

**FACTORS AFFECTING THE IMPLEMENTATION OF
STRENGTHENING MATHEMATICS AND SCIENCES IN SECONDARY
EDUCATION PROGRAMME IN TEACHING PHYSICS WITHIN
MOMBASA COUNTY, KENYA.**

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E55/CE/14064/2009**

**A Thesis submitted in partial fulfillment for the award of the Degree of
Master of Education in the school of Education of Kenyatta University.**

MAY 2013

DECLARATION

Student's declaration

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

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Supervisors' Declaration

We confirm that the work reported in this thesis was carried out by the student under our supervision.

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DEDICATION

To my wife Linet and our children Anthony, Carren and Alfred for their moral support and patience which have been an inspiration to me.

ACKNOWLEDGMENT

My sincere acknowledgment goes to my supervisors, Dr Ndichu Gitau and Dr.Moses Ochanji who have patiently guided me through the process of developing this work. I would also wish to acknowledge my school principal Mr. Michael Mwangi for his understanding during my numerous trips to consult with my supervisors, Thirdly, I would wish to acknowledge my colleague John Ogembo, who has been a constant challenge and a source of encouragement to me in the whole process of working on this thesis.

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LIST OF ABBREVIATIONS AND ACRONYMS

ASEI	-	Activity, Student, Evaluation, Improvement
ASS	-	Attitude Scale for Students
CEMASTEА	-	Centre for Mathematics Science and Technology Education in Africa
DAC	-	Development Assistance Committee
DEO	-	District Education Officer
GOK	-	Government of Kenya
INSET	-	In-Service Education and Training
ISHOD	-	Interview schedule for Heads of Departments
JICA	-	Japan International Co-operation Agency
KCPE	-	Kenya Certificate of Primary Education
KCSE	-	Kenya Certificate of Secondary Education
KNEC	-	Kenya National Examination Council
MOE	-	Ministry of Education
MOEST	-	Ministry of Education Science and Technology
PDSI	-	Plan, Do, See, Improve
PTQ	-	Physics Teacher Questionnaire
QASO	-	Quality Assurance and Standards Officer
SMASE	-	Strengthening of Mathematics and Sciences in Education
SMASSE	-	Strengthening of Mathematics and Sciences in Secondary Education

SPSS - Statistical Package for Social Sciences
WECSA - Western, Eastern, Central and Southern Africa

ABSTRACT

The performance in mathematics and sciences in Kenyan secondary schools has remained low for many years. The Strengthening of Mathematics and Sciences in Secondary Education (SMASSE) project was introduced as a joint project between the Kenya government and Japan in order to improve the performance in these subjects in KCSE examination. Despite this, the improvement in performance in mathematics and sciences has not been very significant. This study aimed at investigating the factors affecting implementation of SMASSE project in the teaching of physics in Mombasa county. For Kenya to be industrialized by 2030, science, which includes physics, must play a major role. The poor performance in physics is therefore a matter of great concern. The findings of this study is aimed at helping the Physics teacher to come up with better strategies in the teaching of Physics. They are also aimed at helping the curriculum developers and textbook authors to include material in the curriculum which will enhance effective learning of Physics. The findings are also aimed at helping to equip the physics teachers' trainers like in colleges with better teaching strategies to impart to the Physics teachers. The instruments used in the study included questionnaires and interview schedule which were administered to sampled Physics teachers, students and Heads of Science Departments in twelve Mombasa county secondary schools. The data was collected and analysed using SPSS computer software and recommendations given.

CHAPTER ONE INTRODUCTION

1.0 Introduction

The performance in Mathematics and sciences in secondary schools in Kenya has generally been quite low over the years. This concern brought about the introduction of Strengthening of Mathematics and Sciences in Secondary Education (SMASSE) programme aimed at improving the performance in these subjects. This study is aimed at investigating the factors that determine the implementation of SMASSE project in the teaching of Physics in particular, in Mombasa county.

This chapter discusses the problem to be studied in the research by looking at the following areas: The background of the study, the statement of the problem, the objectives of the study, the research questions, significance of study, scope and limitations of study, the assumptions of the study, the theoretical framework, the conceptual framework and the operational definitions of key terms.

1.1 Background to the Study

The Strengthening of Mathematics and Science in Secondary Education (SMASSE) project is a joint venture between the Kenya government through MOEST and the government of Japan through JICA, initially on pilot basis. The SMASSE project is mainly involved in in-service training (INSET) of serving teachers in mathematics and science in secondary schools in Kenya.

The SMASSE project was started in July 1998 in Kenya as a pilot project involving nine districts; namely. Kisii, Gucha, Kakamega, Kajiado, Makueni, Murang'a, Lugari, Butere-Mumias and Maragua. In October 2000 the project was extended to cover six more districts, namely: Taita-Taveta, Kiambu, Baringo, Meru South, Garissa and Kilifi. The pilot phase of the project came to an end in June 2003 ushering in the next phase in which the project covered all the districts in the republic of Kenya.

The SMASSE project came into being when the poor performance in mathematics and sciences (Biology, Physics and Chemistry) became a matter of serious concern. A broad curricula, lack of facilities and inadequate staffing were always cited as the major causes of the problem (Wambui,N and Wahome,A, Unpublished). Although dismal performance in these subjects had almost been accepted as the norm in some schools, the Ministry of Education Science and Technology and other stake holders felt there had to be an intervention. Consequently, the SMASSE project team conducted a baseline survey in the nine pilot districts (Kajiado, Gucha, Kakamega, Lugari, Butere-mumias, Kisii, Muranga, Maragua and Makueni), in order to determine the areas that needed intervention and to come up with a strategic plan of operation. Interviews were conducted for head teachers, teachers, students, parents and laboratory assistants. More data was collected by administering questionnaires to teachers and students, lesson observation and video recording of lessons for further analysis. From the results of the survey, it was evident that there were numerous problems in Mathematics and science education in Kenya. These include negative attitude towards Mathematics and sciences by head

teachers, teachers and students, poor teaching methodology, poor mastery of content by the teachers, inadequate teaching and learning resources, among others.(Njuguna, 1999)

The SMASSE project, through in-service education and training of already serving teachers of Mathematics and sciences, was aimed at addressing the problems within its scope. The SMASSE project INSET curriculum was developed to upgrade and strengthen teachers' confidence by carefully addressing the various areas of concern, which negatively affect the performance in the mentioned subjects.

To achieve this, the SMASSE project team came up with what was termed as ASEI movement which is an acronym for **A**ctivity focused teaching and learning, **S**tudent centered learning, **E**xperiment based approach, and **I**mprovisation. This movement was aimed at upgrading the various aspects of teaching and learning such as student involvement in the teaching and learning activity and of locally available materials in teaching and learning process .To achieve the ASEI conditions, the organizers of the project came up with the PDSI approach to teaching and learning which stands for **P**lanning activities based on ASEI principles, **D**oing the planned activity, **S**eeing if the objectives were achieved and **I**mproving on the whole process based on the outcome of the evaluation. During INSETS, teachers carry out peer teaching on the ASEI lessons and later actualize them in schools.

Apart from Kenya, the SMASSE project was also implemented in other African regions through SMASE-Western, Eastern, Central and Southern Africa (SMASE-WECSA) as a regional association of mathematics and science educators. It was started in 2001 for the purpose of strengthening the quality of teaching and learning of mathematics and science in member countries. Member countries have adopted SMASSE's ASEI movement and PDSI approach as a way of improving classroom practice.

The overall goal of the project is to upgrade the capability of young Kenyans in mathematics and science. The purpose of the project is to strengthen the quality of mathematics and science education at secondary school level through INSET.

The project applied two approaches in strengthening quality of Education: mounting capacity development workshop for school managers' and conducting INSET to strengthen quality of teaching force in mathematics and science. INSET is one of the approaches employed to up-grade teachers' skills and competence the world over (Karega 2008), and is in conformity with worldwide consensus that improving quality of education depends on improvement of quality of classroom practices (Kibe et al. 2008). Indeed cases have been noted of schools where there were qualified teachers or adequate equipment and materials, yet students' achievement in the mathematics and science subjects had not been necessarily high (Kibe, et al. 2008). On the contrary, there were poorly endowed schools in terms of facilities and scholarly material, yet they posted relatively better examination results owing to effective teaching and management of learning environment.

The INSET and workshop activities for SMASSE are guided by findings of baseline survey carried out in 1998/99. As a result, a forty days' curriculum was introduced which was split into four modules, each module being covered in 10 days in a year (Waititu and Orado,2009).

In the first year, the theme of training was on “Attitude change”, with objective of creating among the teachers a reason to accept teaching circumstances they find themselves in, and to do the best in those circumstances. The training explored rationale for continuous professional development and accorded participants with opportunity to own findings of the baseline survey, particularly the challenges relating to teachers. It then went on to handle topics on pedagogical issues in relation to how they limited or impeded quality learning outcomes. Such topics were: teachers' and students' attitudes; teaching approaches and methods; instructional design; adolescent psychology and gender issues; stress and stress management and classroom communication skills. These topics were then contextualized using some of the subject matter content which had been identified as challenging to teachers and learners.

In the second year, the training rallied on a theme titled “Hands-on Activities”. During this training, only three pedagogical topics were covered: Resource utilization, Use of practical work in teaching and learning of mathematics and sciences and ASEI Instructional design. Pedagogical topical issues in module one and in module two were

contextualized in additional subject matter content identified as challenging to teachers and learners.

In the third year, the training focused on “Actualizing lesson based on ASEI –PDSI teaching approach. Hitherto, the training had been using peer teaching to exercise on desired pedagogical skills. Training in this third module moved the trainees into actual classrooms where teaching was done, with collegial support and evaluation. The actualization was strengthened by training on how to use communication skills for effective classroom interaction and also how to assess and evaluate teaching and learning process. More subject content matter among those areas that were challenging to teachers and learners was covered.

In the fourth module, the theme was “Impact transfer”. It was tempered with review of some of the topics on pedagogical issues covered in module one, two and three, with key emphasis on how to impact on the learners. Actualization was then carried out again besides covering more of the content matter that had been identified as challenging to teachers and learners. As indicated earlier, this study was concerned about the teaching of Physics. Table 1.1 shows the performance in Physics nationally from 2000 to 2009.

Table 1.1: KCSE Physics performance nationally from 2000 to 2009.

Year	Percentage mean score
2000	21.91
2001	17.62
2002	20.78
2003	22.03
2004	23.92
2005	24.59
2006	40.32
2007	41.31
2008	36..21
2009	31.31

Source: 2005 and 2009 KCSE Examination report by KNEC.

Considering that the SMASSE project went national in 2003, the improvement in students' performance in physics registered was quite slight in the subsequent years up to 2005. However, remarkable improvement in performance was registered from 2006 as shown in table 1.1. It is also worth noting that there is a worrying downward trend in students' performance in Physics from 2007 to 2009 which should be addressed.

1.2 Statement of the problem

According to Kenya vision 2030 (GOK, 2007), Kenya should be industrialized by the year 2030. For this vision to be realized, science must play a major role since technology, which brings about industrialization, involves application of scientific knowledge. Good performance in Physics is therefore a matter of great concern nationally. Proper implementation of SMASSE teaching and learning approach can therefore help to

improve students' performance in Physics hence facilitating the realization of vision 2030.

