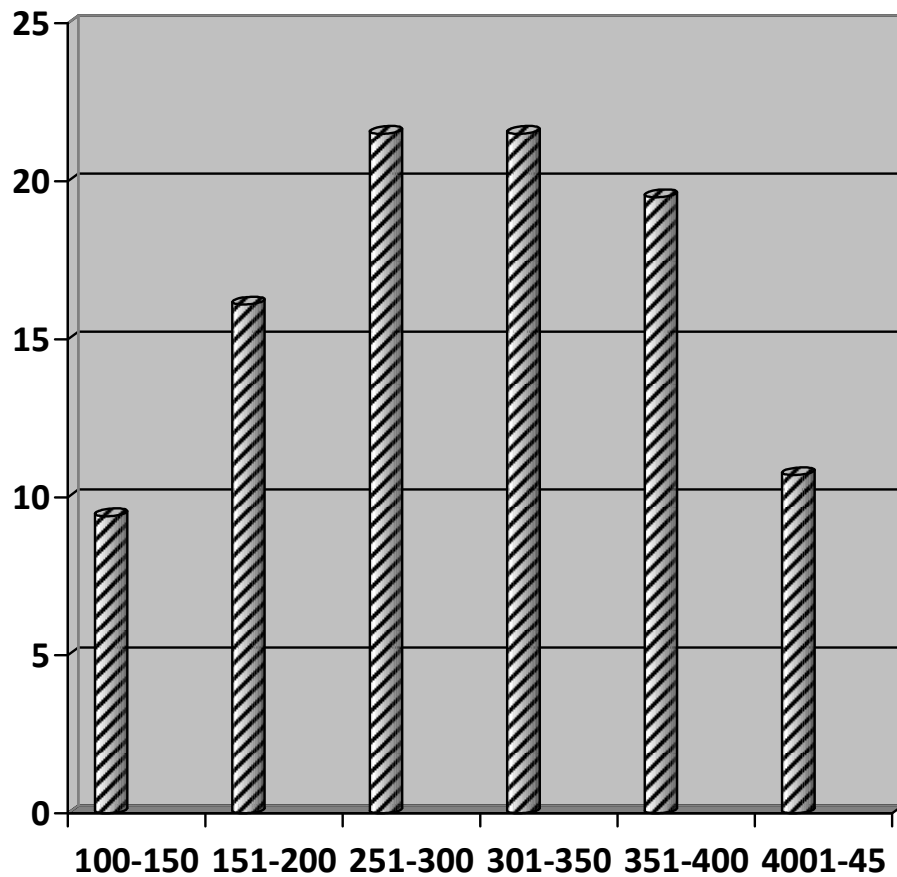
Gender	Age	12-13 years	14-15years	Total
		Count	49	20
Boys	%	71.0%	29.0%	100.0%
	Count	62	18	80
Girls	%	77.5%	22.5%	100.0%
	Count	77	72	149
Total	%	51.7%	48.3%	100.0%

About 77.5% of the girls and 71.0% of the boys are aged between 12-13 years while 29.0% of the boys and 22.5% of the girls were aged between 14-15 years of age. These being class eight pupils it is possible to have this age. On the other hand there are more girls (53.7%) than 46.3% of the boys counterpart. Hence there is need to encourage boys enrolment, retention and completion in primary schools in Dondori Division.

Performance in KCPE Examination

Pupils' performance is very important. This would help the study to establish the performance in class of the pupils involved in the study. This would also help the study evaluate the influenced of strengthening mathematics and science education on pupils' science performance and performance in general. The pupils were asked to indicate their marks in the last term. The results are as shown in the Table 4.3.

