

**IMPACT OF STRENGTHENING MATHEMATICS AND SCIENCE IN
SECONDARY EDUCATION (SMASSE) ON STUDENT PERFORMANCE AND
ATTITUDE TOWARDS PHYSICS IN MARAKWET WEST SUB-COUNTY.**

BY

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DECLARATION

This research project is my original work and has never been submitted for examination or degree in any other university.

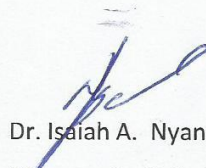


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This research project has been submitted for examination with my approval as the University supervisor



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DEDICATION

This research project is dedicated first to the almighty God who has taken care of me till now. My mother Mary , my uncles Samuel , Chris , Philip and Paul who together ensured that I have an education. To my sisters Emily and Eunice for their encouragement. To my beloved wife Lillian and all my children Shalom, Faith, Derrick and Godfrey for their support love and encouragement to you all I say may God bless you.

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LIST OF ABBREVIATIONS / ACRONYMS

ASEI	Activity, Students, Experiment, Improvisation
CEMASTEА	Centre for Mathematics, Science and Technology Education in Africa
INSET	In-service Education and Training
SMASSE	Strengthening of Mathematics and Science in Secondary Education
JICA	Japan International Co-operation Agency
KNEC	Kenya National Examination Council
MOEST	Ministry of Education Science and Technology
PDSI	Plan, Do, See, Improve
SMASSE-WECSA	Strengthening of Mathematics and Science in Secondary Education in Western, Eastern Central and Southern Africa
TIMSS	Third International Mathematics and Science Study
TPB	Theory of Planned Behavior
TRA	Theory of Reasoned Action

ABSTRACT

Performance in Physics has been steadily deteriorating over the last few years. This prompted the researcher to investigate the impact of SMASSE INSET on students' performance in Physics, teaching approaches and methodologies and teachers and students' attitude towards Physics. The objectives of the study were to investigate whether SMASSE INSET has changed the teacher's and students' attitudes, improved the performance and the teaching approaches and methodology in Physics.

This was a field study that was conducted in Marakwet west sub-county. A descriptive survey design was adopted for the study. Questionnaires are used as the research instruments. The respondents of the study were selected from the Form four and form three students of the year 2014. A sample of 371 students, 20 mathematics Heads of Department and 20 Mathematics teachers were selected using both stratified and simple random sampling. Analysis of data is done using descriptive statistics; tables, pie charts and bar graphs which show the variety of responses as well as number of respondents making them.

The study established that the students' attitude towards Physics has greatly improved as a result of SMASSE INSET. The study also found out that teacher's teaching approaches and methodology have greatly improved as a result of SMASSE INSET. However the attitude and teaching approaches could not translate to good performance. In order to make SMASSE INSET more effective in schools and in the teaching of Physics, it could be included in the programs of Teacher Education at the level of teacher preparation.

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background to the Study

Education forms a lifelong source of manpower through which the individual acquire knowledge, skills, positive attitude and positive behaviour, which will be the backbone foundation of the country's wealth. The Kenyan government in its vision 2030 has highlighted education as one of the pillars, which will be used to propel Kenyan into industrialized country by 2030. However the effort to realize quality education in all levels of education has been backwashed by poor performance in mathematics and sciences especially at secondary level. This can be attributed to lack of textbooks, teaching materials and science teachers caused by congestion of curriculum and the tight educational budget and hence the level of education was lowered mainly in subjects of science and mathematics. Eshiwani, (1993) noted that achievement in what was offered as science and mathematics was astonishingly poor. Similarly, Birgen (2004) stated that despite the explosion of trained teachers in the last decade, the scorecard in these key subjects had persistently made depressing reading. To address the poor performance in mathematics and sciences, the Kenyan government in conjunction with government of Japan initiated an In-Service Education and Training (INSET) for strengthening mathematics and sciences in secondary education (SMASSE). The INSET was piloted in 15 Sub-countys from February 27th 1998 to 30 June 2003. The Project (SMASSE) was then implemented in 2004 to cover all Sub-countys in Kenya. In Marakwet West Sub-county mathematics and science teachers underwent and completed the four cycles of SMASSE Project, in which teachers were in-serviced on ways of teaching mathematics using ASEI/PDSI, the principles of SMASSE project. This study aimed at assessing the impact of SMASSE INSET training on performance and attitude in Physics in secondary schools in Marakwet West Sub-county.

1.2 Statement of the Problem

Physics has a vital role regarding the opportunities available for students after KCSE. Kenya vision 2030 attainment would require that science and technology is at the core. Njuguna (1998) observed at performance in science subject has been dismal,

schools in Kenya had failed to adequately provide the needed scientific and technological manpower for development. Hence research was needed to find out why that situation existed and what could be done to improve the quality of science and technological education.

The Kenya government through the Ministry of Education in conjunction with the government of Japan came up with SMASSE In-service Education and Training (INSET) project as a remedy to the problem. For five years since July 1998, Japan has been extending support in training in-service teachers for science and physics in pilot regions of Kenya (SMASSE1).Based on the achievement of SMASSE I, SMASSE II has been implemented to cover the whole country.

The overall research problem that was addressed in this study was that despite the launching of the SMASSE INSET to cover the whole country in the year 2003, the performance of secondary school students in mathematics at KCSE level has been very low. This prompted the researcher to investigate the impact of SMASSE in-service training in Marakwet West Sub-county.

1.2.1 Research Questions

- (1) Is there a difference in performance of students in KCSE Physics before and after SMASSE in-service training of teachers?
- (2) What is the attitude of students and teachers towards learning and teaching of Physics?
- (3)What is the relationship between SMASSE INSET teacher training and teaching approaches or methodology in Physics?

1.3 Objectives of the Study

The study attempts to determine the effect of SMASSE on:

- (1) The performance of students in Physics.
- (2) Students and teachers attitude towards learning and teaching Physics.
- (3) Teaching approaches or methodology in Physics.

1.4 Study Hypotheses

In order to answer the above questions, the study tested the following null hypotheses;

H0₁: There is no significant difference in KCSE performance in Physics before and after SMASSE training of teachers.

H0₂: There is no significant change in attitude of teachers towards teaching Physics before and after SMASSE.

H0₃: There is no significant difference between SMASSE inset and teachers' teaching approaches and methodology.

1.5 Justification of the Study

Science education is the foundation of scientific and technological development. If this foundation is weak the scientific base that sustains technological development cannot be properly erected. The consequences of this are grave for the nation; unacceptable levels of scientific illiteracy among the citizenry and stagnation in economic development Riak et al, (1996). It is acknowledged globally that the quality of science teacher training is a key factor affecting the quality of science education in any country Riak et al.(1996). It is for this reason that SMASSE was greatly embraced by the ministry of education. Physics is a science that tries to describe how nature works in a mathematical language. It is considered to be the most fundamental of all natural sciences yet the number of students taking it has been on the decline as it is perceived to be a very difficult subject. It is for this reason that this study narrowed its study to Physics.

The study findings provided monitoring and evaluation information about the project implementation. Results of this study will be of use to the ministry of Education and SMASSE administrative team, policy makers, teachers, students and other stakeholders in education. Additionally it will give some insights on measures that can be undertaken in order to attract more students into studying Physics.

1.6 Operational Definition of Terms

Attitude: This is taken to mean the student's acquired internal state or feeling influencing their choice towards learning.