For a long time, according to Changeiywo, physics has been mystified as difficult and hence, some schools have not offered it in the last two years of secondary school education. Recent findings show that students who hold negative stereotype images of scientists, science and technology in society are easily discouraged from pursuing scientific disciplines and usually performed poorly in science subjects (Changeiywo, 2000). This situation does not favour Kenya's move towards developing a scientific and technological nation. The concern is that the performance in Physics is going down and the subject is less popular among students in Kenyan secondary schools as compared to other science subjects. The enrollment in KCSE for the three sciences in 2008 and 2009 shows that the number of candidates enrolled for Physics is about a third of the number enrolled in Chemistry and Biology as shown in table 1.2.

Table 1.2: KCSE enrollment in science subjects in 2008 and 2009

Subject \ Year	2008	2009
Physics	92,648	104,188
Chemistry	296,360	328,922
Biology	271,735	299,302

Source: 2009 KCSE examination report by KNEC.

Since 2003 the government has been implementing a new curriculum in both primary and secondary schools, and has a new examination format (KNEC, 2005). This new format makes a deliberate attempt to attract students to study Physics (Orende & Chesos, 2005). Although the government has done its part the role of the teacher in the classroom is important. The teaching approach that a teacher adopts is one factor that may affect students interest (Mills, 1991). Therefore use of appropriate teaching methods is critical to the successful teaching and learning of Physics.

Despite the introduction of SMASSE project which was aimed at enhancing performance in mathematics and sciences, physics, like the other three subjects namely mathematics, chemistry and biology, has not consistently registered remarkably improved performance. (see the table 1.3). This research was therefore aimed at investigating the determinants for effective implementation of SMASSE approach in the teaching and learning of Physics, with the intention of coming up with possible ways of improving the implementation of the project, which will result in consistently good performance in Physics. Table 1.2 shows the performance of Mathematics and sciences nationally from the year 2006 to 2009.

Table 1.3: National KCSE performance in Mathematics and Sciences from 2006-2009

Year	Percentage scores			
	Mathematics	Physics	Chemistry	Biology
2006	19.04	40.32	24.91	27.45
2007	19.73	41.31	25.39	41.95
2008	21.30	36.21	22.74	30.34
2009	21.13	31.31	19.12	27.15

Source: 2009 KCSE Examination report by KNEC.

Table 1.1 shows that although the percentage score in Physics has been better for the last few years compared to Mathematics and other sciences, Physics performance is showing a downward trend, an issue that should be addressed.

1.3 Objectives of the study

The objectives of the study were as follows:

1. To assess teachers' attitudes towards SMASSE programme
2. To assess students attitudes towards Physics as a subject.
3. To establish whether ASEI/PDSI approach has been implemented in teaching Physics in Mombasa county.
4. To identify challenges involved in implementing ASEI/ PDSI approach in teaching Physics
5. To suggest possible ways of overcoming the challenges involved in implementing ASEI/PDSI approach in the teaching of physics.

1.4 Research Questions

The research was aimed at answering the following questions:

1. What is the general teachers' attitude towards the SMASSE project?
2. What is the students' attitude towards Physics?
3. How far has general SMASSE approach been applied in teaching Physics in Mombasa county?
4. What are the challenges involved in implementing the ASEI/PDSI approach in teaching Physics?
5. How can the challenges in applying ASEI/PDSI approach in teaching physics be overcome.

1.5 Significance of the study

The research finding will sensitize Physics teachers, who are the implementers of the Physics curriculum, on the strategies and techniques suggested to improve the performance in Physics. They will also help the students to identify difficult areas and to adopt the strategies suggested in handling the difficult areas.

For curriculum developers, the findings will assist them to come up with more appropriate teaching methodologies so as to improve the students' performance in Physics. The authors of Physics text books will also be sensitized through the research findings to prepare the learning materials that enhance effective learning in Physics.

The Physics teacher trainers, like in colleges and INSETs can be assisted by the findings to equip the teachers with better strategies of teaching Physics.

1.6 Scope and Limitations

The study was limited to selected secondary schools in Mombasa county . The schools selected were those offering physics as one of the science subjects and those involved in the SMASSE programme. Mombasa county secondary schools were preferred for easy accessibility by the researcher whose working station is located in the county.

Although SMASSE project involved Mathematics and all the three sciences, that is physics chemistry and biology, the study was only concerned with implementation of SMASSE on teaching physics as a subject only. The study involved only form three students.

1.7 Assumptions of the study

The following were the assumptions made in undertaking the study.

1. The respondents are honest in responding to the items in the questionnaires.
2. The teachers involved have been teaching Physics in the school long enough.
3. SMASSE approach will lead to improved performance in Physics.
4. SMASSE approach is appropriate in teaching Physics.

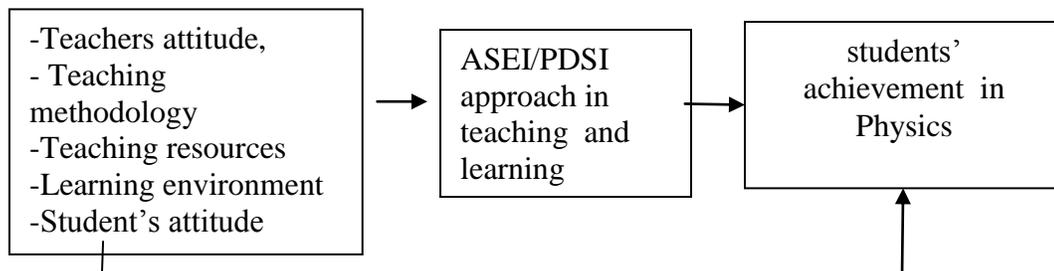
.8 Theoretical framework

This study was based on Bloom's theory of School Learning as presented by Murphy Jo (2007). In this theory, Benjamin Bloom suggested that children's level of achievement and rate of learning in different academic subjects as well as their emotional well being (positive and negative) is strongly influenced by the "quality of instruction" or what can

be thought of as teacher effectiveness including the extent to which the instruction to be given is appropriate to the learner. He noted that even though the way children are taught is important; there are other factors that influence the way students receive information and the way they interact in the classroom.

The study attempted to investigate the factors which implementation of ASEI/PDSI approach in teaching and learning which is expected to improve the quality of instruction and the teachers' effectiveness in delivering the Physics content required to students. The areas considered in the study which affect the implementing the ASEI/PDSI teaching and learning approach in classroom teaching are teachers' attitude, teaching and learning resources and learning environment. Other factors also include teaching methodology and students' attitude towards physics as a subject. Figure 1.1 shows how the variable elements mentioned in the theoretical framework interact.

Figure 1.1 Interactions of Elements of the Theoretical Framework.



Source: Adapted and modified from Di Viesta (1989)

In figure 1.1, the flow chart the areas of concern which may influence the implementation of SMASSE programme in the teaching learning of physics which will then affect the student's achievement in Physics.

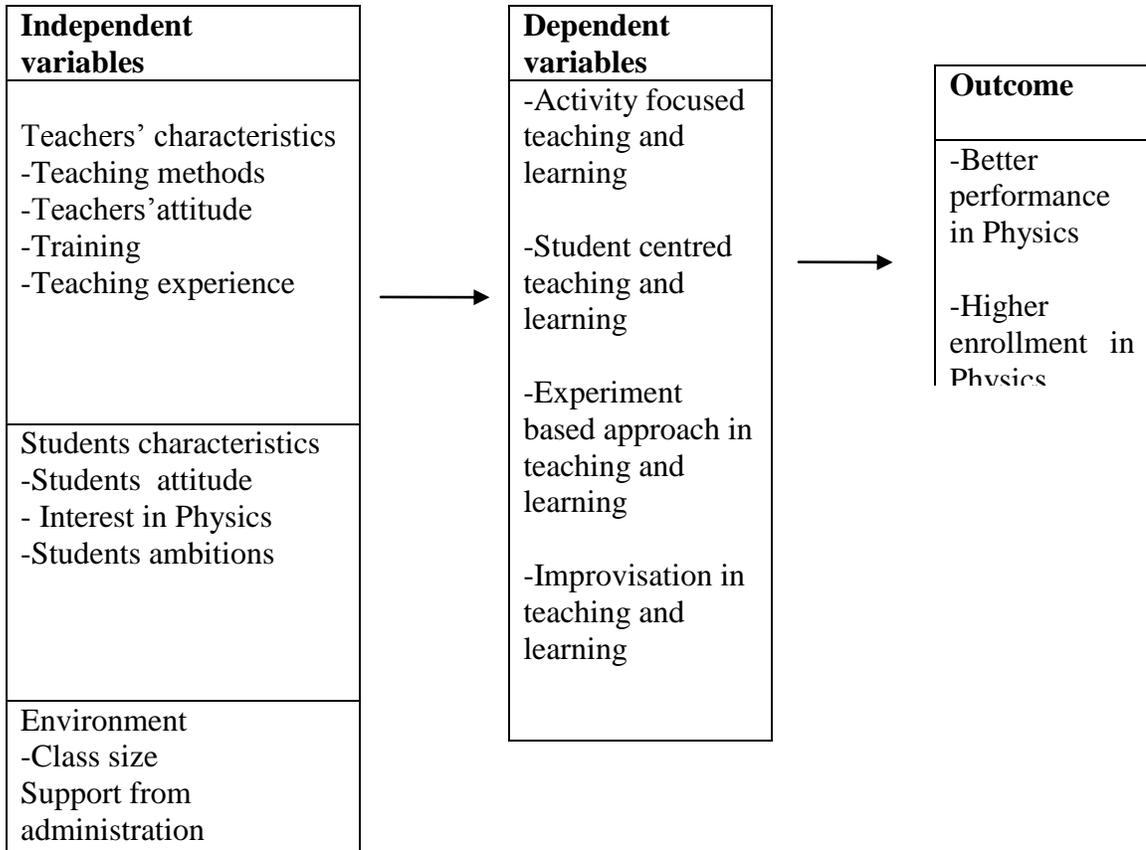
1.9 Conceptual framework

There are variables which interact to influence the teaching and learning of Physics. These are independent and dependent variables. In this study, the teacher characteristics and student characteristics were independent variables. These factors influence the effectiveness of implementation of the SMASSE approach in the teaching and learning of Physics, which is the dependent variable.

In this study the researcher aimed at finding out the classroom practices used and how they affect the implementation of SMASSE approach in the teaching and learning of Physics and also to find out to what extent the practices advocated by SMASSE project are practiced in teaching secondary school Physics.

Figure 1.2 shows the conceptual model on how the dependent and independent variables influence each other and how eventually they affect the implementation of SMASSE approach in the teaching and learning of Physics.

Fig.1.2 Relationship between variables influencing effective implementation of SMASSE approach in teaching Physics and the expected outcome.



Source: Adapted from Kotte 1992

1.10 Operational Definition of key Terms

Actualizing the lesson- Taking the trainees to the actual classroom situation where they were required to implement what they had learnt during the training sessions

Attitude change- Change in the way of thinking. This was the theme in the first cycle of SMASSE which was meant to encourage the teachers to accept the circumstances around them and to do the best in those circumstances.

Constructivism- A theory of knowledge that argues that humans generate knowledge and meaning from an interaction between their experiences and their ideas.

Diagnostic practices- The practice in assessment in which the teacher seeks to find out where the students have a problem in understanding a certain concept in order to clarify the concept learnt.

Effective implementation - The ability to put into practice the ideas advocated in SMASSE cycles so as to realize good performance in the subjects concerned.

Effective learning- The ability for the student to efficiently acquire the knowledge, skills and attitudes required for good performance.

Formative practices - The practice in assessment in which the teacher seeks to find out the level of acquisition of knowledge and skills imparted to the students.

Hands on activities- Activities which involve practical work during the teaching and learning process.