Figure 4.1 Marks for the Last Term

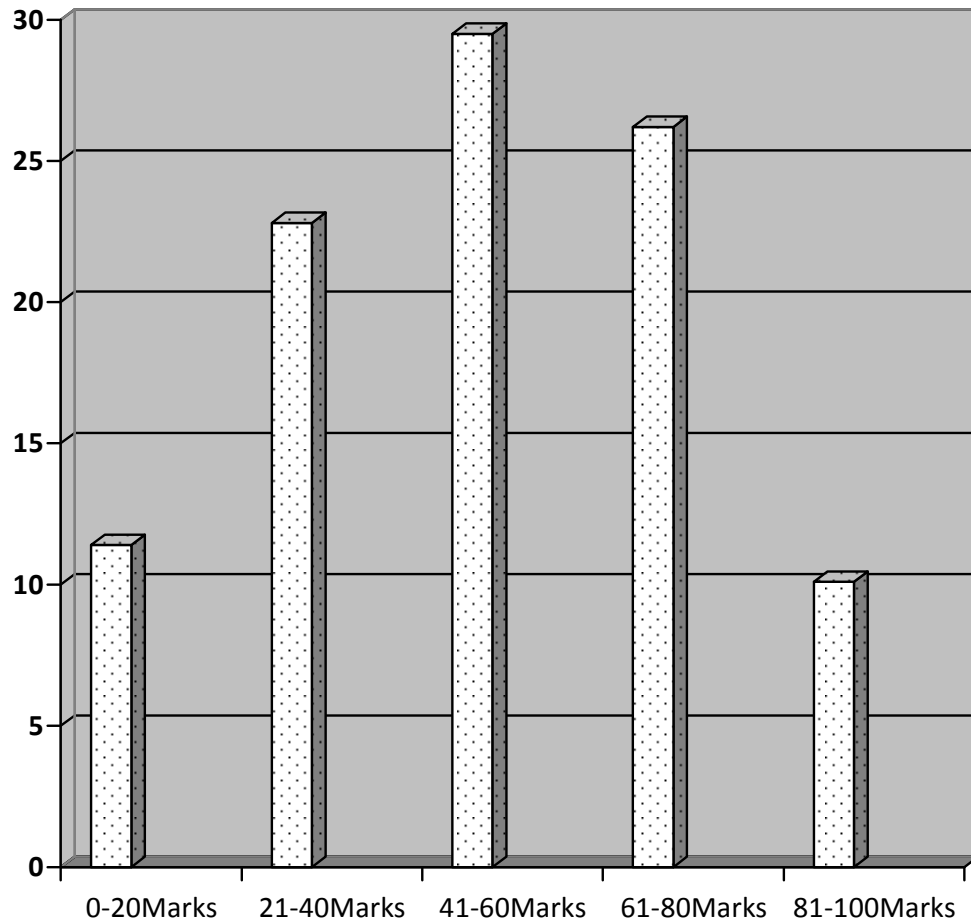


The pupils were asked to indicate the marks they had attained in the last term. About 9.4% had attained between 100-150 marks. 16.1% had attained 151-200 marks, 21.5% had attained 201-250 and 251-300 marks respectively while 19.5% had attained 301-350 marks, another 10.7% had attained 351-400 marks. A small percentage of 1.3% of the pupils had attained 401-450 marks. This show that slightly above half of the pupils had attained half the required marks out of five hundred marks. The pupils were again asked to indicate their current performance in science. The results are as shown in Table 4.4.

Table 4.4 Pupils Current Performance in Science

	Frequency	Percent
0-20 marks	17	11.4
21-40 marks	34	22.8
41-60 marks	44	29.5
61-80 marks	39	26.2
81-100 marks	15	10.1
Total	149	100.0

Figure 4.2 Pupils Current Performance in Science



About 29.5% of the pupils had 41-60 marks while 26.2% of them had attained 61-80 marks, 22.8% of them had attained 21-40 marks, 11.4% of the had attained 0-20 marks and 10.1% of them had attained 81-100 marks in science. This shows that at least three quarters of the pupils had attained 41-above marks in science while only a small percentage of 11.4% of the pupils had a minimal performance in science of 0-20marks. This could have been as a result of many

things, one being the teachers teaching methodology or other factors from within or outside the school environment.

Headteachers and teachers demographic data

The study sought to establish headteachers and teachers demographic data. The results are as shown in Table 4.5.

Table 4.5 Headteachers' and Teachers Gender Distribution

Gender	Head teachers		Teachers	
	Frequency	Percent	Frequency	Percent
Male	9	75.0	8	30.8
Female	3	25.0	18	69.2
Total	12	100.0	26	100.0

Table 4.5 shows, that the majority of the headteachers (75%) were male, while majority of the teachers (69.2%) were female. The findings show that majority of the teachers were female and more men were in the administrative positions. These findings concur with Cubillo and Brown (2010) who note that the teaching profession is predominated by women. However, women are less well represented in administrative positions than they are in teaching jobs.

Age of the headteachers and teachers

The age of headteachers and teachers is important. The results are as presented in Table 4.6

Table 4.6 Head Teachers' and Teachers Age Bracket

Age (years)	Head teachers		Teachers	
	Frequency	Percent	Frequency	Percent
Below 30 years	0	0.0	2	7.7
30-39 years	0	0.0	16	61.5
40-49 years	3	25.0	6	23.1
Over 50 years	9	75.0	2	7.7
Total	12	100.0	26	100.0

Table 4.6 shows that all the head teachers were over 40 years old while majority of the teachers (61.5%) were aged between 30 to 39 years. The findings are an indication age is a determinate of effective educational administration ability. This is in-line with a study done by Kingangi (2009) that indicate that the ability to solve administrative issues effectively increases with increase in age.

Education qualifications

The study further sought to find out the education qualification of teachers and presented the findings as shown in Table 4.7.

Table 4.7 Head Teachers' and Teachers' Highest Academic Qualification

Professional qualification	Head teachers		Teachers	
	Frequency	Percent	Frequency	Percent
MED	2	16.7	2	7.7
BED	8	66.7	4	15.4
Diploma	2	16.7	6	23.1
Certificate	0	0.0	14	53.8
Total	12	100.0	26	100.0

Table 4.7 indicates that all the headteachers and teachers had attained different levels of professional qualification with majority of the headteachers having a Bachelor's Degree and 53.8% of the teachers having a P1 Certificate. This was an implication that all teachers and headteachers were in the capacity to carry out their role in schools, as stipulated in the Basic Education Act (2013), the TSC Act (2012) and Sessional Paper no 5 on Policy Reforms for Education, Training and Research in the 21st century Therefore the respondents were liable to give valid data for the study.