Sub-county INSET centre: An institution which has been chosen as a centre for in servicing of mathematics and science teachers at the Sub-county level

Impact : Any effect, whether anticipated or unanticipated, positive or negative, brought about by an intervention

National INSET Centre: This is the headquarters of the SMASSE project in Kenya. It is normally referred to as CEMASTE (centre for mathematics, science and technology Education in Africa).

Performance: This refers to the status of students with respect to acquired skills and knowledge as compared with other students or other schools, adopted standards or national educational standards.

Secondary school: An institution of learning that offers four years of formal schooling preceding university education. The education offered at this level is based on the four year curriculum which is broad based and builds on concepts, principles, skills and attitudes established at the primary level.

1.7 Study Matrix

The research was carried out in secondary schools in Marakwet West Sub-county in Elgeyo Marakwet County. Marakwet West Sub-county is bordered by the following Sub-countys; eldoret east, Keiyo North, Baringo North Marakwe East, Sigor, West Pokot and Cherangany. This area was selected because over the last few years, the performance in Physics has been on a downward trend (Education Insight, May-June 2007, Issue 12). The subject of this study was drawn from Form three and form four students. The choice of target students was based on the assumption that they had a longer experience in learning Physics and are more mature.

CHAPTER TWO

2.0 LITERATURE REVIEW AND CONCEPTUAL

FRAMEWORK

2.1 Introduction

This chapter has reviewed literature that is general in nature and some which are more specific to SMASSE INSET. Review of related literature has been done extensively, covering both local and international research studies on a topical basis. The purpose of the review was to identify research gaps in improving performance in sciences especially physics. Also the study sought to investigate the impact of SMASSE INSET on students' attitudes and performance in Physics in secondary schools.

2.2 The Review

2.2.1 The Learning Gap and the Need to Improve

The learning gap is closely related to the achievement gap and opportunity gap, a learning gap is the difference between what a student has learned i.e., the academic progress he or she has made and what the student was expected to learn at a certain point in his or her education, such as a particular age or grade level (Robert Wiebe 2009). There is always room for improvement, no matter how well our students are doing now; it would be foolish not to try to improve. Interest in international studies has grown since publication of "The learning Gap", heightened recently by release of the results of the "Third International mathematics and Science study (TIMSS)". As the name implies, this was the third in a series of international studies. The first was conducted in 1960s and the second in the early 1980s. In both of these studies, USA students performed quite poorly compared with their peers in most Asian and many European countries, (Stigler and Hiebert, 1999).

The difference in their performance is largely attributed to the different teaching approaches adopted by their teachers. For instance, Japanese teachers lead class discussions, asking questions about the solutions methods presented, pointing out important features of student's methods and presenting methods themselves. Because they seem to believe that learning Physics means constructing relationships between facts, procedures and ideas, they try to create a visual record of these different

methods as the lesson proceeds (Stigler & Hiebert, 1999). Additionally a lot of practical lessons as opposed to the USA teachers who have replaced the chalkboard with the overhead projector, and teaching are extremely limited, focused for the most part on a very narrow band of procedural skills, (Beaton 1996, & Mulis et al 1999).

Here in Kenya, concerns about the quality of education provided being raised, researchers and education analysts have sought to provide empirical data on literacy and numeracy quality indicators. The National Assessment System for Monitoring Learning Achievement (NASMLA) a semi-autonomous section in the Kenya National Examinations Council (KNEC) was released in the year 2010 (KNEC, 2010). With regard to numeracy, the report indicates that the mean score stood at 295.6 which was slightly lower than the standardized mean of 300 and that boys did better than girls. The report further indicates that slightly more than half (51.7 per cent) of the pupils tested attained the desirable levels.

This report and a few others studies point to the need of investigations into the teaching and learning of Mathematics and Sciences in Kenya. The centrality of the role of the teacher in the teaching and learning process is widely acknowledged and the search for the solution to the poor quality of education generally especially Sciences have started to focus on the teacher. (*Teacher Preparation and Continuing Professional Development in Africa, Country Report 2011*)

2.2.2 The Development of Student Achievement in Physics

Twenty four years ago, secretary Bell's National Commission on Excellence in Education declared the United States to be a "nation at risk" because of its troubled and failing educational system (NCEE, 1983). Since 1983, the educational system has been scrutinized by numerous groups and more than a hundred reports have been published. During recent years the National Science Foundation (NSF) has invested billions of dollars in projects to enhance curricula and instructional materials and train teachers. Given this level of efforts it would be reasonable to expect some indicators of improvement in students learning of mathematics (Miller, 1999).

The recent results from the third international mathematics and science study (TIMSS) indicate the US fourth-grade students are closer to the international mean in physics achievement than either American 8th - grade or 12th grade students, and that

the distance between the US mean physics achievement and the international mean increases with continued schooling (Beaton et al 1996, Mulis et al 1999). The National Centre for education statistics summary of student physics achievement among 8th grade students in the United State and other countries is clear and succinct:

Compared to their international counterparts US students are somewhat below the international average of 41 TIMSS countries in physics. In physics, students in 20 countries outperform our eighth grades.

Students in 13 countries are not significantly different than ours and the US students out perform their counterparts in 7 nations. We can say with confidence that the US outperformed four countries in physics; Lithuania, Cyprus , Portugal, Iran. The US also outperformed Kuwait Columbia and South Africa, but due to deviations in their administrations of TIMSS, we have less confidence in their scores. These seven countries are the only ones that we outperformed in physics. (Department of Education 1996, pp 19, 23-24).

This is hardly what was expected after millions of hours of curriculum development and teacher training and billions of dollars. By identifying the background and developmental factors that account for high and low physics achievement scores, it will be possible to think about possible interventions and strategies for influencing the overall level of physics achievement in the United States. (Miller, 1999).

2.2.3 Attitudes Towards Learning Choices

Attitudes largely determine what students learn and their willingness to learn. Lingren (1980) supported this view by stressing the importance of students holding favorable attitudes if learning experiences are to be successful.

Several definitions have been offered as to what attitudes are. Fishbein and Ajzen (1975) stated that an attitude is one's general feeling of favor or otherwise toward some stimulus objects. A similar definition was offered by Thorndike and Hagen (1975) and Richardson (1977). They added that this judgment or feeling is towards an individual, a group, an object, an institutions or a proposition. Caution must be taken as to what attitudes students have as fears passed on to students stay with them for the rest of their education (Philips, 1980). Extending this further, Tobias,

(1978:54) stated that "negative attitudes can powerfully inhibit intellect and curiosity and can keep us from learning what is well within our power to understand".

In the secondary school, Fakuode (1973) found that it is common knowledge that the majority of the students in Nigerian Secondary schools dislike mathematics and sciences when comparing the two sexes. Internationally females have been noted to have more negative attitudes (Iben, 1991; Dike, 1984; Omuoha, 1982; Oyewole, 1982; Tobias, and Weissbrod, 1980; Preece, 1979; Fennema and Sherman, 1977; Bassa, 1976). The differences between the attitudes of males and females increase as students' progress in school (Lewy, 1982).

According to Mukherjee and Umar (1989) of Kano state polytechnic, Nigeria, attitudes can be changed as theories of attitude change have shown. Research on attitudes change of individuals and their subsequent behavior has been mainly in fields other than education. Attitudes like values are products of the social interactions a child is likely to experience with his parents, teachers and neighborhood community. Successful interactions depend on positive reinforcements, which in their turn lead to ego- involvement of the persons concerned.