Impact transfer - Transferring the ideas learned during the SMASSE cycles to the classroom situation so as to influence the learning process of the learners.

Pedagogical issues - Issues that have to do with teaching and learning process.

Summative practice - The practice in assessment in which the teacher seeks to grade the student depending on his or her performance.

1.11 Summary on Introduction

This chapter has highlighted various areas of study including how SMASSE programme was introduced in Kenya. The problem to be discussed is also identified including the objectives, the scope and the limitation. The theory behind the study has also been discussed. The next chapter deals with reviewing literature from various sources which is related to the study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter deals with review of literature relevant to the study. The literature is reviewed under the following: Learning environment and effective teaching of Physics, Learning resources and effective teaching of Physics, teachers characteristics and effective teaching of Physics, Students characteristics and effective teaching of Physics, Teaching strategies and effective teaching of Physics and assessment and effective teaching of Physics.

2.1 Learning environment and effective teaching of Physics

Students thrive in environments where they feel safe, nurtured and respected. All students even those who have learning difficulties and extraordinary personal challenges can do well when they are physically comfortable, mentally motivated and emotionally supported. The classroom environment should be an exciting comfortable place, since the classroom has direct impact on the children. The teacher has the responsibility of creating pleasant surrounding that emphasizes learning (Clifford and Edwards, 2008).

The Physics teachers should know how students learn and how to use instructional practices so that the learning environment is student centered, knowledge centered, assessment centered, and community centered (National Research Council, Washington

DC, 2005). Teachers should know how to establish and maintain a respectful, supportive, and safe learning environment that is emotionally and physically conducive to learning.

This study was designed to establish whether the teaching and learning of physics in Mombasa county takes place in a conducive environment which encourages hands on activities as advocated in SMASSE programme. This will influence the students' interest in the subject. The study was also designed to identify the challenges involved in providing a suitable teaching and learning environment in the teaching of physics. This is in attempt to answer the second and fourth research question.

2.2 Learning resources and effective teaching of Physics

A study by Owolabi (2004) revealed that the performance of Nigerian students in ordinary level Physics was generally poor. This was attributed by the author to many factors. Teaching strategy itself was considered as an important factor. Jegede et al (1992) reported factors responsible for students' general poor performance in science. These are poor laboratory facilities, inability of Physics teachers to put across ideas clearly to the students and inadequate number of learning facilities in schools against inconsistent increase in the number of students.

Physics as a science subject is activity oriented and the suggested method for teaching it which is guided discovery methods resource based. This suggests that the mastery of Physics concepts cannot be fully achieved without the use of instructional learning materials. The teaching of Physics without learning materials will certainly result in poor

performance in the subject. Franzer et al (1992) stressed that a professionally qualified science teacher no matter how well trained will be unable to put his ideas into practice if the school setting lacks the equipment and material necessary for him or her to translate his competence into reality. Bassey (2002) gave the opinion that science is resource intensive. Further more in a period of economic recession it will be very difficult to find some of the electronic gadgets and equipment for Physics in schools. A situation that is further compounded by the galloping inflation in the country, hence the need to produce the materials locally.

Onasanya et al. (2008), Adebimpe (1997) and Aguisiobo (1998) noted that improvisation demands adventure, creativity, curiosity and perseverance on the part of the teacher. The author added that such skills are only realizable through well-planned training programme on improvisation. Akinyemi and Orukota (1995) noted that improvisation whether they cost less than standard manufactured ones or not they cost money. He added this money is usually not readily available for the teacher.

Researchers such as Ogunleye (2000), Okonkwo (2000), Mkpanang (2005) and Obioha (2006) reported that there were inadequate resources for the teaching of science subjects in secondary schools in Nigeria. They further stated that where there were little resources at all, they are not usually in good conditions, while the few that were in good conditions were not enough to go round those who needed them. Hence there is need for improvisation.

Okpala et al. (1998) stressed that science subject should be taught primarily as a practical subject. Later on, Omoosewo (2008) ascertained that in a modern science curriculum programme, students need to be encouraged to learn not only through their eyes, or ears, but should be able to use their hands to manipulate apparatus. Okoboh et al. (2001) study on sex difference in academic achievement of primary school pupils observed significant improvement in performance when the instructional materials are used.

This study was designed to find out whether resources are available for the teaching and learning of physics in Mombasa county, and whether proper use is made of the available ones. This will encourage active participation by the students as indicated in the ASEI teaching approach. This is in attempt to answer the third and fourth research questions hence achieving the third and fourth objectives of the study.

2.3 Teacher characteristics and the effective teaching of Physics

According an article by Buddin Richard and Gema Zamarro (2009) teacher effectiveness is typically measured by traditional teacher qualification standards, such as experience, education, and scores on licensure examinations. They argue that there is no evidence that these standards have a substantial effect on student achievement in Los Angeles public elementary, middle, and high schools. Alternative measures of teacher qualifications and different kinds of reward systems might be more effective at improving teacher quality.

The motivation of the learner to achieve may be enhanced or damaged by the teacher's attitude towards the students and how he or she interacts with them (Flanders, 1970). Franyo (2007) argue that if the students' needs are responded to appropriately, it is possible for effective communication to take place. Among the teachers, there are those who choose to ignore or do not notice these cues, so they influence the communication to be one-sided.

While teachers' professional qualification should be upheld in our schools, teachers should employ the use of individual verbal communication for instance acceptance of students' feelings, praising and encouraging the weak students. This encourages a positive attitude towards learning and higher achievement by the student, According to the Kenya Government in Report of the national committee on education objectives and policies (1976) no matter how education is viewed, the role and quality of teachers must be given the most critical consideration.

Teachers work within hierarchies in institutions that place highly visible constraints upon their professional discretion (Hawthorne, 1992). Teacher's efforts which make a difference in the students' achievement are influenced by the school administration.

According to American Association of Physics teachers (1988), an effective Physics teacher should understand what constitutes effective teaching. He should understand how

to develop learning outcomes for science instruction that incorporate state and national standards for teaching science, and select appropriate curriculum materials to meet standards-based outcomes. They understand the logical connections between the topics of the curriculum, the need to build on each other, and to create learning progressions. They are aware of the “depth versus breadth” conundrum of science teaching, and have an understanding of how to appropriately balance transmission and constructivist approaches to teaching and learning.

According to the association, physics teachers prepare lessons using a variety of instructional approaches, create unit plans, and deal with the broad implications of year-long curriculum planning. This includes the proper alignment between preparing objectives, designing appropriate means of achieving these objectives, and ways of assessing whether the goals are achieved. He should use a variety of instructional strategies to help students learn and understand the concepts of physics. These include but are not limited to interactive demonstrations, inquiry lessons and labs, reading, case study discussions, peer instruction, cooperative learning, Socratic dialogues, problem-based learning, historical studies, and the use of strategies tailored to meet the needs of diverse learners. They will effectively utilize cooperative learning strategies that involve small groups of students in roles where they share a common goal and resources in order to build interdependence. The article by the association also suggests that Physics teachers should elicit, identify, confront, and resolve resilient preconceptions that students bring to the classroom that are derived from casual observations of the physical

world. Teachers should understand the difficulties that students encounter in the formulation of scientifically acceptable explanations. They should help students self-assess and regulate their learning by reflecting critically on what they should know and be able to do.

Physics teachers should understand and apply accepted practices of science to help students develop knowledge on the basis of observation and experience. This includes the appropriate use of learning cycles and instructional practices such as discovery learning, interactive demonstrations, inquiry lessons, inquiry labs and hypothetical inquiry. Physics teachers assess student learning continually by effectively using diagnostic, formative, and summative practices. They should also be familiar with technology and the use of technology tools in physics lessons.

This study was designed to find out what attitude the physics teachers have towards SMASSE programme since this will affect their ability to implement the teaching approach suggested in the programme. This is to answer the first research question in the study in order to achieve the first objective of the study.

2.4 Students characteristics and effective teaching of Physics

Anthony (2000) reported a study of perceptions of factors influencing success in academics and emphasized the role of motivation. Students and lecturers agreed on the

importance of motivation, however their opinions diverged in relation to factors such as importance of active learning, help-seeking and student effort.

Easton (2002) interviewed students from an alternative residential high school in the United States of America in order to determine perceptions of learning needs. Students identified the need for self-esteem, personal accountability, and personalized learning. They talked about the need for teachers who care and also about active learning. They further mentioned the need to feel emotionally safe, the need for high expectancy on the part of the school and the need for self-directed learning or learning by choice.

In analyzing student-generated solutions to enhance the academic success of African-American youth, Tucker, Herman, Pedersen, Vogel and Reinke (2000) found that both academic preparation of students and positive peer influences would enhance academic success and that praise and encouragement by teachers and parents is needed to facilitate student school work and achievement. They further affirm that student achievement seems to be associated with occupational aspirations. Similarly, Wong, Wiest and Cusick (2002) state that student perceptions of teacher behaviors that promote the development of student autonomy, parent involvement, competence and self-worth were predictors of motivation and achievement. Factors such as age and gender may also be related to attitudes concerning factors of achievement. In conclusion, Whitelaw, Milosevic and Daniels (2000) cautioned that the relations are complex and require further study.

This study was designed to find out what attitude the students have towards physics as a subject, since this is one of the students' characteristics which can affect the implementation of ASEI/PDSI approach in the teaching of physics in secondary schools. This attempts to answer the second research question in this study in order to achieve the second objective.

2.5 Teaching Strategies and effective teaching of Physics

Effective teaching comes from the knowledge of the relationship between classroom process measured through observation of systems and student outcomes, most notably gains in standardized achievement test, for instance KCSE. However, some principles on effective teaching are rooted in logic of instructional design, for example, instructional methods (Corno & Snow, 1986).

The school curriculum assumes different types of learning that call for different type of teaching. No single teaching method such as direct instruction or social construction of meaning can be the method of choice for all occasions. For any subject, Physics included, instructional needs change as the students' expertise develops. Therefore, what constitutes an optimal mixture of instructional methods and learning activities will evolve as the student's school years, instructional units and even individual lessons progress (Corno & Snow, 1986; Gastel, 1991; Harris and Taylor, 1983).

If students are to learn science, we must give them respect for observation rather than the pronouncement of textbooks (Garson, 1988). According to Khatete (1995), constructivism brings about the desired outcome of conceptual change by creating a conflict between the student's naive ideas and the accepted scientific ideas. It is the role of the teacher to establish the student's ideas in a given concept area then introduce analogies of accepted scientific concepts so that the student can compare their own conceptions with the scientifically accepted concepts. This may lead to a better understanding of the scientific concepts hence greater achievement in sciences- in this case Physics.

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

According to Khatete, due to the foregoing scenario, head teachers, the entire teaching staff of most schools will resort to drilling of their students through repetitive teaching of

what is likely to lead to a higher percentage of their students passing the KCSE so that their school can appear in the top 100 nationally or as currently practiced, produce the greatest number of students in the top 100 nationally.

According to Harris and Taylor (1983), effective teaching practices should allow for increased opportunity to learn. Students tend to learn more when most of the time allocated for curriculum activities and classroom management systems emphasizes maintaining their engagement in those activities. An effective teacher allocates most of the available time to those activities designed to accomplish instructional goals. Establishment of a learning orientation involves beginning the lesson and activities by communicating the purpose of the activity, connecting it to prior knowledge and cueing the students' that kind of activity that requires and establishes the learning orientation.

The net result of education is a trained mind and education is what is left after all that has been learnt in school has been forgotten (Harlen W. 1999).