4.3 Learners' centred teaching methodologies on SMASE influence pupils' science performance in KCPE

Activity Student Experiment and Improvisation (ASEI) lesson design considers the quality of classroom activities as critical to achieving effective teaching and learning (SMASE, 2010). Teachers are the main agents of curriculum implementation and therefore, the learner should be at the centre of the process.

ASEI aims at helping teachers appreciate the benefits of active learner involvement in the teaching and learning process. Teachers are guided on how to use a variety of activities for effective lesson delivery. Mwangi (2014) denotes that the use of practical activities in learning needs to be emphasized. This is done through arranging the learning process systematically. This study sought to identify activities pupils are involved in science classes which are learner centred. The results are as shown in Table 4.8.

Table 4.8 Pupils Performance of Activities in Science

	Daily	Weekly	Fortnight	Yearly	Total
Individual experience	45(30.2%)	73(49.0%)	31(20.8%)	0	149(100.0%)
Group discussion	55(36.9%)	73(49.0%)	21(14.1%)	0	149(100.0%)
Observe teacher demonstration	76(51.0%)	73(49.0%)	0	0	149(100.0%)
Go for field trips	0	0	0	149(100.0%)	149(100.0%)
Do project work	27(18.1%)	87(58.4%)	35(23.5%)	0	149(100.0%)
Do peer training	98 (65.8%)	51(34.2%)	0	0	149(100.0%)

All the pupils indicated that they attended field trips once a year. This implies during field trips pupils are able to learn different lessons that could be offered in science according to the sites visited. Majority (65.8%) of the pupils noted that they did peer-training daily in their class and 34.2% of them did it weekly.

This implies that pupils were also taking the challenge of teaching each other in class in what they had understood as the teacher was teaching them especially in science experiences. About 58.4% of the pupils noted that they were involved in project work in their class weekly while 23.5% of them were involved in a fortnight project work and 18.1% were involved daily in project work. This implies pupils were given activities to carry out as a project in their class activities as a learning activity. Slightly above half of the pupils (51.0%) said that they observed teachers' demonstration daily while 49.0% did it weekly. Teachers' demonstration in a practical lesson should be observed by pupils to help them imitate the activity and they try out on the activity on their own. About 49.0% of the pupils engage in group discussions in weekly basis and individual experiences respectively. On the other hand group discussions were also done on daily basis by 36.9% of the pupils and 14.1% did their in a fortnight while 30.2% of the pupils did individual experiences daily and 20.8% of them did them in a fortnight. This implies that pupils gained hand-on experience when they carried out individual experiences and also when they held group discussions. The results agree with Danahar & Umar, (2010) argues that learners engage in experiment activities where they manipulate variables. On the other hand JICA (2007) argues that ASEI emphasis on shift from recipe and demonstration type of experiments to investigative and hand on type of experiments. Pupils involved in well- designed experiments, they learn how to observe, manipulate, measure, reason, and develop skills for gathering information.

From the teachers and headteachers questionnaires, majority of the teachers (74.1%) and 66.7% of the headteachers that pupils were involved in individual

experiences and group discussions in weekly basis while (25.9%) of the teachers and 33.3% of the headteachers indicated that pupils were involved in individual experiences daily. This implies that teachers gave pupils time for individual experiences in science lessons and they also involved the school management in the same. All the teachers and headteachers indicated that teachers were observed by pupils while demonstrating on science activities, daily weekly and also while planning for field trips which took place once a year. This implies that teachers demonstrated in science class activities and this was aided by learning and teaching aids provided by the school. All the teachers also indicated that they gave pupils projects to carry out at home and bring them to school. This was also observed by the head teachers since they had gone through the schemes of work given and had sometimes supervised teachers as they implemented their lesson plans. All the teachers indicated they encouraged daily peer teaching for pupils to remind others in class what they had learnt in the previous class. The result concurs with Mwangi (2014) who said that practical performance can only emphasized on the process and product for a given project. This is also in line with the findings of the Peer Reviewed Scientifically Based Methods of Instruction (2011).

Performance in science

Poor performance of students in science has often been regarded as symptomatic of poor learning approaches (Dewey, 2011). The ASEI pedagogical shift focus of lesson is on the learner, while the lessons' objectives are geared to improving the learners' academic achievement and quality of learning. Emphasis help learners construct and reconstruct meaning directly from their encounters with the empirical world. Learning activities enable science practical subjects to build a bridge between the realm of objectives and observable properties on one hand and the realm of ideas on the other. Hence

this study sought to know from the pupils whether they got homework their current performance in science. The results are as presented in Table 4.9.