2.2.4 Physics Teaching

There has always been an interest in the development of positive students' attitudes towards physics. The objectives of any physics curriculum include fostering favourable feelings toward physics as well as imparting cognitive knowledge. While Bolaji (1996) has provided an overview of much aspect of attitudes towards physics including a review of instrumentation, it is still unclear how the school environment affects the development of students' attitudes towards physics.

Some researches have been done on the relationship between school variables and students attitudes towards physics. Several investigations have found a small but positive correlation between some schools factors and attitudes (Jacobs, 1974, Fields, 1975; Evans 1978, Paul, 1986), although these studies do not examine the influence of specific variables. Gordon (1975), cooper (1988) and MC Maham (1992) provide evidence that aspects of the classroom learning environment, or climate, are positively related to physics attitudes. An environment lower in intellectual demands, difficulty and amount of frictions or conflicts is likely to show more students positive attitude

(Armstrong, 1985). A number of studies have indicated that the personality and behavior of the teachers is very important in the formation of students' attitudes, with one notable exception by Fennema (1990). Anderson (1991) found that it is important for teachers to be enthusiastic and use more indirect teaching behaviors.

Ninth grade pupils interests in physics was found by Reed (1968) to increase with teachers who are warm and who utilized student's intrinsic motivation. Fennema and Sherman (1995) found that students of teachers who were well- organized, achievement-oriented and enthusiastic tended to have more positive physics attitudes.

In support by other studies concerning the effect of the teacher, the students mentioned the teacher, in both personality and interrelationships with students as a crucial variable in attitude formation (Bolaji Caleb, 1996). The findings of the study carried out by Bolaji (1996) suggests that the assessment of physics attitudes needs to differentiate enjoyment from usefulness and indicates the importance of students investment through effort in developing positive attitudes towards physics. Teacher personality, relations and interactions with students' classroom activities, rewards, assignments and students work are all controlled by the teachers. The results from this study suggests the need for the teachers to develop positive relations with students, to stress classroom activities which involve active- teaching process and student participation and to engage students meaningfully in the subject, so that a fruitful and satisfying results is assured.

2.2.5. SMASSE INSET

2.2.5.1 Impact of SMASSE INSET on shift in teaching strategies.

In 1985, Kenya changed her education system from 7-4-2-3 (seven years of primary, 4 years of ordinary secondary, 2 years of Advance secondary level and a minimum of 3 years of university education depending on the course taken) to the current 8-4-4 education system (8 years of primary, 4 years of secondary and a minimum of 4 years of university education depending on the course taken) (Mackay report 1981). The changeover made science subjects compulsory in all Kenyan public schools. The new education policy found many schools ill- equipped to start science classes coupled with the extra demand for science teachers. The new education system's high demand for science facilities and teachers hardly gave room for teachers' professional

development of how to implement the new curriculum. This has remained so for sometimes now. Students in Kenya sit for national examinations that are centrally set, moderated, marked and graded (KNEC, 1998).

According to the KNEC (1998), student's overall performance in science subjects has been declining over the years. It has been argued that one way of addressing the difficulties students experience in Kenya science classrooms is through appropriate teaching interventions that can be realized through professional development of science teachers (SMASSE project, 1998). It is hoped that professional development programs for science teachers will equip teachers with appropriate teaching skills and instruction strategies that are necessary to effectively implement science curricula in schools.

By so doing, the Kenyan authorities with assistance from the government of Japan hope to strengthen the teaching and learning of mathematics and science education in public schools through a pilot project called "Strengthening Mathematics and Science in Secondary Education (SMASSE)".

SMASSE targeted teachers first because of the time they spend with students. The attitude of the teacher impacts negatively on students. Negative attitude among students is manifested in untidy incomplete homework, frequent absenteeism, lack of attention in class, poor performance and low enrolment in optional science subjects, especially physics, (Wambui and Wahome, 2006).

2.2.5.2 Rationale for SMASSE In-service Education and Training (INSET)

The following are some of the factors that may disturb the education system equilibrium thereby making it necessary for teachers to undergo INSET (SMASSE Project 1998):

- Curriculum change

Curriculum requirements of any education system do not remain constant but are ever changing with time. This may for instance be as a result of changing education policy to respond to contemporary societal needs. For example in Kenya there has been a shift of emphasis for education for "white collar job" to education for "self-

reliance". Under such circumstances, in-service training becomes necessary if the new curriculum is to be effectively and efficiently implemented.

INSET would provide the necessary forum where the policy makers and implementers would deliberate on matters pertaining to new aims and objectives, content, sequencing, modalities of implementation etc and reach a consensus.

- Change in Teaching Approaches/ Methodologies

Changes in curriculum bring about a need for re-examination of pedagogical aspects. New teaching methods/ approaches may be required to teach new curricula. Other than new curricula there is continuous research on effectiveness of teaching/ learning methods/ approaches and as such practicing teachers need to be updated on the current trends. For example, there has been a strong recommendation by educators for a shift from a teacher- centered approach to student- centered approach of teaching.

Without in-service training during which such developments are articulated, teachers may find it difficult to discard old practices for the new ones.

- Teacher's Professional Development

A considerable amount of in- service education for teachers is conducted in the absence of particular curricula changes. Such INSET is provided due to the potential benefits to the teachers' professional growth.

Its degree of success is judged by the competencies that the teacher acquires or by improvement in the teacher's classroom practices but not in terms of its contribution to some overall curricula or instructional direction established for a school or program.

- Follow-up

Much of the good practices taught and learned in college are soon undone because of lack of follow-up. Newly posted teachers very soon after entering the profession resort to outdated teaching practices most likely due to discouragement by colleagues that much of what is taught in college is theoretical and don't work in actual practice. Another factor could be frustrations encountered in the course of duty, etc. INSET

thus provides a good opportunity to make a follow-up and undo retrogressive acts, attitudes and practices. It may be true to some extent that most teacher trainers, especially in the universities are out of touch with the realities of the classroom and that some courses are generally theoretical. It is more for such reasons that INSET, during which pre-service training can be harmonized with the realities of educational practice, becomes essential.

2.3 Theoretical Framework

This study was based on the Theory of Reasoned Action (TRA) and the Theory of Planned Behaviours (TPB). The theory of reasoned action (TRA) was first proposed by Ajzen and Fishbein (1975 and 1980).

The components of TRA are three general constructs:

- (1) behavioural intention
- (2) Attitude and
- (3) Subjective norm

TRA suggest that a person's behavioural intention depend on a person's attitude about the behaviour and subjective norms.

$$BI = A + SN$$

If a person intends to behave in a particular way then it is likely that the person will that way.

Furthermore, a person's intentions are themselves guided by two things: the person's attitude towards the behaviour and the subjective norms. Behavioural intention measures a person's relative strength of intention to perform behaviour.

Attitude is comprised of beliefs about the consequences of performing the behaviour multiplied by a person's valuation of these consequences. Subjective norm is seen as a combination of perceived expectations from relevant individual or groups along with intentions to comply with these expectations. In other words, "the person's perception that most people who are important to him or her think he should or should not perform the behaviour in question" Ajzen and Fishbein, (1980).

The theory of planned behaviour is a theory which predicts deliberate behaviour, because behaviour can be deliberative and planned. The theory of planned behaviour holds that only specific attitudes toward the behaviour in question can be expected to predict that behaviour Ajzen, (1991).