This study was designed to find out which strategies the teachers prefer in the teaching of physics in secondary schools in Mombasa county. The strategies used will dictate whether the ASEI/PDSI teaching and learning approach is applied in the teaching of physics. This would help to answer the third research question hence achieve the third objective of the study.

2.6 Assessment and effective teaching of Physics

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

According to Kellaghan and Greney (2004) the assessment of learning in the classroom students learning in the classroom by teachers and by students is an integral component of teaching and learning process. Much of this assessment is subjective, informal, immediate and ongoing as it interacts with learning as it occurs, monitoring students' behavior, scholastic performance and responsiveness to instruction. In addition to ongoing teaching, classroom assessment involves questioning and dialogue, the marking of homework, and the use of portfolios. Its function is primarily formative. It occurs

during learning rather than when learning is presumed to complete. And is designed to assist or improve the acquisition of knowledge and skills. Its role is to determine the students' level of knowledge skills or understanding to diagnose the problem the student may be encountering to make decisions about the next instructional steps to take and to evaluate the learning that has taken place in a lesson.

According to Kellaghan (1992) and Black and William (1998) there is evidence that the quality of classroom assessment may be deficient in many ways. The problems identified include poorly focused questions, a predominance of questions that require short answers requiring factual knowledge the evocation of response that requires repetition rather than reflection, and the lack of procedure designed to develop higher order cognitive skills. The study noted that in when questions were asked they were closed, a form of questioning that does not facilitate the development of higher order thinking skills. Further there was little assessment of pupils understanding before the teacher moves to the next part of the lesson (Ackers et. al 2001). A study in Swaziland described the vast majority of questions in higher secondary classes as either rhetorical or at low cognitive level (Rolluick et al 1998) A low taxonomic level of questioning similarly was not in primary classes in Tanzania. The questions asked were described as merely requiring the people to recall facts which they did individually or in chorus. (O-saki and Agu, 2002).

Home work provides opportunity for teachers to assess the proficiency of their students and to receive feedback on their problems. The Tanzania study reported that little

homework was given. Furthermore some teachers were observed to rarely mark pupils work. Few exercise books contained teachers' comments that might have provided reinforcement to good work or identified problems in poor work (O-saki and Agu 2002)

Several commentators attribute the assessment procedures that are prevalent in schools to the nature of teaching and learning situations in which the teacher is dominant and the student is passive. Teachers have been described as talking non-stop throughout the lesson leaving no room for students' activities. (Bude, 1993).

Lessons in science in upper secondary schools in Swaziland also have been characterized as teacher centred with the teacher asking questions and the students answering in chorus or individually (Rolluick et al 1998).

Other explanations that have been offered for poor assessment practice include the prevalence of poorly qualified teachers, large class sizes, poor facilities and shortage of learning material. In Guinea for example teachers were reported to be poorly trained in assessment techniques, the classroom reality being far from the continuous evaluation procedures recommended by official programmes (Carron and Chau,1996).

It is also likely that while the causes and effects of repetitions and drop-outs are complex, classroom assessment practice and public examination may contribute to them. (N'tchongan-Sonou 2001). To improve classroom assessment teachers may need to

appreciate that learning is more than improved examination results, more than acquisition of information and that learning does not only acquire, but generate, master, develop and create knowledge (Samoff 1999)

This study attempted to find out whether physics teachers in Mombasa county adequately assess their students which forms part of the ASEI/PDSI approach. This would help to answer the third research question in the study which would help to achieve the third objective of this study.

2.7 Summary of Literature Review

From the literature reviewed, it is evident that there has been concerted effort by various scholars to address the low achievement in sciences. However, some of the studies cited have not addressed physics in particular which may have its own unique challenges. The studies also address the factors that affect performance in science in general. This study addresses the factors which affect the effective implementation of ASEI and PDSI approach as advocated in the SMASSE programme which none of the studies cited above has addressed. This research is intended to fill this gap in the body of knowledge. The findings and recommendations will help to improve the teaching of physics which will have a positive effect in physics performance in secondary schools. The next chapter discusses how the study will be carried out.

CHAPTER THREE

RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the methodology or procedure that was followed in conducting this study. The issues discussed are design of study, target population and locale, sampling and sample size, research instruments, piloting, collection and analysis of data.

3.1 Design of study

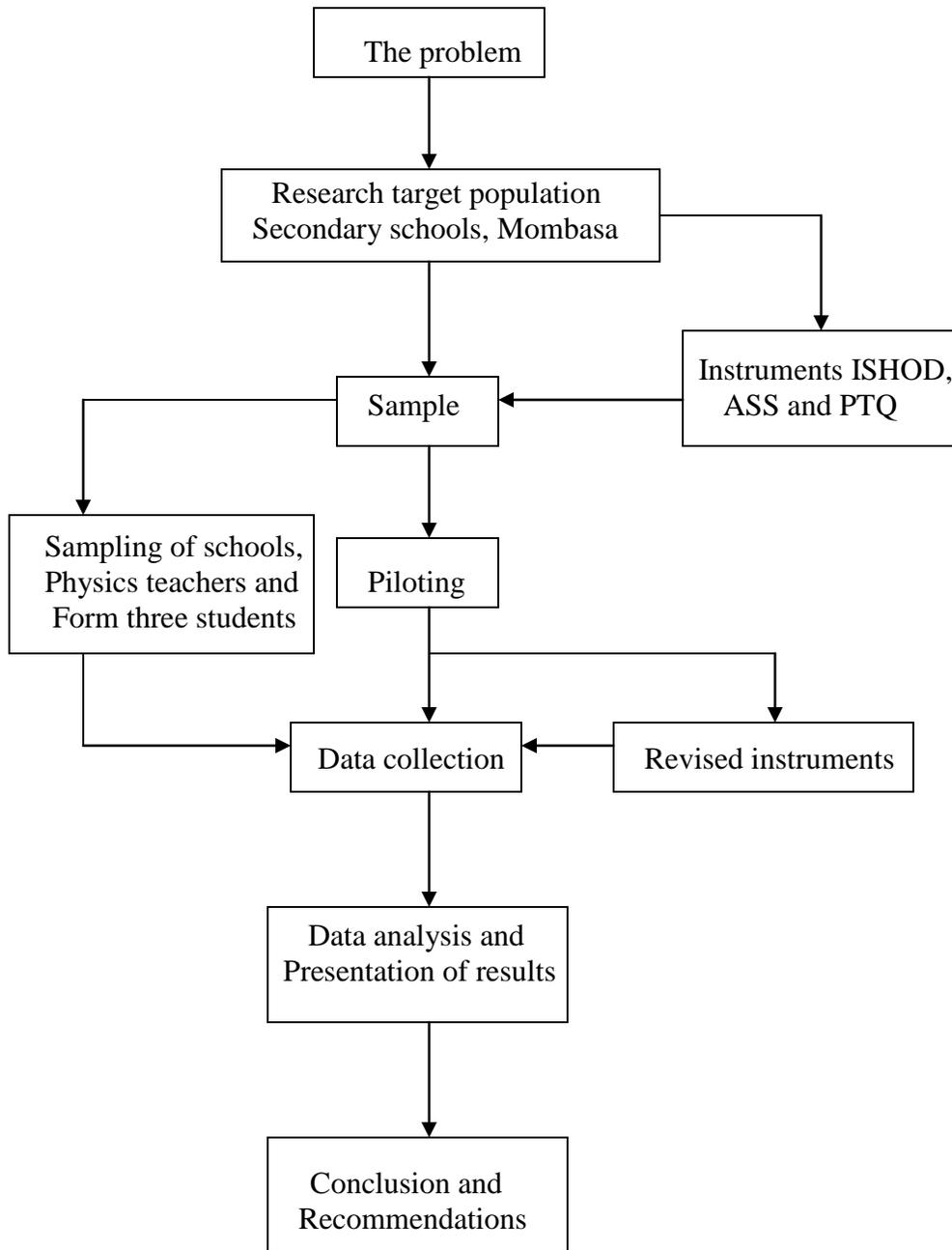
The design of this study was descriptive survey study. This design involves fact finding, formulation of important principles of knowledge and solution to significant problems.

According to Mugenda and Mugenda (1999), descriptive survey is a method of collecting information by interviewing or administering questionnaires to a sample of individuals. This was appropriate because the study involved collecting data in order to answer questions about the current status of the subject of study. This design was also used to assess attitudes and opinion about events and procedures.

In using this study the researcher constructed questions that would solicit the desired information. Identified the individuals that would be involved in the survey, identified the means by which the research would be conducted and summarize the data in such a way that it provides the designed descriptive information.

The process is summarized in the flow chart in fig. 3.

Fig. 3.1 Process of Study



Source: Adapted from Cohen and Manion (1994)

3.2 Target Population and Locale

The target population was students and teachers in Mombasa county secondary schools in which no study on implementation of SMASSE programme had been conducted earlier. The county has 33 secondary schools 13 of which are public while twenty are private. The sample of respondents for the study comprised of secondary school physics students and teachers from the county, and selected Heads of Science Departments from the sampled schools. A list obtained from the district education office shows that the county has six public boys' school, five public girls' schools and two public mixed schools. The county has twenty private schools which are all mixed. This information is represented in table 3.1.

Table 3.1 Distribution of schools in Mombasa county.

	Type of school			
	Boys	Girls	Mixed	Total
Public	6	5	2	13
Private	0	0	20	20
Total	6	5	22	33

Source: DEO's office, Mombasa

3.3 Sampling and sample size

This section describes the sample, sample techniques used in sample selection and the methods used in determining the sample size to be used in the study. The primary sources of information in the study were:

- a) The secondary school Physics teachers from sampled Mombasa county secondary schools.
- b) Form three Physics students in the selected secondary schools in the district. Form threes were preferred to form ones and twos because they have had adequate exposure to secondary school Physics curriculum. Form fours were left out because they were busy preparing for their final exam.
- c) Heads of Science Department from the sampled schools.

3.3.1 Sample selection techniques

This section shows how the sample for the study was obtained.

- a) County: Secondary schools in Mombasa county were selected because the county has a cosmopolitan population. It is therefore a good representation of the greater national population. The county was also preferred for easy accessibility to target schools since this is where the working station of the researcher is located.
- b) School category: The study involved the public and private schools in the county since the project involved both categories of schools.
- c) School type: Schools in Kenya are classified into three categories: Boys' schools, girls' schools and mixed schools. In order to have a good representation of all the categories stratified sampling was preferred to random sampling.
- d) Individual schools: For stratified sampling, the schools were first divided into Public and private schools. These categories were then further divided into boys, girls and mixed schools. Each category was sampled using stratified random sampling in which names of

the schools in these categories were written on pieces of paper and the required number of schools selected by randomly picking the required number of pieces of paper from a container. This avoided any bias within these categories during sampling.

e) Physics teachers: This involved stratified random sampling in which Physics teachers were selected from the sampled schools. A total of twenty four Physics teachers from the twelve sampled schools were therefore selected.

e) Students: In sampling the students to be involved in the study, the names of form three students in each sampled school were written down on pieces of paper and put in a container. The required number of students, which was between thirty and forty form three Physics students from each sampled school, was selected by randomly pick names from the container. This gave a total of 462 students from the twelve sampled schools involved in the study.

f) Heads of Departments. A head of Science Department was selected from each of the sampled schools. This gave a total of twelve Heads of Science Department.