Table 4.9 Pupils Given Homework versus their Current Performance in Science

		Current performance in science					Total
		0-20 marks	21-40 marks	41-60 marks	61-80 marks	81-100 marks	
Yes	Count	15	23	30	24	6	98
	%	15.3%	23.5%	30.6%	24.5%	6.1%	100.0%
No	Count	2	11	14	15	9	51
	%	3.9%	21.6%	27.5%	29.4%	17.6%	100.0%
Total	Count	17	34	44	39	15	149
	%	11.4%	22.8%	29.5%	26.2%	10.1%	100.0%

Majority of the pupils had received some homework (98 [65.8%]) while 51[34.2%]) did not get homework. Among the pupils who got homework, 15.3% of them got a score of 0-20 marks while 23.5% of them got 21-40 marks, 30.6% of them getting 41-60 marks, 24.5% attained 61-80 marks and 6.1 attained 81-100 marks in science this shows that majority of the pupils (62.2%) with homework had attained a mark more than 41-100 marks in science while 48.8% of them had a low mark of 0-40 marks. On the other hand thou there was a high percentage of pupils who performed better but did not have homework in science at 74.6%. This implies whether pupils were given homework or not did not help them attain good grades but teaching activities used by the teachers in class. The results from

pupils concurs with headteacher and teachers that good grades were gotten where pupils had the mastery of the subject. The results confirm KNEC (2013) results that noted poor performance of 2012 Kenya Certificate of Primary Education was due to pupils failing to answer questions that required constructed, scientific and multidimensional knowledge. CEMASTEVA (2011) acknowledges that active pupil's participation in learning is key in quality education and also contributes to better outcome in examinations.

4.4 Improvisation of local learning resources on SMASE influence pupils' science performance in KCPE

Improvisation of locally available resources helps science teachers who often do not have access to the resources needed to optimally perform experiments. Innovative teachers can use cheaper products to simulate experiments. Therefore teachers can also help students learn improvisation as an important life skill to help them think critically about the scientific concepts underlying the devices (Ndirangu, 2013). This study sought to find from the pupils whether teachers had teaching when teaching. The results are as shown in Table 4.10

Table 4.10 Pupils Response on Science Teacher Use Teaching

Teaching aid		Performance in Science				Total
		Excellent	Good	Average	Poor	
Yes	Count	6	34	55	27	122
	%	4.9%	27.9%	45.1%	22.1%	100.0%
No	Count	0	0	16	11	27
	%	0%	0%	59.3%	40.7%	100.0%
Total	Count	6	34	71	38	149
	%	4.0%	22.8%	47.7%	25.5%	100.0%

Aids with Performance

From Table 4.10 the study clearly shows pupils performance being better for schools that had teaching aids that is 4.9% of the pupils had performed excellently in science while 27.9% of them were good and 45.1% of them were average and only 22.1% of them were poor. On the other hand pupils from schools that did not have teaching for science performed average (59.3%) and poor (40.7%) respectively. This implies that teachings aids had an impact on pupils' performance in science. The results agree with those of the headteachers (83.3%) and teachers (81.5%) who indicated availability of teachings aids in their schools while 16.7% of the headteachers and 18.5% of the teachers indicated lack of teaching aid. The results from the pupils concurs with Dewey (2011) who observed that teaching resources enhanced retention of cognitive skills to about 80% of what is learnt and they not only enhance communication between teachers and learners but also facilitates child centred learning. The results from teachers concur with those of Nyawamu (2010) established that

lack of teaching equipment in most schools discouraged teachers from doing their best.

The pupils were asked to indicate how often the teaching aids were used in class. The results are as shown in Table 4.11.

Table 4.11: Times Teachings Aids are used and Performance in Science

		Performance				Total
		Excellent	Good	Average	Poor	
Always	Count	5	22	27	17	71
	%	7.0%	31.0%	38.0%	23.9%	100.0%
Sometimes	Count	1	10	20	8	39
	%	2.6%	25.6%	51.3%	20.5%	100.0%
Rarely	Count	0	2	8	2	12
	%	.0%	16.7%	66.7%	16.7%	100.0%
Not at all	Count	0	0	16	11	27
	%	0%	0%	59.3%	40.7%	100.0%
Total	Count	6	34	71	38	149
	%	4.0%	22.8%	47.7%	25.5%	100.0%

From table 4.11, it is clear that performance for pupils where teaching aids was used always was high with 7.0% being excellent, 31.0% have a good performance, 38.0% of them have average performance. Pupils from schools where teaching aids were used rarely performance was good and poor for 16.7% respectively and 66.7% were average. For the pupils where the teachings aids

were not used at all 59.3% of the pupils performed averagely while 40.7% of them performed poorly. Teachers from schools where teaching aids were available and always used it and sometimes indicated that the performance was both excellent, good and average for majority of their pupils. This also concurred with headteachers from schools where teachings aids were availed and used always and sometimes. This implies that pupils' performance was affected by also the use of teaching aids. The results also concurs with Ndinda (2011) in his study on impact of teaching and learning in secondary school performance stated that learning resources play a great role in influencing good performance his study demonstrated that most of the performing schools in Kisumu municipality made use of teaching and learning resources. Inadequate teaching and learning resources affect effective curriculum implementation leading to poor performance. Mobilizing of resources should be ensured for teachers to effectively implement curriculum implementation curriculum. Since adequate resources boost efficiency in curriculum.