All the above views concerning the theory of reasoned action and the theory of planned behaviour helped the researcher in establishing the impact of SMASSE INSET on the student's attitude and performance in physics in secondary schools.

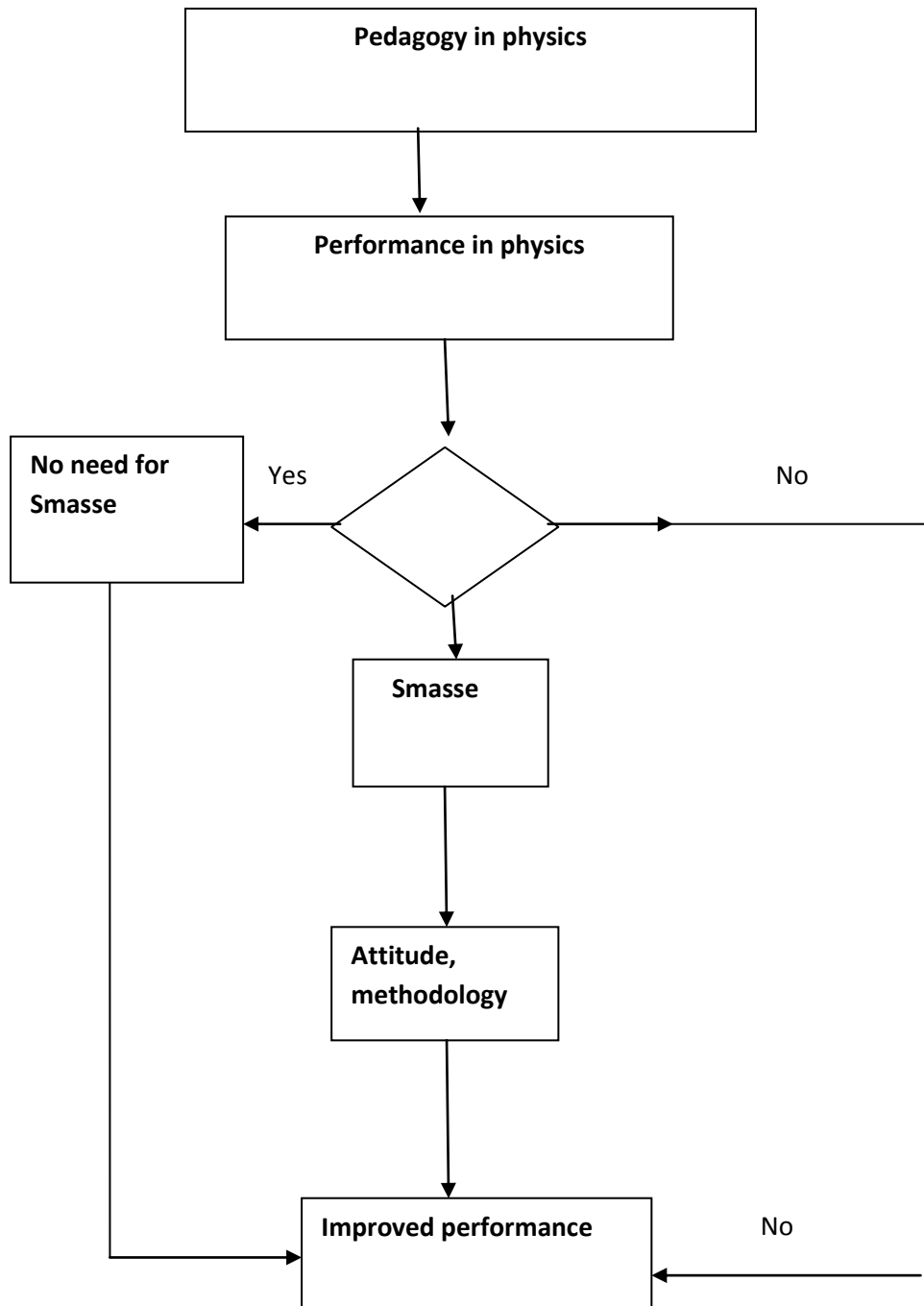
2.4 Conceptual Framework

The main focus of this study was to assess the impact of SMASSE INSET training on students' performance and attitude in physics in Marakwet West Sub-county. The independent and dependent variables will be measured.

The dependent variables in the study are the attitude and academic performance in physics in secondary schools in Marakwet West Sub-county. On the other hand, the independent variable is SMASSE INSET.

In academic performance as an independent variable, the factors considered for study included the number of students taking Physics; school mean grade in physics in KCSE examinations; and the students' attitude towards physics.

The factors considered in the independent variable in motivation of teachers included job satisfaction, remuneration, punctuality and commitment, opportunities for their in-service training and development and the rate of teacher turnover. Figure 2.1 on the next page is the conceptual framework of the study.



Source; modified TRA

CHAPTER THREE

3.0 RESEARCH DESIGN AND METHODOLOGY

3.1 Research Design

This study adopted a descriptive survey design. According to Gay (1981) a descriptive research is a process of collecting data in order to test hypotheses or to answer questions concerning the current status of the subjects in the study. Descriptive survey designs are used in preliminary and exploratory studies to allow researchers to gather information, summarize, present and interpret for the purpose of clarification Orodho, (2002). Borg and Gall (1989) note that descriptive survey research is intended to produce statistical information about aspects of education that interest policy makers and educators.

Descriptive survey is a method of collecting information by interviewing or administering a questionnaire to a sample of individuals (Orodho, 2003). It can be used when collecting information about people's attitudes, opinions, habits or any of the variety of education or social issues Orodho and Kombo,(2002). For example, teachers in schools can carry out a survey to find out student's attitudes towards their teaching styles or discipline.

3.2 Data Types and Sources

The study variables were grouped into two categories, namely independent variables and the dependent variable.

The independent variable is the SMASSE INSET.

The dependent variables are the students' attitudes toward Physics and performance in Physics.

3.3 Reconnaissance (Pilot Survey)

Piloting is trying out of research instruments on the respondents who will not be used in the main study.

Pilot study was meant to assess reliability by checking for consistency. This helped in ensuring that the data which was expected to be produced was in line with the study

objectives. Research instruments may be pre-tested on a small sample of at least ten respondents Mulusa (1990).

In this study, two schools that did not take part in the main study were selected for piloting. The researcher visited each school that was selected from the population. He first of all consulted the principals and explained to them the purpose of the visit. They principals called the Physics Heads of Department to their offices. The respondents were informed by the researcher that the information gathered was to be used in improving the teaching and learning of Physics and that whatever information they gave was to be kept confidential.

A sample of 20 students and 4 physics teachers were used for piloting. The researcher gave the questionnaires to physics Heads of Department and the physics teachers who had undergone SMASSE INSET. Class teachers of form three and four assisted the researcher in administering the students' questionnaire. The test- retest method was employed within an interval of two weeks .The responses to the items in the questionnaire were assigned numerical values.

3.3.1 Target Population and Sample Size

The target population of this study, that is, the actual population to which the findings was generalized is secondary schools in Marakwet West Sub-county. This study targeted 20 Physics teachers who have undergone the SMASSE INSET training drawn from different secondary schools. It also targeted 150 Physics students as the primary respondents drawn from form 3 and form four students.

Marakwet West Sub-county has 33 secondary schools with student population of 8165. There are 9 Boys', 12 Girls' and 12 mixed secondary schools all distributed in the 5 divisions of Marakwet West Sub-county (MOEST, 2007).