3.3.2 The sample size

This section describes how the sample size for the study was determined.

c) Number of schools: The schools considered in the study were the secondary schools in Mombasa county. These are 33 in total: 13 of which are public schools while 20 are private. A sample of 12 schools which is about 36% of the total population was taken. Stratified random sampling was used to select the schools

for each category. The number of schools considered in each category is shown in table 3.2

Table 3.2 Sampling grid for schools

	Type of school			
	Boys	Girls	Mixed	Total
Private	0	0	6	6
Public	3	3	0	6
Total	3	3	6	12

b) Number of respondents

i) Teachers: Physics teachers were selected from each of the sampled schools. The sampling was stratified random sampling since the teachers had to be Physics form three teachers from the selected schools. The number of teachers involved in the study was twenty four in total.

ii) Students: Form three Physics students were selected from the sampled schools. This gave a total of 462 students to be involved in the study.

ii) Heads of Departments: A Head of Science Department was picked from each of the sampled schools. This gave a total of twelve heads of Department.

3.4 Research instruments

This study used three types of instruments:

i) Physics Teacher' Questionnaire (PTQ)

This questionnaire attempted to document the academic and teaching qualifications of teachers, their teaching experience, number of SMASSE cycles attended and their attitude towards the SMASSE programme. It also attempted to capture their attitude towards the Physics curriculum and their methodology of teaching the subject. This assisted to find out whether the teachers prefer the teaching approach suggested in SMASSE INSETs.

ii) Attitude Scale for Students (ASS)

This instrument attempted to capture the attitude of the student towards physics as a subject, which would affect the implementation of ASEI/PDSI approach in the teaching and learning of physics.

ii) Interview Schedule for Heads of Departments (ISHOD).

The interview was administered to Heads of science Department participating schools. The interviews were carried out in form of discussions with the Heads of Science Departments in the schools.

3.5 Piloting

The validity and reliability of the instrument was tested through piloting of the research instruments in a secondary school in Mombasa county which was not among the sampled schools for the study. This was done by administering the Physics Teachers' Questionnaire (PTQ) to the Physics teachers in the school and also administering the Attitude Scale for Students (ASS) to forty form three Physics students. The Head of

science department was also interviewed. This is aimed at refining the instruments hence improving the validity and reliability.

3.5.1 Validity and reliability of the instruments

Validity is the degree to which the test measures what it is supposed to measure. According to Mugenda and Mugenda (1999), the usual procedure for assessing content validity measure is to use professionals or experts in that particular field. The researcher therefore relied on the approval by statisticians and other authorities in the field of research.

An instrument is reliable when it can measure a variable accurately and consistently when used under similar conditions (Borg and Gall, 1989). To establish this, the split-half method was used. By using this method, the researcher aimed at determining reliability coefficient for ASS and PTQ which have numerical questions. The reliability coefficient varies from 0.0 (indicating no reliability) to +1.0 (indicating perfect reliability). The numerical questions for both the instruments were organized into two sets; an odd set and an even set. All odd numbered items were then placed in one subset and all even numbered items in the other subset. The two halves were then computed and compared for the degree of correlation. The correlation of the scores made in each half of the questionnaire was obtained by using Pearson Product Moment Correlation coefficient (r) to give an estimated reliability. In order to get more accurate values Spearman-Brown prophecy formula was used i.e.

$$r_{\text{total test}} = \frac{2r_{\text{split half}}}{1 + r_{\text{split half}}}$$

The coefficient (r) for ASS and PTQ were found to be approximately 0.7

The refined instruments were then administered to the sample respondents in the main study. The refinement process is necessary since it determines the difficulty of the items in the instruments. It also checks the appropriateness of the language used and helps to allocate appropriate time for the instruments.

3.6 Collection of data

This involved the actual administration of the research instruments. It was preceded by the researcher's preliminary visit to the schools sampled for the study. During this visit the researcher attempted to strike the rapport with school authorities and to verbally explain the purpose of the study. The visit also made the necessary arrangement for the actual administration of the research instruments and data collection. The students' questionnaires were administered with the help of non-Physics teachers to avoid conflict of interest. This was done during break time to avoid interfering with the school programme. The researcher administered Physics Teachers Questionnaires and held interviews with HODs

3.7 Analysis of data

The quantitative data from the study was analyzed using descriptive statistics with the help of SPSS computer software. This involved the use of frequency tables, means and

percentages. The results were presented in form of tables. For qualitative data, narrative forms were used to summarize the information obtained. This enabled the researcher to make informed conclusions and recommendations.

3.8 Summary on Research Methodology

This chapter discussed the design that would be used including the location of study and the sampling techniques. The instruments to be used in the study have also been discussed including how the data will be collected. The next chapter deals with how the data was presented, analyzed and interpreted.

CHAPTER FOUR

DATA PRESENTATION, ANALYSIS AND INTERPRETATION

4.0 Introduction

The chapter deals with presentation, analysis and interpretation of the data collected from twelve secondary schools in Mombasa county. A sample of 462 students from six public secondary schools and six private schools, twenty four Physics teachers and twelve heads of science department from the same secondary was used for this study. Data analysis and report findings were done using descriptive statistics in the form of tables, frequencies, means and percentages. The chapter is presented under the following: Background information and characteristics of the respondents; Teachers' attitude towards SMASSE project; Students attitude towards Physics; Application of SMASSE project in the teaching of Physics; challenges involved in applying the SMASSE approach in the teaching of Physics and how SMASSE project can be implemented more effectively in teaching Physics in secondary schools in Mombasa county.

4.1 Background information and characteristics of the respondents

The students sample consisted of 462 students from six public secondary schools and six private secondary schools. Table 4.1 shows .the distribution of the sampled students.

Table 4.1 School type and students' gender

School type	N	Frequency	Percentage
Boys Public	462	127	27.5%
Girls Public	462	105	22.5%
Mixed private	462	230	49.8%
Gender			
Boys	462	261	56.5%
Girls	462	201	43.5%

Table 4.1 shows that 127 of the sampled students (27.5%) came from boys public schools while 105 students (22.5%) came from girls public schools. 230 of the students (49.8%) came from private schools, all of which were mixed. The table also shows that 261 (56.5%) of the students were boys while 201 (43.5%) of the students were girls. 232 (50.2%) of the students came from public schools while 230 (49.8%) of them came from private schools.

The teachers sample consisted of twenty four Physics teachers from Mombasa county, two from each of the sampled schools. Table 4.2 shows the characteristics of sampled teachers.

Table 4.2 Teacher Characteristics

Gender							
				N	Male	Female	
				24	18(75 %)	6 (25%)	
Professional qualification							
		N	B Ed	BSc	Dip Ed	MEd	
		22	8 (36.4%)	6 (27.3%)	6 (27.3%)	2 (9.1%)	
Teaching experience							
		N	1-5yrs	6-10yrs	11-15yrs	Above15	
		21	6 (28.6%)	4 (19.0%)	5 (23.8%)	6 (28.6%)	
Heads of Departments							
				N	Male	Female	
				12	7(58.3%)	41.7%	

NB: The value N in the table varied according the number of respondents who responded to a particular item in the questionnaire.

Table 4.2 shows that out of the 24 teachers, eighteen of them (75%) were male while six of them (25%) were female. On professional qualification only 22 indicated their qualification. Eight of them (36.4%) had Bachelor of Education (B Ed), Six of them (27.3%) had Bachelor of Science (BSc), six of them (27.3%) had Diploma in Education (Dip Ed) and two of them (9.2%) had Masters in Education (Med). The teachers were also requested to indicate their teaching experience. Out of the 21 who responded to this item , six (28.6%) had taught between zero and five years, Four (19%) had taught from six to ten years, Five (23.8%) had taught from eleven to fifteen years and six (28.6%) had taught for above 15 years.. The Heads of Science department sample consisted of 12 teachers seven (58.3%) of whom male and five (41.7%) of whom were female.

4.2 Teacher's attitude towards SMASSE

In order to answer research question 1 on the attitude of the Physics teachers towards SMASSE project, six items in the physics teacher's questionnaire (PTQ) and one item in the interview schedule for HODs (ISHOD) were used. These items sought to inquire whether SMASSE INSETs take too much time, whether SMASSE INSETs are too involving, whether teachers should be given incentives while attending SMASSE INSETs, whether SMASSE funds should be channeled elsewhere and whether SMASSE approach is teaching Physics is useful. The scores range from 5 for strongly positive attitude to 1 for strongly negative attitude. They were also asked to say what motivates them to attend SMASSE INSETs. The HODs were required to state whether the attitude of science teachers towards SMASSE was excellent, good, fair, poor or very poor. Table 4.3 shows a summary of the responses from the teachers in terms of percentages on Likert scale of attitude test and what motivates them to attend the SMASSE INSETs

Table 4.3 Teachers' attitude towards SMASSE.

Statement	N	SA(%)	A(%)	NS(%)	D(%)	SD(%)	Av. score
SMASSE insets take too much time	23	13.0	30.4	0	47.8	8.7	3.01
SMASSE insets are too involving	23	8.7	56.5	4.3	26.1	4.3	2.61
Give SMASSE attendants incentives	23	52.2	43.5	0	4.3	0	1.57
SMASSE funds to be channeled elsewhere	23	17.4	13.0	0	52.2	13.0	3.39
SMASSE approaches are useful	23	34.8	52.2	0	0	13	3.96
What motivates teachers to attend SMASSE INSETs							
Reason	N	Nothing	Professional development	To learn new teaching skills	To interact with others		
Frequency	24	2	1	20	1		

NB: The value N in the table varied according the number of respondents who responded to a particular item in the questionnaire.

From table 4.3, only 23 out of 24 teachers responded to these items of the questionnaire. Out of the 23 teachers who responded on the question on whether SMASSE INSETS take too much time, three teachers (13%) strongly agreed seven teachers, (30.4%) agreed, eleven teachers (47.8%) disagreed and two teachers (8.7%) strongly disagreed that SMASSE INSETS take too much time.. The average attitude score for this question was 3.01. Asked whether SMASSE INSETS are too involving, out of the 23 respondents two (8.7) % strongly agreed thirteen teachers (56.5%) agreed, one teacher (4.3%) was not sure, six teachers (26.1%) disagreed and one teacher (4.3%) strongly disagreed. The average attitude score for this item was 2.61.

On whether SMASSE INSETS participants should be given incentives out of the 23 teachers who responded, twelve (52.2%) strongly agreed 10(43.5%) agreed while one teacher (4.3%) disagreed. For this item, the average score was 1.57. On whether SMASSE funds should be channeled elsewhere, out of the 23 teachers four (17.4%) strongly agree, three (13%) agreed, twelve teachers (52.2%) disagreed and three teachers (13%) strongly disagreed. The average attitude score for this item was 3.39. On the statement that SMASSE approach is useful in teaching Physics, out of the 23 teachers, eight of them (34.8%) strongly agreed, twelve (52.2%) agreed, and three teachers (13%) strongly disagreed. The average attitude score was 3.96. On the question on what

motivates them to attend SMASSE INSETs, Two out of the 24 teachers who responded said nothing motivates them one teachers said he attended for professional development, twenty said they attended to learn new skills in teaching Physics while one said what motivated him is to interact with others.

From the interviews with the HODs, two (16.7%) rated the attitude of science teachers towards Physics as good, four (33.3%) rated the attitude as fair while six (50%) rated the attitude as poor.

4.3 Students attitude towards Physics

To answer the second research question on students' attitude towards Physics, six items in the Attitude scale for students (ASS) questionnaire were used. The score in the attitude scale range from 5.0 for strongly positive attitude to 1.0 for strongly negative attitude .In these items, students were asked to state whether they like their Physics teacher, whether they took physics because they had no option, whether they like Physics, whether Physics is generally a difficult subject, whether Physics improves the living standards of people and whether physics is important in solving everyday problems. Table 4.4 gives a summary of their responses.