Availability of Science textbooks

Teaching and learning resources are key elements in the effective delivery of the curriculum (CEMASTE, 2013). Lack of these resources leads to teacher centered learning and hence leads to passive learning. Learning resources are critical inputs in the teaching because they assist learner to synthesize what is learnt and thus improve performance. The study sought to know the availability of science textbooks and performance in science. The results are as shown in Table 4.12.

Table 4.12: Availability of Science Textbooks and Performance In Science

Available of science						
textbooks		Performance in science				Total
		Excellent	Good	Average	Poor	
Yes	Count	8	34	53	32	127
	%	6.3%	26.8%	41.7%	25.2%	100.0%
No	Count	0	0	16	6	22
	%	0%	0%	72.2%	27.3%	100.0%
Total	Count	8	34	79	38	149
	%	5.4%	22.8%	53.0%	25.5%	100.0%

In Table 4.12, majority of the pupils 85.2% indicated that science textbooks are available and hence had an effect of performance in science and 14.8% of them pupils who indicated that they lacked science textbooks. Gituthu (2014) concurs only 30 percent of teachers in secondary schools improvise resources in experiment while 70 percent rarely do. This denies the students a chance to raise their interest and curiosity. The pupils also indicated that 96.6% of the pupils indicated that they shared a copy of the science textbook while 3.4% of them had a copy of each for the science textbook.

4.5 Plan Do See Improve Approach on SMASE influence pupils' science performance in KCPE

PDSI (Planning, Doing (carrying out the planned activity) Seeing (evaluating the outcome of activity) followed by Improvement is a process of checking the progress of an activity against its plan and answering the question of how the activity is being carried out in relation to the intended planned objectives (SMASE, 2013). Through planning entry behaviour which is background knowledge, skill and attitudes are facilitated and incorporated into teaching and process. Planning and using systematic approach to teaching the entry behaviour or prerequisite knowledge and skills which is one of the contributing factors that determine the outcome of good or poor performance. This study sought to from the pupils whether the participated in activities during the science lessons. The results are as shown in Table 4.13.

**Table 4.13: Pupils Response to the time that the Following
Activities are Carried Out in Science Lesson**

Activities	Daily	Weekly	Termly	Total
Participate in lesson preparation	27(18.1%)	87(58.4%)	35(23.5%)	149(100.0%)
Give suggestions during the lesson	55(36.9%)	73(49.0%)	21(14.1%)	149(100.0%)
Report your findings	76(51.0%)	73(49.0%)	0	149(100.0%)
Comment on the lesson delivery	27(18.1%)	87(58.4%)	35(23.5%)	149(100.0%)
Ask questions on unclear concepts	98 (65.8%)	51(34.2%)	0	149(100.0%)
Share your experience with others	45(30.2%)	73(49.0%)	31(20.8%)	149(100.0%)

Majority of the pupils (65.8%) indicated that they asked questions on unclear concepts daily. This implies that pupils were eager to learn new concepts and understand them. About 58.4% of the pupils also indicated that they gave comments on the lesson delivery and participated in lesson preparation weekly respectively. The others factors that were highly rated on daily basis include report their findings (51.0%) while 49.0% reported on weekly basis. This implies pupils participated in giving comments on lesson delivery and also gave their reports findings to their teacher daily. The result agrees with Arunga (2007) who noted that during planning teachers should take into consideration the learner's background such as learning difficulties, needs interests,

misconceptions and previous experience in relation to the topic. This is supposed to enable learners to understand the concepts and appreciate what they are learning and apply in their real life.

4.6 Teachers' attitude on ASEI and PDSI strategies on SMASE influence science performance in KCPE

According to Ndirangu (2013) teachers' attitudes towards ASEI PDSI strategies had a strong influence on students' attitude towards the subject consequently the student attitude had a strong bearing on their achievement. ASEI PDSI forms a framework of concepts that are the basis for continuous practice of effective content delivery that forms the ingredients of effective delivery of curriculum. Teachers are thus designed to develop suitable teaching activities in all lessons.

Table 4.14 Pupils Attitude towards Science Lessons

	Frequency	Percent
Very much	73	49.0
Not very much	67	45.0
Not sure	8	5.4
Not at all	1	.7
Total	149	100.0

About 49.0% of the pupils indicated that they enjoyed very much the science lesson while 45.0% of them indicated that they did not enjoy very much the science lesson. This implies that just as slightly below half of the pupils enjoyed science lesson hence had a positive attitude towards science lesson while the other pupils had a negative attitude. The results Kebaso (2012) found out that poor attitude towards learner- centred strategies is both on the part of learner and the teachers. He pointed out that while students think sciences are generally harder than languages and humanities; teachers might tend to think the same right from their school days or may have lost hope in their students' performance. On the other hand teachers attitude towards the science lesson was also evaluated. The results are as shown in Table 4.14