A sample of 30% of the schools in the Sub-county was selected for the study. The study covered all the divisions of Marakwet West Sub-county.

The schools were categorized into boys' boarding schools, girls' boarding Schools and Mixed Schools. Thereafter schools from each of the three categories were randomly selected.

To calculate the number of sampled schools by category, the total number of schools in each category was multiplied by the ratio of schools sampled to the total number of secondary schools in the Sub-countys. Therefore from the 11 schools to be sampled, 3 Boys, 4 Girls and 4 mixed schools were selected. This is so as to ensure that there is an adequate representation of the different categories of schools.

3.3.2 Data Collection Instruments

In the study, the following instruments and techniques were used.

1. Student's questionnaire (SQ)
2. Teacher's questionnaire (TQ)
3. HOD Physics Questionnaire

The three instruments were used to supplement each other and to give a deeper and wider exploration into research perspective which gave the research more quality.

Student's Questionnaire (SQ)

Tuchman (1987) says that a questionnaire is a way of getting data about persons by asking them rather than watch them behave. A questionnaire is a research tool whereby the respondent gives the responses to the questions asked through the written mode. The use of questionnaire as a tool in research is quite efficient because through them the researcher is able to obtain personal views from the respondents. In this questionnaire closed ended questions was used. This was of help to the researcher to obtain the personal views of the respondents (Appendix I).

For closed ended questionnaire, five-point likert scale was used to measure attitudes and experiences associated with Physics. The higher the score the more positive the attitude towards physics, with the exception of questions which are negative and should show a lower score to indicate a more positive attitude. Responses from negatively worded items were reversed before inclusion in the computation of the average value.

Teacher's Questionnaire (TQ)

The teachers' questionnaire was used to seek information on the following items : teaching experiences , experiences gained after undergoing the SMASSE INSET and frequency of in-service courses among others. (Appendix II)

HOD Physics Questionnaire

HOD Physics questionnaire in this study was used to seek information on the performance in physics at KCSE level from the year 2009 to 2012. One way analysis of variance (ANOVA) and t-test was applied to find out whether there were any significant differences in performance two years before SMASSE and two years after SMASSE (Appendix III).

Reliability of the research instruments

Reliability is a measure of the degree to which a research instrument yields consistent results or data after repeated trials (Mugenda and Mugenda: 1995).

According to Seliger and Shohamy (1989) reliability is the extent to which data collection procedures and research tools are consistent and accurate. In a research study, a reliability coefficient can be computed to indicate how reliable data are. A coefficient of 0.80 or more implies that there is a higher degree of reliability of the data (Mugenda and Mugenda , 2003). Reliability of the data is in fact a very important aspect of a research study and should be addressed early in the research process and also reported in the final document.

3.3.3 Sampling Procedure

Proportionate Stratified random sampling design will be used. According to Mugenda and Mugenda (1999), in stratified random sampling subjects are selected in such a way that the existing sub groups in the population are more or less reproduced in the sample. Sampling is the procedure a researcher uses to gather people, places or things to study. It is a process of selecting a number of individual or objects from a population such that the selected group contains elements representative of the characteristics found in the entire group (Orodho and Kombo, 2002). A sample is finite part of a statistical population where properties are studied to gain information about the whole (Webster, 1985).

The subjects of this study were drawn from Form three and form four students. The choice of the students was based on the assumption that they had a longer experience in learning physics soon after the SMASSE INSET was implemented in August 2004.

It was also assumed that the form three and four students would be more mature in their opinions and attitudes towards Physics. Sample of 150 students were used comprising of Girls and Boys from Boys’ boarding schools, Girls’ boarding schools and mixed Schools. This figure was arrived at by using a generalized scientific guideline for sample size decision by Krejcie, and Morgan (1970).

The two Boys’ schools and the three Girls’ school were selected using simple random sampling. The 12 mixed schools were distributed throughout all the five divisions. A sample size of at least 3 schools from each division was chosen using simple random sampling. This was done by placing the names of schools in a container and then picking the required number of schools at random. The purpose of these strata is to ensure that each category of school is represented in the study as the selection was made from these categories.

The researcher also gathered information from physics teachers of the schools that participated in the study. Their information was hoped to strengthen the validity of the results. A total of 20 physics teachers were selected for the interview. Table 3.1 shows total number of schools in the sub –county against the sample size .

Table 3.1 sampling of schools

Category of schools	Total number of schools in Marakwet West Sub-county	Selected sample
Boys, Schools	9	3
Girls’ schools	12	4
Mixed and day schools	12	4
Total	33	11

Source : Marakwet West Sub County Education Report 2013

3.4 Data Processing and Analysis

3.4.1 Data Processing

Quantitative and qualitative methods are used in the analysis of data. The data is analysed using Ms Excel. The process includes both descriptive and inferential analysis. Descriptive analysis uses categorical variables which are described in terms of frequencies and percentages.

Quantitative methods are used to analyze numeric data in order to measure and explain the relationship and differences amongst variables such as the population of students, pupil teacher and pupil book ratio. The techniques are also used to analyze the academic performance of students in terms of grades. Qualitative data is organized, coded and categorized for proper interpretation. The researcher analyses the variables or cases of qualitative data that illustrate themes and make comparisons and contrasts.

3.4.2 Data Analysis Techniques

The data collected was analysed using both descriptive and inferential statistical techniques. Frequencies, percentages, means and standard deviations were employed for the descriptive statistics while the one way analysis of variances (ANOVA) and Chi-square (χ^2) was employed for inferential statistics. The significance was tested by computing the P- value at a significance or alpha level of 0.05.

3.4.2.1 SMASSE INSET and Student's Attitude Towards Physics.

The data collected on students' attitude was analyzed so as to give a general picture about the students' attitude towards physics after the implementation of SMASSE INSET.

Before the implementation of SMASSE INSET, students used to have negative attitude towards physics (Baseline findings, 1998).

3.4.2.2 SMASSE INSET and Students Performance in KCSE Physics Examinations.

Data collected was analyzed from the year 2002 up to the year 2006. The year 2004 was taken as the base year. This was the time when SMASSE INSET was introduced

in Marakwet West Sub-county. The aim of collecting the data was to investigate the students' performance in Physics two years before SMASSE INSET was introduced and the effect of SMASSE INSET on students' performance two years after SMASSE INSET was introduced in the whole Sub-county.

3.5 Scope and Limitation

This study was conducted in Marakwet West Sub-county. This area was selected because over the last few years, the performance in Physics has been on a downward trend (Education Insight, May-June 2007, Issue 12).

The challenges experienced in the study include:

- (1) Financial limitations. This study required a lot of money for stationery, piloting and travel plus accommodation expenses.
- (2) Time- the study required a lot of time so as to collect comprehensive data required for the study
- (3) The study heavily relied on the assumption that all the respondents were cooperative and that they provided accurate and reliable data

CHAPTER FOUR

4.0 RESULTS AND DISCUSSIONS

4.1 Introduction

The study investigated students' attitudes and performance in physics. Data collected was analyzed to get the overall picture of students' attitude toward physics. Specifically data was analyzed to determine whether:

- 1) SMASSE INSET has changed the students' attitudes towards physics.
- 2) SMASSE INSET has improved the performance in physics
- 3) SMASSE INSET has improved the teachers teaching approach and methodology.