Table 4.4 Students attitude towards Physics

Statement	N	SA (%)	A (%)	NS (%)	D (%)	SD (%)	Av. score
I like my Physics teacher	462	40.5	41.1	9.3	4.1	5.0	4.08
I took Physics-I had no alternative	462	10.9	9.0	3.9	18.4	57.1	4.03
I like Physics	462	37.7	37.9	15.2	4.5	4.8	3.99
Physics is generally a difficult subject	462	12.0	13.7	20.7	29.6	24.1	3.40
Science improves living standards	462	56.9	34.6	5.2	1.3	1.9	4.43
Physics is useful in solving everyday problems	459	32.2	47.5	12.9	3.9	3.5	4.01

NB: The value N in the table varied according the number of respondents who responded to a particular item in the questionnaire.

From table 4.4 when the 462 form three Physics students were asked whether they like their Physics teacher 187 students (40.5%) strongly agreed, 190 (41.1%) agreed, 43 (9.3%) were not sure 19 students (4.1%) disagreed while 23 of them (5.0%) strongly disagreed with the statement that they like their Physics teacher. The average attitude score for this question was 4.08.

Asked whether they took Physics since they had no option out of the 458 students who responded to this question 50 (10.9%) strongly agreed, 41 (9.0%) disagreed and 264 (57.1%) strongly disagreed. The average attitude score was 4.03. The other statement they were asked to respond to is the Physics generally a difficult subject. Out of the 462 students who responded to this statement 55 (12.0%) strongly agreed, 63 (13.7%) agreed, 95 (20.7%) were not sure 136 (29.6%) disagreed and 111 (24.1%) strongly disagreed that Physics is a difficult subject. The average attitude score was 3.4.

When asked to state their opinion on whether physics improves the living standards of people 462 students responded in which 263 (56.9%) strongly agreed 160 (34.6%) agreed, 24 (5.2%) were not sure 6 (13%) disagreed and 9 (1.9%) strongly disagreed that Physics improves the living standards of people. The average attitude score for this item was 4.43. On whether Physics is useful in solving everyday problems, out of the 459 students who responded on the statement, 148 (32.2%) strongly agreed that Physics is useful in solving everyday problems, 218 (47.5%) agreed 59 (12.9) were not sure, 18 (3.9%) disagreed while 16 (3.5%) strongly disagreed to this statement. The average attitude score was 4.01.

4.4 Application of SMASSE in the teaching of Physics.

In order to answer the third research question as to whether SMASSE approach has been applied in the teaching of Physics in Mombasa county, six items in the attitude scale for students (ASS) questionnaire, eight items in the physics teachers questionnaire (PTQ) and one item in the interview schedule for HODs (ISHOD) were used.

In the ASS questionnaire, students gave their opinion on Likert scale on whether they participated in learning Physics, whether they perform the Physics practicals individually, whether the teacher promptly marks their class practicals, whether the Physics teacher uses teaching aids in the Physics lessons, whether the teacher gives assignment to students and whether he or she marks the assignments given. The scores range from 5 for strongly positive attitude to 1 for strongly negative attitude. In the PTQ questionnaire, the

teachers were asked to indicate whether they use conventional apparatus, improvised apparatus or none at all for the topics given. In the interview with the HODs, the heads of science department were asked whether the SMASSE approach is practiced in their schools. A summary of their responses is given in table 4.5.

Table 4.5: Students assessment on the teaching of Physics

Statement	N	SA (%)	A (%)	NS (%)	D (%)	SD	Av. Scor
. We participate in learning Physics	460	46.5	44.1	5.0	2.8	1.5	4.31
We usually perform practicals individually	462	32.5	34.2	10.2	11	12.1	3.64
Teacher promptly marks the class practicals	460	26.5	32.6	16.7	15.2	8.9	3.53
Teacher uses teaching aids in Physics lesson	460	14.3	23.0	14.3	25.4	22.8	2.81
Teacher usually gives us assignments	461	52.5	38.2	3.0	3.0	3.0	4.43
Teacher always marks assignments	459	25.9	37.5	13.1	14.4	9.2	3.57

NB: The value N in the table varied according the number of respondents who responded to a particular item in the questionnaire.

From the table 4.5 out of the 460 students to the statement that they participate in learning Physics 214 (46.5%) strongly agreed, 203 (44.1%) agreed, 23(5.0%) were not sure, 13(2.8%) disagreed while 7 (1.5%) strongly disagreed. The average attitude score for this item was 4.31

On whether they perform Physics practicals individually, out of the 462 students who responded 150 (32.5%) strongly agreed that they perform practicals individually, 158 (34.2%) agreed 47 (10.2%) were not sure. 51 (11.0%) disagreed while 56 (12.1%) strongly disagreed. The average attitude score was 3.64. The students were also required

to indicate whether the Physics teacher marks their class practicals promptly. Out of the 460 who responded, 122 (26.5%) strongly agreed, 150 (32.6%) agreed that the teachers mark their Physics practicals promptly, 77(16.7%) were not sure, 70 (15.2%) disagreed while 41(8.9%) strongly disagreed. The average attitude score was 3.53.

Asked whether their Physics teacher uses teaching aids during Physics lessons, 460 students responded to this statement. Out of these, 66 students (14.3%) strongly agreed that the teacher uses teaching aids. 106 students (23.0%) agreed, 66(14.3%) were not sure, 117 (25.4%) disagreed while 105 (22.8%) strongly disagreed to the statement. The average attitude score for this item was 2.81.

The students were also required to give their opinion on whether their Physics teacher usually gives them assignments. Out of the 461 students who responded 242 students (52.5%) strongly agreed that their Physics teacher gives them assignments.176 students (38.2%) agreed, 14 (3.0%) were not sure, 14 (3.0%) disagreed while 14 (3 %) strongly disagreed. The average attitude score to this item was 4.43.

On whether the teacher marks the assignment given out of the 459 students who responded 119 (25.9%) strongly agreed that their teacher marks the assignment they give.172 (37.5%) agreed, 60 (13.1%) were not sure, 66(14.4%) disagreed while 42(9.2%) strongly disagreed to that statement. The average attitude score was 3.57.

Table 4.6 which follows shows the response from teachers as to whether they use commercially manufactured resources, improvised or no teaching and learning resources for the given topics.

Table 4.6 Use of Teaching Resources

Topic	N	Commercial (%)	Improvised (%)	Both	None
Measurement I	21	61.9	-	38.1	-
Thermal expansion	21	38.1	19.0	14.3	-
Heat transfer	21	47.6	33.3	19.0	-
Rectilinear propagation of light	21	42.9	28.6	28.6	-
Electrostatics I	21	42.9	33.3	23.8	-
Hookes law	21	66.7	4.8	28.6	-
Waves	21	33.3	38.1	23.8	23.8
Sound	21	19.0	38.1	33.3	9.5
Fluid flow	21	19.0	57.1	9.5	14.3
Newtons laws of motion	21	52.6	26.3	21.1	-
Work, Energy Power and machines	21	47.6	14.3	33.3	
Heating effect of Electric current	21	47.6	28.6	23.8	
Quantity of Heat	21	66.7	14.3	19.0	
Gas laws	21	42.9	28.6	14.3	14.3

From table 4.6, Only 21 out of 24 teachers responded to this item of the questionnaire.

For the topic measurement I, 13 of them (61.9%) used only commercial resources to teach the topic, eight of them (38.1%) used both commercial and improvised resources.

For the topic Thermal expansion, fourteen teachers (38.1%) indicated that they use only commercial apparatus to teach the topic four of them (19.0%) use only improvised resources while three teachers (14.3%) use both commercial and improvised.

For the topic Heat transfer ten teachers (47.6%) use only commercial apparatus seven teachers (33.3%) use improvised apparatus while four teachers (19.0%) use both. For Electrostatics 1 out of the 21 teachers nine indicated (42.9%) that they use only commercial apparatus, seven teachers (33.3%) use only improvised apparatus while five (23.8%) indicated that they use both commercial and improvised resources.

On waves, seven teachers (33.3%) indicated that they use commercial apparatus, eight teachers (38.1%) use only improvised apparatus, while five teachers (23.8%) use both commercial and improvised while one teacher (4.8%) uses no apparatus. Out of the 21 teachers who responded to the topic Quantity of heat, 14 of them (66.7%) use commercial resources to teach the topic. Three teachers (14.3%) indicated that they use only improvised resources while 4 teachers (19.0%) indicated that they use both.

For the topic Gas laws, out of the 21 teachers, nine (42.9%) use commercial resources, six of them (28.6%) use improvised resources while three teachers (24.3%) use both. On whether ASEI/PDSI approach is practiced in their schools, out of the ten HODs who responded, eight said yes while two said that the approach was applied partially.

4.5 Challenges involved in implementing SMASSE approach in the teaching of Physics.

To answer the forth research questions on the challenges involved in implementing SMASSE project in the teaching of Physics, one item in attitude scale for students and

eleven items in Physics teachers questionnaire (PTQ) were used. Seven of these items involved expressing their opinion on the use of resources on Likert scale. In these items the teacher was requested to give the number of Science laboratories in School. They were also required to state the number of SMASSE cycle they had attended and to state the reason for missing any of the cycles. For items involving expressing their opinion on Likert scale, the Physics teachers were required to indicate whether the use of resources in teaching Physics enhance the students understanding whether use of resources take more teaching time, whether improvisation takes too much time and whether they feel they can teach well without resources. They were also required to indicate whether use of resources gives them confidence in teaching Physics, and whether the laboratory Physics apparatus are adequate in their Schools. In the other item in PTQ, the Physics teachers were asked to state any problems they encountered in using the learning resources.

In the interview schedule for HODs five items were used to answer this research question. In these items, the HOD was asked to give some of the concerns raised by the teachers which may affect the teaching of sciences. They were also requested to state whether their school has enough Physics teachers, to rate the support of the school administration support in supplying the resources required in teaching sciences and also to rate the competence of the SMASSE inset facilitators. They were also requested to state whether their schools borrow apparatus from INSET centres. Table 4.7 gives a summary of the teachers' responses.

Table 4.7 Challenges in implementing SMASSE project

Number of Students per class								
Number	N	30 and below	31-40	41-50	Above50			
Frequency	438	105	100	124	109			
Teachers response on resources								
Statement	N	SA	A	NS	D	SD	Av.sc ore	
	%	%	%	%	%	%		
Resources enhance understanding	24	83.3	16.7	0	0	0	4.83	
I take more time when using resources	24	33.3	12.5	4.2	41.7	8.3	2.80	
Improvisation takes too much time	24	4.2	70.8	0	25	0	2.46	
I can teach well without resources	24	4.3	13.0	4.3	52.2	26.1	3.82	
Resources give confidence in teaching	24	41.7	58.3	0	0	0	4.42	
Lab apparatus are adequate	21	9.5	66.7	9.5	14.3	0	3.14	
Number of Science labs in school								
Number	N	One	Two	Three	Four	Five	Avar age	
Frequency	22	3	3	13	2	1	2.77	
Number of SMASSE cycles attended								
Number		Non e	One	Two	Three	Four	Five	Avar age
Frequency	23	1	1	1	6	6	7	3.78

NB: The value N in the table varied according the number of respondents who responded to a particular item in the questionnaire.

From table 4.7, out of the 438 students who responded on the number of students in their class, 105 (24%) reported that they are 30 and below, 100 (22.8%) students said they are from 31 to 40, 124 (28.3%) said they are 41 to 50 while 109 (24.9%) said they were above 50 Physics students in their class.