Table 4.15 Teachers Attitudes of Activities in Science

	Agree	Neutral	Disagree	Total
As ASEI lesson plan is difficult to prepare	5(18.5%)	20 (74.1%)	2(7.4%)	27(100%)
A lot of time is required to prepare comprehensive lesson notes	16(59.3%)	8(29.6%)	3(11.1)	27(100%)
My students rarely give correct answers	18(66.7%)	7(25.9%)	2(7.4%)	27(100%)
It is not possible to have an activity in every lesson	23(85.2%)	4(14.8%)	0	27(100%)
Evaluation is very necessary for effective teaching and learning	25 (92.5%)	2(7.4%)	0	27(100%)
Immediate follow up of assignment enhance academic performance	26 (96.3)	1(3.7%)	0	27(100%)

Majority of the teachers (96.3%) agreed that there was need for immediate follow up of assignment enhance academic performance while 92.5% agreed that evaluation is very necessary for effective teaching and learning and 85.2% indicated that it is not possible to have activities in every lesson. The results agree with Torress (2010) who assets that attitude of teachers has a great effect that expands beyond the classroom. Improving student learning depends on its teaching force with appropriate knowledge and attitude towards teaching and learning the formation has its foundation on content and pedagogical knowledge. Attitude is mental images that individuals have about their perceptions. Teachers being important resources should play an active role on attitude formation.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATION

5.1 Introduction

This chapter provides a summary of the study, summary research findings, conclusions and recommendations as well as suggestions for further research.

5.2 Summary of the study

The purpose of the study was to investigate influence of strengthening mathematics and Science Education on pupils science performance in Kenya certificate of Primary Education in Dondori division. The study aimed to achieve this by assessing learner-centred teaching methodologies, improvisation of learning resources, PDSI approach as well as teachers' attitudes towards ASEI-PDSI strategies influence pupils' science performance in KCPE. It was based on constructive theory by Taber in 2009. The study adopted a descriptive survey design and targeted 12 public primary schools with 12 head teachers, 90 science teachers and 1510 class eight pupils. Simple random sampling technique was used to sample 30% of teachers and 10% of pupils in all public primary schools. Therefore the study sample comprised of 12 head teachers, 28 teachers and 151 standard eight pupils. Data were collected by the use of questionnaires. Collected data were analysed both qualitatively and quantitatively and presented in frequencies and percentages in form of tables and figures. All the 12 questionnaires from head teachers, 27 teachers' questionnaires and 149 pupils questionnaires were returned, realizing an instrument return rate of 98.4%, which was very satisfactory for the purpose of the study.

5.3 Summary of research findings

Learners' centred teaching methodologies on SMASE influence pupils' science performance in KCPE

All the pupils indicated that they attended field trips once a year. This implies during field trips pupils are able to learn different lessons that could be offered in science according to the sites visited. Majority (65.8%) of the pupils noted that they did peer-training daily in their class. About 58.4% of the pupils noted that they were involved in project work in their class weekly. From the teachers and headteacher questionnaires 74.1% of the teachers and 66.7% headteachers said that group discussion and individual experiences in science lessons were carried out on weekly basis. Performance of pupils was also tested against their homework, 65.8% indicating that they had homework and 62.2% of the pupils attained between 40-100 marks in their current science exam.

Improvisation of local learning resources on SMASE influence pupils' science performance in KCPE

Improvising of local learning resources on SMASE influence pupils' science performance in KCPE, 59.3% of the pupils indicated they had an average performance with the availability of learning resources on SMASE. Headteachers (83.3%) and teachers (81.5%) who indicated availability of teachings aids in their schools. When teaching aids are used always the performance of pupils was average performance. On the availability of science textbooks majority of the pupils 85.2% indicated that science textbooks are available and hence had an effect of performance in science.

Plan Do See Improve approach on SMASE influence pupils' science performance in KCPE

Majority of the pupils (65.8%) indicated that they asked questions on unclear concepts daily. About 58.4% of the pupils also indicated that they gave comments on the lesson delivery and participated in lesson preparation weekly respectively.

Teachers' attitude on ASEI and PDSI strategies on SMASE influence science performance in KCPE

From the pupil's attitude, 49.0% of the pupils indicated that they enjoyed very much the science lesson. About 96.3% of the teachers agreed that there was need for immediate follow up of assignment enhance academic performance while 92.5% of the teachers agreed that evaluation is very necessary for effective teaching and learning and 85.2% indicated that it is not possible to have activities in every lesson. ASEI lesson plan was difficult to prepare. ASEI lesson plans for every lesson as prescribed during the SMASSE in-service training.

5.4 Conclusions

From the findings of the study it can be concluded that field trips once a year taught the pupils a different lesson that could be offered in science according to the site visited. This was supported by the teachers and headteachers' response who noted the most effective method was field trips, group discussion and individual experiences in science lessons which were carried out on weekly basis.

The improvisation of local learning resources on SMASE influences pupils science performance in KCPE was influenced by availability of teaching and learning materials. Availability of science books would enable pupils to attain better grades

The plan do see improve approach on SMASE influences pupils performance as indicated by pupils asking questions on unclear concepts daily. Pupils also participated in lesson delivery and participated in lesson preparation weekly. The teachers and the headteacher's also indicated that pupils were helped to understand concepts that were not clearly understood during the lesson. This would enable the pupils to perform better in their KCPE.