As stated in chapter three, the main research instruments were students' questionnaire, teachers' questionnaire and HOD mathematics questionnaire. Three research hypotheses were tested. The independent variable, SMASSE INSET was considered against students' attitudes, performance in physics and teacher's teaching approaches and methodology. Both descriptive and inferential statistics were used to analyze the data.

4.2 SMASSE INSET and Students' Performance in KCSE Physics Examinations.

Data collected was analysed from the year 2002 up to the year 2006. The year 2004 was taken as the base year. This was the time when SMASSE INSET was introduced in Marakwet West Sub-county. The aim of collecting the data was to investigate the students' performance in physics two years before SMASSE INSET was introduced and the effect of SMASSE INSET on students' performance two years after SMASSE INSET was introduced in the whole Sub-county.

The overall performance of students' performance in Physics is as shown in Table 4.2 (p. 43) Mean scores and mean grade were used to gauge the overall performance. From Table 4.2, the analysis of the results shows that two years before SMASSE INSET was introduced, the students' performance was 4.018 (D+) and 4.060 (D+) respectively. Two years after SMASSE was introduced the students' performance was 3.372 (D) and 3.562 (D+). The analysis clearly shows that the performance in

KCSE has been declining even with the introduction of SMASSE INSET. One of the reasons why SMASSE was introduced was to improve the poor performance in physics which had almost been accepted to be the order of the day. The ministry of education science and technology and other stakeholders felt there had to be an intervention measures hence the SMASSE project.

In the year 2006, the first group of students sat their exams under a new curriculum that was introduced in the year 2003. Students may not have done well due to fear and anxiety of the new curriculum.

It is hoped that as time goes by, the students are expected to do well since the two papers examined clearly shows the areas to be examined. Paper 1 mainly covers forms 1 and 2 work whereas paper 2 covers mainly forms 3 and 4 work

TABLE 4.2: KCSE PHYSICS RESULTS ANALYSIS FOR SAMPLED SCHOOLS BEFORE AND AFTER SMASSE.

		12	11	10	9	8	7	6	5	4	3	2	1		
	ENTRY	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	MS	MG
2002	457	5	6	4	20	20	22	35	45	49	98	98	55	4.018	D+
2003	417	11	3	8	13	18	28	31	35	45	66	93	66	4.060	D+
2004	601	6	6	12	14	16	31	38	35	52	97	129	165	3.418	D
2005	712	11	5	19	13	21	25	42	39	59	111	181	186	3.372	D
2006	569	10	9	17	12	15	23	33	36	36	102	145	131	3.562	D+

Source: KCSE results from 2002- 2006

Percentage of students who scored C+ and above are as follows:

Year	Number	Percentage
2002	77	16%
2003	81	19%
2004	85	14%
2005	94	13%
2006	86	15%

Two years before SMASSE was introduced the percentage of students who score C+ and above was 16% and 19% respectively. Two years after the introduction of SMASSE INSET the percentage of students who had scored a grade of C+ and above was 13% and 15% respectively. This clearly shows that the quality grades have declined with the introduction of SMASSE INSET.

Analysis was further done to determine the effect of SMASSE INSET on students' performance as per the school category. Analysis was done on Boys secondary school, girls' secondary school and mixed schools. The results are shown in Table 4.2.1(p.45). Two years before SMASSE INSET was introduced, the performance was 4.785 (C-) and 4.967 (C-) respectively. Two years after SMASSE INSET was introduced the performance was 4.546 (C-) and 4.98 (C-). The analysis shows that there is no much difference in performance before and after SMASSE INSET was introduced. The mean grade over the years has almost remained the same. Table 4.2.2(p.46) shows the percentage of students who scored C+ and above. In terms of the quality grades, the students who scored C+ and above two years before SMASSE was 25.1% and 27.2% respectively. Two years after SMASSE was introduced, the percentage of students who scored C+ and above was 28.7% and 31.5% respectively. The analysis shows that there is a slight improvement of the quality grades in Boys' schools with the introduction of SMASSE INSET.

Table 4.2.1: KCSE PHYSICS RESULTS ANALYSIS FOR SAMPLED SCHOOLS AS PER SCHOOL CATEGORY

YEAR	SCHOOL	ENTRY	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	MS	MG
2002	Boys sch	219	5	4	3	14	14	15	19	27	25	48	33	12	4.785	C-
	Girls sch	126	0	1	0	4	4	7	9	9	122	27	37	16	3.540	D+
	Mixed sc.	112	0	1	1	2	2	0	7	9	12	23	28	27	3.054	D
2003	Boys sch	180	9	1	4	8		17	18	22	26	25	25	15	4.967	C-
	Girls sch	86	1	1	2	3		7	8	6	11	21	17	4	4.441	D+
	Mixed sc.	151	1	1	1	2		4	5	7	8	20	51	47	2.762	D
2004	Boys sch	271	6	5	9	10		16	24	19	24	45	55	48	4.159	D+
	Girls sch	111	0	1	1	2		7	7	7	12	17	19	36	3.189	D
	Mixed sc.	219	0	0	2	2		8	7	9	16	35	55	81	2.616	D
2005	Boys sch	251	9	4	11	9		16	25	25	21	33	39	46	4.546	C-
	Girls sch	225	1	1	6	3		4	9	10	23	45	69	50	3.062	D
	Mixed sc.	236	1	0	2	1		5	8	4	15	33	73	90	2.419	D-
2006	Boys sch.	200	10	7	14	10		11	15	16	11	28	39	28	4.98	C-
	Girls sch.	199	0	2	2	2		7	15	15	18	47	49	40	3.221	D
	Mixed sc.	170	0	0	1	0		5	3	5	7	27	57	63	3.294	D-

SOURCE: KCSE RESULTS 2002-2006

Table 4.2.2: Percentage of students who scored C+ and above

Year	School category	Entry	Number	percentage
2002	Boys sch	219	55	25.1%
	Girls sch	126	16	12.7%
	Mixed sch.	112	6	5.36%
2003	Boys sch	180	49	27.1%
	Girls sch	86	19	21.1%
	Mixed sch.	151	13	8.60%
2004	Boys sch	271	56	20.7%
	Girls sch	111	13	11.7%
	Mixed sch.	219	16	7.3%
2005	Boys sch	251	72	28.7%
	Girls sch	225	19	8.40%
	Mixed sch.	236	13	5.50%
2006	Boys sch	200	63	31.5%
	Girls sch	199	15	7.50%
	Mixed sch.	170	8	4.70%

Source: Marakwet west sub-county academic committee report 2008

Two years before SMASSE INSET the mean grades for girls' schools were 3.540 (D+) and 4.441 (D+) respectively. Two years after SMASSE INSET, the mean grades for girls were 3.062 (D) and 3.221 (D) respectively.

The analysis clearly shows that there is a decline in girl's performance with the introduction of SMASSE INSET. The introduction of SMASSE INSET had a negative impact on the performance of girls' schools in Marakwet West Sub-county. The percentage of students who had C+ and above before the introduction of SMASSE INSET was 12.7% and 22.1% respectively. Two years after the SMASSE INSET was introduced, students who had a grade of C+ and above were 8.4% and 7.5% respectively. This clearly suggests that there is a decline of quality grades with the introduction of SMASSE INSET. The decline in the quality grades can partly be attributed to the introduction of the new curriculum which was examined for the first time in 2006.