Concerning the number of Science labs in the samples schools table 4.6 shows that out of the 22 teachers who responded to this question three teachers (13.6%) indicated that they

have one lab, three other teachers (13.6%) indicated that they have two labs, 13 teachers (59.1%) said they have three labs, two teachers (9.1%) indicated they had four and one teacher (4.5%) indicated that they have five science laboratories. This gave an average of 2.77 labs per school.

On the number of SMASSE cycles attended out of 23 teachers who responded to the question, two (8.7%) had attended one cycle; one teacher (4.3%) had attended two cycles, six teachers (26.1%) had attended three cycles. Six other teachers (26.1%) had attended four, seven teachers (30.4%) had attended five cycles while one teacher had attended none. Asked to give reason for missing any of the cycle out of the seven who responded two said they were sick, one said their school pulled out of SMASSE one said he was out of his station at that time and three said they went for studies.

On the items involving the respondents expressing their opinion on Likert scale 24 teachers responded to each of the items. For the statement that resources enhance understanding 20 teachers (83.3%) strongly agreed while 4 teachers (16.7%) agreed. The average attitude score for this item was 4.83. On whether they take more time when using resources out of the 24 teachers, 8 (33.3) strongly agreed 3 teachers (12.5%) agreed, One teacher (4.2%) was not sure 10 teachers (41.7%) disagreed while 2 teachers (8.3%) strongly disagreed. The average attitude score was 2.80 Asked whether improvisation takes too much time one teacher (4.2%) strongly agreed, 17 teachers (70.8%) agree, and six teachers (25%) disagreed. The average attitude score was 2.46.

On the statement that one can teach well without resources out of the 23 teachers who responded, one teacher (43%) strongly agreed, three teachers (13.0%) agreed one teacher (4.2%) was not sure, 12 teachers (52.2%) disagreed while six teachers (26.1%) strongly disagreed. The average attitude score for this item was 3.82. Asked whether use of resources in teaching gives them confidence, out of the 24 teachers who responded to this item, 10 teachers (41.7%) strongly agreed while 14 teachers (58.3%) agreed. The average attitude score for this item was 4.42. On whether the Physics apparatus in the lab are adequate out of the 21 respondents to this question two (8.3%) strongly agreed that the apparatus are adequate, 14 (66.7%) agreed two (9.5%) were not sure while three teachers (14.3%) disagree. The average attitude score for this item was 3.14.

On the problems encountered in using teaching and learning resources some of the problems cited were; poor working condition of some equipment, harmful effects caused by some apparatus, frequent breakdown of some equipment, inadequate apparatus for the students, inadequate time for experimental work and lack of user manual for some equipment leading to incompetence in handling them.

From the interview with the twelve HODs, the following concerns raised by science teachers which negatively affect the implementation of the SMASSE programme in the teaching of physics; Limited lab facilities, high work load, negative attitude towards sciences by students and low entry behavior in form one due to poor performance in sciences in Keya Certificate of Primary Education (KCPE). Other concerns were too

many students per class which reduces individual attention given to students and the syllabus being too wide. On the question of whether they have enough Physics teachers in their schools, four of the HODs (33.3%) said they have enough teachers while eight of them (66.7%) said they do not have enough physics teachers. When asked to rate the support of the administration in supplying the teaching resources, two HODs (16.7%) rated the support as poor, six (50%) rated the support as good while four (33.3%) rated the support as excellent. On the competence of the facilitators in SMASSE insets, eight HODs (66.7%) rated them as good while two (16.7%) rated them as fair.

On whether they borrow teaching resources from SMASSE centres, only two (16.7%) said they borrow frequently. The other ten do not, with four of them saying they are not aware of such provision. Two other HODs said they do not borrow because of the logistics involved and two others said they have adequate resources in their schools.

4.6 How SMASSE project can be implemented more effectively in teaching Physics

To answer the fifth research question on how SMASSE can be implemented more effectively in the teaching of Physics in Mombasa county, three items in the Physics teacher Questionnaire (PTQ) and two other items in the interview schedule for HODs (ISHOD) were used. One item in the PTQ required the teachers to suggest how SMASSE INSETs can be made more useful. Another item required them to suggest possible solutions to the problems they encountered in using resources while the other item asked the teachers to suggest how the teaching in Physics can be improved for better

performance in the subject. In the interview schedule, one of the items required that the HOD suggests how he/she can address the issue raised by science teachers which may affect the teaching of sciences. In the second item they were asked to suggest how the SMASSE INSETs can be improved.

On suggestions given by Physics teachers on how SMASSE can be made more useful, the teachers gave the following suggestions; Availing more teaching resources to schools, the government to provide fund to schools for purchasing lab equipment, reducing the content in the syllabus to allow for more practical lessons, reducing teachers work load, including information technology in the SMASSE programmes, including an open forum for teachers during the SMASSE INSETs and to train teachers for both teaching subjects.

From the interview schedule with HODs, the following suggestions were made on how to address issues raised by the science teachers which affect their teaching, the HODs gave the following suggestions; Employment of Board of Governors teachers to curb the shortage of teachers, to urge the administration to limit the number of students per class during recruitment of form one students, the head teachers should have a positive attitude towards sciences, encouraging teachers to improvise to curb the problem of shortage of the teaching apparatus, buying more lab equipment, having holiday tuition to address the problem of inadequate time and to buy projectors for teaching sciences in order to create interest and enhance understanding in sciences.

On the question on how SMASSE INSETs can be improved, the HODs gave the following suggestions; there should be certification for the SMASSE INSETs attendants for every cycle. They also suggested that the attendants should also be given more incentives. Others suggestions were that the certification should be considered for promotion to higher job groups and that the teachers should be trained on Information Technology to enable them to apply modern technology in teaching.

On suggestion of possible solutions to the problems encountered in using resources, the Physics teachers gave the following suggestions; Obtaining enough resources for learners to handle the apparatus individually, proper maintenance of the lab equipment, purchasing good quality teaching materials, assigning more time for the Physics lesson in the timetable, increasing teacher/student ratio, planning for practical work early enough, use of motion pictures to explain some concepts and to use coloured diagrams in text books to create interest in Physics.

In the next chapter a summary of the findings is given. It also gives the conclusion on the findings and gives recommendations.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter deals with summarizing the research findings, making conclusions, giving recommendations based on the findings and giving suggestions for further research. The main aim of the study was to discuss the various determinants of implementation of SMASSE project in the teaching of Physics in secondary schools in Mombasa county.

5.1 Summary

The summary in this chapter is based on the objectives of the study. The chapter is therefore discussed under the following: Teachers attitude towards SMASSE project, students' attitude towards Physics, implementation of SMASSE approach in the teaching of Physics in Mombasa county and challenges involved in implementing SMASSE project in teaching Physics.

On teachers attitude towards SMASSE project the average attitude score for the items in table 4.3 which shows the attitude of Physics teachers towards SMASSE is 2.91. Out of 24 teachers 21 indicated that what motivated them to attend SMASSE INSETs was to learn new skills in teaching and for professional development.

On students' attitude towards Physics, the average attitude score obtained for items in table 4.4 which shows the attitude of Physics students towards the subject was 3.99 which shows a generally positive attitude.

On whether SMASSEs ASEI-PDSI approach in teaching has been implemented in the secondary schools in Mombasa county, table 4.5 on students' assessment on the teaching of Physics gives an average score of 3.72. Table 4.6 on the teachers' use of resources shows that for the topics given, most of the teachers use conventional apparatus, improvised apparatus or both. However, there are some topics in which some of the teachers do not use any apparatus. From the interview with the HODs, 66.7% of the HODs said that SMASSE approach was being applied in teaching sciences in their schools while 33.3% said that the approach was being partially applied.

Concerning the challenges experienced in implementing the SMASSE approach in the teaching of Physics table 4.7 shows that more than half the number of students respondents (233 out of 438) indicated that they had a physics class of more than 40 students. The table also gives the average score of teachers' attitude on resources for the five items used as 3.67. The table also shows that out of 22 schools for the teachers who responded, 16 schools had three science labs and above. Six schools had less than three labs. On the number of SMASSE cycles attended by the Physics teachers, only seven teachers had attended all the five cycles that were so far conducted in the county, while one of the teachers had attended none. From the interview with the science HODs, some

of the challenges mentioned were high work load, inadequate lab facilities, poor entry behavior during form one admission, wide syllabus and inadequate support by the administration in purchasing of teaching materials.

5.2 Conclusion

For the Physics teachers' attitude towards SMASSE project, the average attitude score of 2.91 shows that the teachers' attitude towards SMASSE is generally negative since the average score is less than 3.00 which is neutral. From what motivates them to attend SMASSE INSETs, 21 out of 24 teachers showed positive expectation as they attend the INSETs. From the interviews with the HODs, only 16.7% of the HODs rated the attitude of science teachers towards Physics as good, with 33.3% rating the attitude as fair while 50% of the HODs rated the attitude as poor. These further shows that the teachers' attitude towards SMASSE project is generally negative should be improved in order to realize effective implementation of SMASSE project in the secondary schools Mombasa county.

From table 4.4 which shows the students' attitude towards Physics, an average attitude score of the six items show that the students have generally a positive attitude towards Physics. This is expected because most of them chose to take the subject in form 3 as reflected by the second item in the table. This attitude, however, can be improved since it is not strongly positive which would be indicated by a score of 5.

From table 4.5 on students' assessment on the teaching of Physics, the average attitude score of 3.72 for the six items shows that according to the students score, SMASSE approach in teaching Physics has been applied, though partially. Table 4.6 on teachers' use of resources also shows a partial application of the approach since much as most teachers use conventional and improvised apparatus for most of the topics given, there are some topics in which some teachers do not use any apparatus at all. The interview schedule with science HODs also shows the SMASSE approach has not been implemented fully in schools. This situation ought to be improved so that performance in Physics can be enhanced.

Concerning the challenges involved in implementing SMASSE approach in the teaching of Physics, while most schools have at least three science labs which implies a separate Physics lab, the number of students per class is too high. For effective individual attention to students, a class should have at most 40 students. The other challenge is the lack of attendance of some SMASSE cycles by some teachers. This negatively affects the implementation of the SMASSE approach in teaching Physics due to lack of adequate knowledge and skills on the part of the teacher. The challenges mentioned by the HODs, namely big work load, inadequate lab facilities, poor form one entry behavior, wide syllabus and inadequate support from the administration also negatively affects the implementation of the SMASSE project in teaching Physics in schools.

Among the factors that affect implementation of SMASSE programme in the teaching of physics in Mombasa county that came up in the study are:

- i) Availability of teaching and learning resources for physics in schools.
- ii) The time allocated for the teaching of the physics subject
- iii) The attitude of the physics teachers towards the SMASSE programme
- iv) Availability of the physics teachers for training in physics during SMASSE INSETs
- v) Physics teachers work load in their various schools.
- vi) The number of students in the physics class
- vii) Students attitude towards physics

5.3 Recommendations

From the fore going conclusion, the following recommendations are deemed appropriate for effective implementation of SMASSE project in the teaching of Physics.

- a) Availing more teaching resources required in teaching physics to schools. This can be done through funding of schools by the government or the schools allocating more money for purchasing lab apparatus for learners to handle the apparatus individually.
- b) Reducing teachers work load by employing more Physics teachers. This may be done by the government or the board of governors in the schools.
- c) Teachers should be trained for both their teaching subjects during SMASSE INSETs. This will ensure that all the physics teachers are trained for the subject. .