Teachers' attitude on ASEI and PDSI strategies on SMASE influence science immediate follow up and enhance academic performance. Pupils Evaluation is necessary for effective teaching and learning and ASAI lesson plan was difficult to prepare.

5.5 Recommendations

Based on the findings and conclusions of the study the following recommendations were made:

There is need more field trips to scientific sites to enable pupils get firsthand information. This should also be done through group discussion after the trips and individual experiences that would enable pupils to experiment their learning that have been done in class.

There is need for the school without teaching and learning aids, science text books to avail them to enable pupils to get information which they have not learnt from other areas in school. This would enable them to complete their homework.

There is need for teachers to employ PDSI to enable pupils understand concepts that they did not understand during lesson time to enable them understand it better when asking questions. Teachers should implement what they have learnt in SMASE INSETS so as to ensure that pupils understand the concepts of the lesson well.

There is need for teacher's change of their attitude towards science lesson to enable change the attitude of the pupils and also to deliver it effectively.

5.6 Suggestions for further research

There is need for further research to be conducted in the following areas:

- (i) An in-depth study to assess the influence of learner-centred strategies on science performance in the entire Nakuru County. This is vital because there are historical, geographical, institutional and other differences between divisions and sub-counties.
- (ii) Further research should be done to identify institutional factors that hinder implementation of learner-centred strategies.

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APPENDICES

APPENDIX I

LETTER OF INTRODUCTION

University of Nairobi,
P O Box 30197-00100,
NAIROBI.

The Headteacher

_____ School

P.O Box

Nakuru North Sub-County

Dear Sir/Madam,

RE: PERMISSION TO COLLECT DATA

I am a postgraduate student in the University of Nairobi, pursuing a master's degree in curriculum studies. I am conducting research on **Influence of Strengthening Mathematics and Science Education teacher development programme on science performance in Kenya Certificate of Primary Education in Nakuru-North.**

Your school has been selected to participate in the research. You are requested to respond to the questionnaire item as honestly as possible and to the best of your knowledge. This research is purely for academic purposes. **Kindly note that your name and that of your school will not be included in the research tools. You are free to withdrawal from the study anytime without giving reasons.**

Thank you.

Yours faithfully,

Lydia Nyawira Maina.

Reg. No.: E55/69950/2013

APPENDIX II

QUESTIONNAIRE FOR HEAD TEACHERS

You are kindly requested to fill this questionnaire indicating your honest response by putting a tick against your response or filling blanks next to the items as indicated. Please do not write your name or name of your school anywhere in this questionnaire.

Section A: Background information

Please indicate your gender. Male Female

Please indicate your age bracket 20-29 years 30-39 years
40-49 years Over 50 years

What is your highest professional qualification? MED BED

Diploma Certificate Other specify.....

SECTION B: Learner centred teaching methodology

How often do you perform the following activities in science?

	Daily	Weekly	Fortnight	Termly	Yearly
Individual experiment					
Group discussion					
Observe teacher's demonstration					
Go for field trips					
Do project work					
Do peer teaching					

7.(a) Do you as science teacher give homework? Yes [] No []

(b) If yes, is the homework marked? Yes [] No []

8. (a) Do science teacher use teaching aids when teaching?

Yes [] No []

(b) If yes, how often?

Always [] sometimes [] rarely []

(a) Does the school provide pupils with science textbooks?

Yes [] No []

(b) If yes, do pupils get a copy each or you share?

A copy each [] share []

9. How often do pupils carryout experiments in science lessons?

Very often [] often [] rarely [] not at all []

(a) Does the head teachers collect and check pupils' science notebooks?

Yes []

No []

(b) If yes how often?

Once in a month []

once in a term []

once in a year []

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
As ASEI lesson plan is difficult to prepare						
A lot of time is required to prepare comprehensive lesson notes						
My students rarely give correct answers						
It is not possible to have an activity in every lesson						
Evaluation is very necessary for effective teaching and learning						
Immediate follow up of assignment enhance academic performance						

Thank you for your cooperation

APPENDIX III

QUESTIONNAIRE FOR TEACHERS

You are kindly requested to fill this questionnaire indicating your honest response by putting a tick against your response or filling blanks next to the items as indicated. Please do not write your name or name of your school anywhere in this questionnaire.

Section A: Background information

Please indicate your gender. Male Female

Please indicate your age bracket 20-29 years 30-39 years

40-49 years Over 50 years

What is your highest professional qualification? MED BED

Diploma Certificate Other specify.....

SECTION B: Learner centred teaching methodology

How often do you perform the following activities in science?

	Daily	Weekly	Fortnight	Termly	Yearly
Individual experiment					
Group discussion					
Observe teacher's demonstration					
Go for field trips					
Do project work					
Do peer teaching					

7.(a) Do you as science teacher give homework? Yes [] No []

(b) If yes, is the homework marked? Yes [] No []

8. (a) Do science teacher use teaching aids when teaching?

Yes [] No []

(b) If yes, how often?

Always [] sometimes [] rarely []

(a) Does the school provide pupils with science textbooks?

Yes [] No []

(b) If yes, do pupils get a copy each or you share?