Two years before the SMASSE INSET the mean grades of students were 3.054 (D) and 2.762 (D) respectively. Two years after SMASSE, the mean grades in mixed school were 2.419 (D-) and 2.294 (D-) respectively. The analysis clearly shows that there is a decline in physics performance in mixed schools with the introduction of SMASSE INSET. The percentage of students who scored C+ and above before the introduction of SMASSE INSET was 5.36% and 8.60% respectively.

Two years after SMASSE INSET was introduced the percentage of students who scored C+ and above were 5.50% and 4.70% respectively.

This clearly shows that there is a decline in quality grades with the introduction of SMASSE INSET.

According to the Kenya National Examinations report released on February 28 (2011), the students overall mean in Physics was 39.32%. A total of 83,387 students sat for Physics exam in 2010. A total of 23,788 female candidates sat for the exam and had a mean of 37.04 % whereas a total of 59,599 male candidates sat for the exam and had a mean of 40.23%. The analysis shows that Physics is the fourth poorly performed subject out of the twenty 22 subjects that were offered in the curriculum. The results are as shown in Table 4.2.3(p. 49).

On further analysis of the data collected, one way analysis of variance (ANOVA) and T- test were used to find out whether there were significant differences in students' performance before SMASSE INSET and after SMASSE INSET. The details of the findings are presented in Table 4.2.4 (p. 50). The hypothesis was HO₂: There is no significant difference between SMASSE INSET and students' performance in physics.

Tables 4.2.4 show the results of the inferential test undertaken and they indicate that on the overall, the differences are not significant at 0.05 significant level. This means that indeed, there is no significant difference between SMASSE INSET and students' performance in physics.

Table 4.2.3 2010 Overall candidates means performance by subject and gender

		OVERALL		FEMALE		MALE	
	SUBJECT CODE & NAME	NO. SAT	MEAN %	NO. SAT	MEAN %	NO. SAT	MEAN %
1	101 English	272,897	39.70	124,718	39.65	148,179	39.74
2	102 Kiswahili	272, 992	45.76	124,745	45.53	148,247	45.95
3	121 Mathematics	274,120	19.74	125,248	15.74	148,872	23.10
4	211 Biology	246, 662	41.95	118,745	38.99	127,917	44.70
5	212 Physics	83,387	39.32	23,788	37.04	59,599	40.23
6	213 Chemistry	268,001	25.38	123,078	22.65	144,923	27.69
7	216 Biology for the blind	37	24.84	12	24.17	25	25.16
8	311 History & Gov't	164,695	50.93	72,913	46.31	91,782	54.60
9	312 Geography	103,252	46.82	42,575	42.74	60,677	49.66
10	313 CRE	165.751	62.40	93,445	62.40	72,306	62.39

11	314 IRE	7,120	61.41	2,611	59.38	4,509	62.58
12	315 HRE	7	48.43	3	64.67	4	36.25
13	414 Home science	11,336	49.37	10,554	49.91	782	42.05
14	412 Art and Design	986	58.67	342	60.00	644	57.95
15	413 Agriculture	120,107	43.67	52,135	40.54	67,972	46.06
16	450 Aviation techn.	53	54.08			53	54.08
17	451 Computer stud	4,770	54.93	2,151	51.66	2,619	57.61
18	501 French	2,136	47.28	1,341	46.28	795	48.97
19	502 German	418	59.18	307	60.20	111	56.32
20	503 Arabic	1,134	67.49	339	64.58	795	68.73
21	511 Music	1,300	53.08	737	53.79	563	52.13
22	565 Business studies	117,395	55.14	52,638	51.49	64,757	58.11

Source: Kenya National Examinations council (2011).

Table 4.2.4: One-way ANOVA for KCSE results before SMASSE and After SMASSE

		Sum of squares	Df	Mean Square	F	Sig.
Boys' results	Between groups	638.021	1	638.021	.529	.471
	Within groups	55469.792	46	1205.865		
Girls' results	Between groups	5250.083	1	5250.083	4.672	.036
	Within groups	51695.833	46	1123.822		
Mixed schools' results	Between groups	768.000	1	768.000	.702	.406
	Within groups	50293.917	46	1093.346		
Overall Results	Between groups	16837.521	1	16837.521	3.160	.082
	Within groups	245109.0	46	5328.456		

4.3 Teachers' Experiences on SMASSE INSET

The aim of the study was to get the feedback from the physics teachers who had attended the SMASSE INSET. A total of 20 physics teachers were sampled for the study. A number of them were very co-operative and they willingly filled the questionnaire. However, the few who were reluctant to fill the questionnaire accepted to have a direct face to face interview with the researcher.

Out of all the teachers who were involved in the study, 85% were males whereas only 15% were female teachers. This means that majority of the physics teachers in Marakwet West Sub-county are males. Fifty percent (50%) of the teachers were trained graduates, 40% were diploma teachers whereas 10% were S1 teachers. Thirty percent (30%) of the teachers had a teaching experience of over 12 years, 10% had a teaching experience of between 9-12 years, 35 % had a teaching experience of between 5-8 years and 25% had a teaching experience of between 1-4 years.

Half of the teachers (50%) had mainly taught all classes from form one to four, 20% had mainly taught forms one and two whereas 30% had mainly taught forms three and four.

Eighty five percent (85%) of the teachers interviewed attended all the four cycles of SMASSE INSET, 10% only attended one cycle whereas 5% attended three cycles.

4.4 Summary

In this chapter the impact of SMASSE INSET on students' attitude towards physics, students' performance in physics and teachers teaching approaches and methodology were analyzed. It came out clearly that SMASSE INSET has improved the students' attitudes towards physics. SMASSE INSET has not resulted in the improved performance in physics. It was noted that the teacher's teaching approaches and methodology has improved as a result of SMASSE INSET.

CHAPTER FIVE

5.0 SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.1 Introduction

This chapter will revisit the research objectives and hypotheses outlined in chapter one, discuss each one of them and draw conclusion.

The main objective of this study was to investigate the impact of SMASSE INSET on students' attitude change and performance in physics in secondary schools in Marakwet West Sub-county. The independent variable for the study was SMASSE INSET whereas the dependent variables were students' attitudes towards Physics and performance in Physics. Data for this study was obtained through the use of students' questionnaire and teachers' questionnaire.

5.2 SMASSE INSET and Performance In Physics

The first objective of the study was: **To determine whether SMASSE INSET has improved the performance in physics.** This also involved the testing of the hypothesis: H_{O1} : there is no significant difference between SMASSE INSET and performance in physics. Using the one-way ANOVA or t- test, the study revealed that overall; there is no significant difference between SMASSE INSET and physics performance. Thus the hypothesis was accepted.

5.3 SMASSE INSET and Students' attitude

The second research question was: **Does SMASSE INSET have any impact on students' attitudes towards physics?** The hypothesis that was tested in this regard was: H_{O2} : There is no significant difference between SMASSE INSET and students' attitudes towards physics. The analysis of the responses to the questionnaire test items shows that there is marked improvement of students' attitude. Thus the hypothesis was not accepted.

The findings revealed that even though the general attitude of the students towards physics has improved, there are areas that need some further improvement.

The findings also revealed that students in girls' boarding schools had a marked improvement in terms of the attitude towards physics as compared to students in boys' schools or mixed school. The school setting which reinforces fear of physics in girls should attempt to remove this fear. Teachers need to constantly point out that learning physics is not a function of sex and that girls are entering into the previously male dominated field like engineering architecture, medicine and others. Only then can we completely shatter the myth of physics as a male affair.