- d) The school administration should ensure that the Physics classes are not congested for proper individual attention to students,
- e) The schools should buy projectors for teaching physics in order to create interest and enhance understanding in the subject. This would enhance a more positive attitude by students towards the Physics subject.
- f) There should be prompt and efficient certification for the SMASSE INSETs attendants for every cycle by SMASSE programme organizers, which be considered for promotion to higher job groups This will motivate the Physics teacher hence improve their attitude towards SMASSE project
- g) The schools should purchase good quality lab equipment and ensure that they are properly maintained.

5.4 Suggestion for further research

One suggested area of study is discussing the factors affecting effective implementation of SMASSE programme in the whole of the coast province so as to get a better national picture.

The other suggested area for further research is Effect of SMASSE programme on students performance in Physics in secondary schools in Mombasa county. This can also be extended to a wider region like the whole of the coast province so as to get a better picture for the whole country.

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APPENDIX A :

PHYSICS TEACHERS QUESTIONNAIRE (PTQ)

Good performance in Science is a very important factor in national development. Kenya's vision 2030 may not be realized without the input in science. A lot of money has been pumped into sciences to enhance to try and achieve this dream. One of the areas which has received this enormous funding is the SMASSE project. Unfortunately, despite this initiative by the government there seems to be no much improvement in performance in Mathematics and Sciences.

This study hopes to identify some of the factors which influence effective teaching in Physics with the view suggesting possible remedies.

To helping doing this I request you to fill this questionnaire as honestly as you can. The information you give will be kept confidential and will be used only for this study. Thank you.

Section I: Background information

1. Name of school _____
2. Gender i) male ()
ii) female ()
3. Type of school

- a) i) Boys ()
ii) Girls ()
iii) Mixed ()
- b) i) Public ()
ii) Private ()

4. Professional qualification

- i) Bed ()
ii) BSc ()
iii) DipEd ()
iv) Others (specify) ()

5. Number of years in teaching ()

6. Which classes do you teach Physics?

- Form 1 ()
Form 2 ()
Form 3 ()
Form 4 ()

7. How many science labs do you have in your school?

()

Section II. SMASSE INSET

Read the following statements about SMASSE INSETs. Against some statements are letters SA (for strongly agree), A (for Agree), NS (for not sure) , D(for disagree) and SD(Strongly disagree)

Tick the appropriate letters depending on what you feel about each statement

8. How many SMASSE cycles have you attended?

()

9. Give the reasons for missing any of the cycles

10. SMASSE INSETs take too much time

(SA) (A) (NS) (D) (SD)

11. SMASSE INSETs are too involving

(SA) (A) (NS) (D) (SD)

12. Give teachers allowances and other incentives when attending SMASSE INSETs as a motivation.

(SA) (A) (NS) (D) (SD)

13. Funds spent on SMASSE S INSETs should be channeled to schools to buy resources .

(SA) (A) (NS) (D) (SD)

14. SMASSE approaches are useful insets in the teaching Physics

(SA) (A) (NS) (D) (SD)

15. What motivates you to attend SMASSE INSETs?

16. Suggest how the SMASSE project can be made more useful in the learning of Physics.

Section III. Resources

Below are the Physics topics in the KCSE Physics syllabus. Indicate by ticking appropriately, whether you use conventional apparatus (commercially manufactured), improvised apparatus or none at all in the teaching of the indicated topics, giving the reason for not using any apparatus.

TOPIC	Conventional resources	Improved resources	None and the reason
17.Measurement I			
18. Thermal Expansion			
19.Heat Transfer			
20.Rectilinear Propagation of Light			
21.Electrostatics I			
22.Hookes Law			
23.Waves			
24.Sound			
25.Fluid Flow			
26.Newton's Laws of Motion			
27.Work, Energy, Power and Machines			
28.Heating Effect of Electric Current			
29.Quantity of Heat			
30.Gas Laws			

Section IV: Attitude test on resources

31. Resources enable learners to understand Physics.

(SA) (A) (NS) (D) (SD)

32. I take more time when teaching with resources than when I am not.

(SA) (A) (NS) (D) (SD)

33. Most resources cannot be used to teach Physics.

(SA) (A) (NS) (D) (SD)

34. Selection, preparation and improvisation take too much time.

(SA) (A) (NS) (D) (SD)

35. With or without resources I can teach effectively and efficiently.

(SA) (A) (NS) (D) (SD)

36. I feel confident in using resources in teaching Physics.

(SA) (A) (NS) (D) (SD)

37. Our school administration is very supportive in supplying learning resources.

(SA) (A) (NS) (D) (SD)

38. What problems do you encounter in acquiring resources?

39. Suggest possible solutions to item 38.

40. What problems do you encounter in using the learning resources?

41. Suggest a possible solution to item 40.

Section V: Physics laboratory and equipment

42. Our school has separate Physics laboratory Yes () No ()

43. The apparatus in the Physics lab are adequate

(SA) (A) (NS) (D) (SD)

44. All the apparatus are in proper working condition

(SA) (A) (NS) (D) (SD)

45. I teach all my double lessons in the laboratory

(SA) (A) (NS) (D) (SD)

46. Suggest how the teaching of Physics can be improved for better performance.

Thank you

APPENDIX B:

ATTITUDE SCALE FOR STUDENTS (ASS)

INSTRUCTIONS

We would like to find out how you feel about the Physics you are learning in school.

Answer the question as honestly as possible. Your answers will be used for this research only.

SECTION I : Personal and general information.

1. Name of the school Class
2. Type of school: Boys Girls Mixed Public ...Private
3. Gender: Girl Boy
4. What is the number of students in your class [stream]? ()
5. We have Science club in the school. Yes () No ()
6. I am a member of the Science club. Yes () No ()

SECTION II

Read the following statements about Physics. Against each statement are letters SA (for strongly agree), A (for Agree), NS (for not sure), D (for disagree) and SD (for strongly disagree). Tick the appropriate letters depending on what you feel about each statement.

a. Physics teacher.

7. I like my Physics teacher.

(SA) (A) (NS) (D) (SD)

8. Our Physics teacher allows us to participate in the learning of Physics

(SA) (A) (NS) (D) (SD)

9. We usually perform experiments individually under the teacher's guidance.

(SA) (A) (NS) (D) (SD)

10. Our Physics teacher usually promptly marks and returns the practical work done before the next one.

(SA) (A) (NS) (D) (SD)

11. Our Physics teacher always uses charts, models and other teaching aids during Physics lesson.

(SA) (A) (NS) (D) (SD)

12. Our Physics teacher usually gives us assignments.

(SA) (A) (NS) (D) (SD)

13. Our Physics teacher always marks the assignment he/she gives us

(SA) (A) (NS) (D) (SD)

14. Our Physics teacher is friendly

(SA) (A) (NS) (D) (SD)

15. Our Physics teacher makes the lesson enjoyable.

(SA) (A) (NS) (D) (SD)

b. Interest in Physics

16. I only took Physics because I did not have an alternative.

(SA) (A) (NS) (D) (SD)

17. I like studying Physics most of my free time.

(SA) (A) (NS) (D) (SD)

18. I like Physics.

(SA) (A) (NS) (D) (SD)

19. Physics is an enjoyable subject.

(SA) (A) (NS) (D) (SD)

d. Ease in learning physics

20. Physics is generally a difficult subject.

(SA) (A) (NS) (D) (SD)

21. Physics is difficult when involving calculations.

(SA) (A) (NS) (D) (SD)

22. Physics is difficult when it involves handling of apparatus.

(SA) (A) (NS) (D) (SD)

23. Physics is too wide.

(SA) (A) (NS) (D) (SD)

e. Career interest in Physics

24. Researches in a Physics laboratory would be an interesting way to earn a living.

(SA) (A) (NS) (D) (SD)

25. To get a good job in future one requires knowledge in Physics.

(SA) (A) (NS) (D) (SD)

26. People who understand Physics are better off in society.

(SA) (A) (NS) (D) (SD)

27. Some of the best jobs in world require Physics knowledge.

(SA) (A) (NS) (D) (SD)

28. In my future career I will use the Physics I learnt in school.

(SA) (A) (NS) (D) (SD)

f. Beneficial aspects of Physics

29. Physics is useful for solving everyday problems.

(SA) (A) (NS) (D) (SD)

30. Physics is very useful for a country's development.

(SA) (A) (NS) (D) (SD)

31. Scientific inventions improve our standard of living.

(SA) (A) (NS) (D) (SD)

g. Harmful aspects of Physics

32. Physics has ruined the environment.

(SA) (A) (NS) (D) (SD)

33. Much of the anxiety in modern society is due to Physics.

(SA) (A) (NS) (D) (SD)

34. Scientific inventions have made the world too complex.

(SA) (A) (NS) (D) (SD)

35. Science and technology are the causes of many of the world problems.

Section III

36. What do you like to be when you leave school? Tick one.

Teacher ()

Lawyer ()

Nurse ()

Doctor ()

Politician ()

Engineer ()

Other (specify) () _____

APPENDIX C:

INTERVIEW SCHEDULE FOR HEADS OF SCIENCE DEPARTMENTS

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

1. In your opinion, how do you rate the performance of Physics in your school?
2. How do you rate the relationship between the teachers and the administration,(Excellent, Good, Fair, Poor, Very poor)
3. What are some of the concerns raised by the science teachers which may affect the teaching of Sciences?
4. How do you rate the relationship between the teachers and the students,(Excellent, Good, Fair, Poor, Very poor)
5. How do you rate the school administration support to the science department()
6. Do all the science teachers in your school attend SMASSE insets? If not why?
7. Do you think ASEI/PDSI approach is practiced in your school? If not ,why?

8. Does your school oftenly borrow any resources from the SMASSE inset centres.? If not why?
9. What are some of the concerns raised by science teachers in your school and how does your administration handle them?
10. In your opinion, what do you think should be done to improve on the implementation of ASEI/PDSI approach in teaching sciences

End

**APPENDIX D:
TIME SCHEDULE**

ACTIVITY	DATE
1.Proposal writing	January – July 2011
2.Handing in the proposal	August 2011
3.Field work and data collection	February2012
4.Data analysis an writing	March 2012
5.Submission of thesis	April 2012

APPENDIX E:

BUDGET

ITEMS	COST (Ksh)
Stationary	2000
Travelling	12000
Subsistence	10000
Proposal	
a) Typing	1,000
b) Photocopying	500
c) Binding (5copies)	250
Thesis	
a) Typing	2,000
b) Photocopying	1,000
c) Binding (4copies)	4000
d) Miscellaneous	5,000
Total	37,750

APPENDIX F:

MOMBASA COUNTY SECONDARY SCHOOLS

1. Light Academy
2. Sheikh Khalifa Academy
3. Aga Khan High School
4. Allidina High School
5. Abuhareira Academy
6. Mama Ngina High School
7. Al Madrasatul high school
8. Memon high School
9. Khamis Secondary School
10. Shimo la Tewa High School
11. Brainsworth Academy
12. Mombasa School for the Physically Handicapped
13. Coast Girls High School
14. Mombasa Baptist High School
15. Star of the Sea Secondary School
16. Sacred Heart Secondary School
17. Qubaa Academy
18. Tudor Secondary School
19. Shariff Nassir

20. Jesus Celebration Centre Secondary School
21. Imara secondary School
22. Tononoka Secondary School
23. Brainsworth Academy, Bamburi
24. Nyali High School
25. Kisauni Secondary School
26. Burhania Secondary
27. Mbaraki Girls secondary school
28. Serani High School
29. Pwani High School
30. Junda High School
31. Kilindini Secondary School
32. Mombasa Secondary
33. Mombasa High School

Source: DEO'S office, Mombasa

APPENDIX G:
RESEARCH PERMIT