A copy each [] share []

9. How often do pupils carryout experiments in science lessons?

Very often [] often [] rarely [] not at all []

(a) Does the head teachers collect and check pupils' science notebooks?

Yes []

No []

(b) If yes how often?

Once in a month []

once in a term []

once in a year []

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Total
As ASEI lesson plan is difficult to prepare						
A lot of time is required to prepare comprehensive lesson notes						
My students rarely give correct answers						
It is not possible to have an activity in every lesson						
Evaluation is very necessary for effective teaching and learning						
Immediate follow up of assignment enhance academic performance						

Thank you for your cooperation

APPENDIX IV

QUESTIONNAIRE FOR PUPILS

Please answer all the questions by ticking (√) against your answer after carefully reading through them. Do not write your name or the name of your school.

SECTION A: Background information

What is your gender? Boys [] Girls []

How old are you?

How many pupils are in your class?.....

How many marks did you score last term?

100-150 () 151-200 () 201-250 ()

251-300 () 301-350 () 351-400 ()

401-450 () 451-500 ()

What is your current performance in Science?

0-20Marks () 21-40 Marks () 41-60 Marks ()

61-80 Marks() 81-100 Marks ()

SECTION B

How often do you perform the following activities in science?

	Daily	Weekly	Fortnight	Termly	Yearly
Individual experiment					
Group discussion					
Observe teacher's demonstration					
Go for field trips					
Do project work					
Do peer teaching					

7.(a) Does your science teacher give you homework? Yes [] No []

(b) If yes, is the homework marked? Yes [] No []

8. (a) Does your science teacher use teaching aids when teaching? Yes [] No []

(b) If yes, how often? Always [] sometimes [] rarely []

(a) Does the school provide you with science textbooks? Yes [] No []

(b) If yes, do you get a copy each or you share? A copy each [] share []

9. How often do you carryout experiments in science lessons?

Very often [] often [] rarely [] not at all []

10a) Does the head teachers collect and check pupils' science notebooks?

Yes [] No []

(b) If yes how often?

Once in a month [] once in a term [] once in a year []

Do you enjoy science lessons? Very much [] not very much []
 not sure [] not at all []

Thanking you for your cooperation

APPENDIX V

AUTHORIZATION LETTER



NATIONAL COMMISSION FOR SCIENCE,
TECHNOLOGY AND INNOVATION

Telephone: +254-20-2213471,
2241349, 310571, 2219420
Fax: +254-20-318245, 318249
Email: secretary@nacosti.go.ke
Website: www.nacosti.go.ke
When replying please quote

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

Ref: No.

Date:
10th June, 2015

NACOSTI/P/15/6776/6265

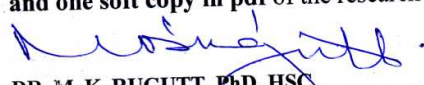
Lydia Nyawira Maina
University of Nairobi
P.O Box 30197-00100
NAIROBI.

RE: RESEARCH AUTHORIZATION

Following your application for authority to carry out research on *“Influence of Strengthening Mathematics and Science Education on pupils’ science performance in Kenya Certificate Of Primary Education in Dondori Division,”* I am pleased to inform you that you have been authorized to undertake research in **Nakuru County** for a period ending **4th September, 2015.**

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

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


DR. M. K. RUGUTT, PhD, HSC
DIRECTOR-GENERAL/CEO

Copy to

The County Commissioner
Nakuru County.

The County Director of Education
Nakuru County.

APPENDIX VI
RESEARCH PERMIT


THIS IS TO CERTIFY THAT: **Permit No : NACOSTI/P/15/6776/6265**
MS. LYDIA NYAWIRA MAINA **Date Of Issue : 10th June, 2015**
of UNIVERSITY OF NAIROBI, 163-20113 **Fee Received : Ksh. 1000**
BAHATI, has been permitted to conduct
research in Nakuru County

on the topic: INFLUENCE OF
STRENGTHENING MATHEMATICS AND
SCIENCE EDUCATION ON PUPILS'
SCIENCE PERFORMANCE IN KENYA
CERTIFICATE OF PRIMARY EDUCATION
IN DONDORI DIVISION

for the period ending:
4th September, 2015



Lydia Nyawira Maina
Applicant's Signature

Michael N. Njoroge
Director General
National Commission for Science,
Technology & Innovation



CONDITIONS

- 1. You must report to the County Commissioner and the County Education Officer of the area before embarking on your research. Failure to do that may lead to the cancellation of your permit**
- 2. Government Officers will not be interviewed without prior appointment.**
- 3. No questionnaire will be used unless it has been approved.**
- 4. Excavation, filming and collection of biological specimens are subject to further permission from the relevant Government Ministries.**
- 5. You are required to submit at least two(2) hard copies and one(1) soft copy of your final report.**
- 6. The Government of Kenya reserves the right to modify the conditions of this permit including its cancellation without notice.**


REPUBLIC OF KENYA

National Commission for Science,
Technology and Innovation

RESEARCH CLEARANCE
PERMIT

Serial No. A 5251

CONDITIONS: see back page