5.4 SMASSE INSET and Teacher's Teaching Approach and methodology

The third objective of the study was: **To determine whether SMASSE INSET has improved the teaching approaches and methodology.** This involved the testing of the hypothesis; H_{O3} : There is no significant difference between SMASSE INSET and teachers' teaching approaches and methodology. The study revealed that there is general improvement in the teachers' teaching approach and methodology after undergoing the SMASSE INSET. Thus the hypothesis was rejected.

5.5 Recommendations

From the research findings and interviews conducted, the following are recommended:

- Since SMASSE INSET is a very important innovation, there is need to incorporate the whole of SMASSE programme into the curriculum at teachers training colleges and universities. Fresh graduates should be SMASSE compliant as they leave their training institutions. INSET should only be introduced as a way of sharpening and reinforcing the teacher's skills and competencies in teaching physics.
- The Teachers Service Commission should employ more physics teachers. Full SMASSE implementation is very demanding on the side of the teachers. Teachers do not give regular assignments in physics owing to the large number of students.

The idea of every teacher having a minimum of 27 lessons per week is not applicable to physics and other sciences. These subjects demand a lot of adequate preparations and planning. When the teacher is overloaded, there are little preparations expected from such a teacher. Moreover, the idea of marking students' work on a daily basis is not possible.

- Examinations structure also need to be reviewed and if necessary changed. Students assess education in terms of success in examinations.

Teachers recognizing the importance of the external examination to the individual student are constrained to relate their teaching to an examination which can test only a narrow field of the students' interest and capacities and so inevitably neglect the qualities which are more important though less tangible. They are forced to attend to what can be examined; and to do that with success, they often have to "spoon-feed" their students rather than encourage habits of independent study. External examinations have a backwash effect. Backwash effect is defined as the effect of examinations upon the curriculum (Shiundu and Omulando, 1992). There is need for a combination of continuous assessment and the final examination for selection to higher levels.

- The teaching of physics is likely to be more efficient if the schools develop their own physics laboratories. Physics laboratories should be allocated for physics teaching and also for students' own investigative activities in physics concepts. In schools a classroom should be set aside as a physics laboratory by equipping it with physics tools such as geometrical instruments, models, projectors, computers etc. The change from students passively learning physics to students performing practical activities require the use of physics tools which need to be conveniently placed in a laboratory for easy access.

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APPENDICES

APPENDIX I: Student's Questionnaire (SQ)

School _____

'Class _____

Gender:	Male	<input type="checkbox"/>	School category	
	Female	<input type="checkbox"/>	Boys ' Boarding school	<input type="checkbox"/>
			Girls ' Boarding school	<input type="checkbox"/>
			Mixed school	<input type="checkbox"/>

Dear student

This is a questionnaire whose aim is to get information about the teaching of physics in secondary schools. As a student who is studying physics, the information you will provide will be very useful in finding ways of improving the teaching of this subject. This information will strictly be kept confidential.

You are required to respond by ticking (\surd) the numerical value on the score for each item which best describes your feeling about the attitudes towards physics, teaching in the classroom and participation in class. There are no right or wrong answers.

Note:

Do not tick more than one numerical value for each item in the scale.

How do you relate your attitude towards physics using the statement below?

Key SD (Strongly disagree) D (Disagree) A (Agree) SA (Strongly Agree)

Item no.	statement	SD	D	A	SA
1	Physics is hard and so should be optional in the syllabus				
2	Physics is purely a theoretical subject				
3	Group work is encouraged during physics lessons				
4	Students with difficulties in physics are encouraged to do more homework and it is marked				
5	Physics should be taught to the very bright and talented students				
6	Students enjoy and learn more during practical lessons than during theoretical lessons				
7	During physics quite a number of teaching aids are used				
8	Your school has been inviting counselors to talk to students on how to improve performance				

How do you rate the method used by your physics teacher using the statement below?

Key

SD (Strongly disagree) D (Disagree) A (Agree) SA (Strongly Agree)

Item no.	Statement	SD	D	A	SA
1	Physics teacher use more practical approach rather than theoretical to make pupils like the subject				
2	Physics teacher prepare work sheets of practical instructions and give the students before the lessons				
3	During groups students are each assigned special responsibilities				
4	Physics teachers use methods, which make physics very interesting				
5	Students freely ask and answer questions without fear or intimidation in class				
6	Students appreciate tests and quizzes important tools for checking the achievement during learning and teaching				
7	Physics teachers guide students on project work				
8	Physics has become easy to understand and apply				
9	In every physics lesson learners are fully involved during learning				
10	Learners are given instructions for every experiment and they do all experiments for themselves including demonstrations				
11	Learners participate in making observations and				

	conclusions of the experiments in class				
12	The teacher consolidates and organizes revision questions and give them to students				
12	The teacher marks all assignments given to students				
13	Students mark their work as teachers give them answers during CATS				
14	Students mark their own books during class exercises and assignments given to students are always checked				
15	All syllabi in physics are covered in school				
16	Learners understand the teachers although exams are relatively difficult				
17	Teachers take a lot of time to explain a small concept				
18	Only few selected students are allowed to participate during physics lessons				
19	Teachers use a language understood by all students				

How do you rate the impact of the methodology used by your teacher for physics using the statement below?

Key

SD (Strongly disagree) D (Disagree) A (Agree) SA (Strongly Agree)

Item no.	statement	SD	D	A	SA
1	Physics lessons are interesting and lively				
2	Students are keen on taking physics				
3	Students grades in physics have greatly improved				
4	Students are taking more time learning and discussing physics				
5	More students are now opting for science based careers				
6	There is more interest in physics related activities during science congress, symposiums and seminars				

APPENDIX II: Physics Teacher Questionnaire

I am conducting a study on the impact of SMASSE project on students' performance at KCSE level in Marakwet West West Sub-county. This is in partial fulfillment of the requirement for the degree of masters of education in the school of post graduate studies University of Nairobi. Your responses will be treated with strict confidence and anonymity. There is no right or wrong answers.

Please tick the response of your choice:

PART A

Background information:

1. State your gender

Male female

2. What is your age bracket? 18-28 years 29-39 years 40-49 years
above 50 years

3. How many students take physics

4. What is the level of your education

Post graduate Graduate Diploma Certificate
Others

If others specify

1. State your employer

TSC BOG Others

2. What are your terms of employment

Probation permanent and pensionable

Temporary contract

3. What is your experience in years in the teaching profession

Less than 5 years 6-10 years

11- 15 years above 16 years

4. What is your current job group

5. Are you SMASSE trained? Yes no

Part B

How do you rate your attitude on physics content using the statements below? (Please tick the appropriate)

Key

SD (Strongly disagree) D (Disagree) A (Agree) SA (Strongly Agree)

Item no	Statement	SD	D	A	SA
1	Physics is only for talented students				
2	Physics should not be optional in school curriculum				
3	Physics is taught and students take notes				
4	Teachers only teach those who understand physics and ignore the rest				
5	The teachers make efforts to check textbooks questions for their suitability before giving students assignments				
6	High students/teachers ratio does not hinder effective teaching during the learning/teaching of physics				
7	The low morale among students and teachers do hinder the learning/teaching of physics				

8	The comment that physics is a difficult subject from parents peers and the community at large create low morale to its teaching				
9	Inadequate facilities in our laboratories do hinder effective teaching/learning of physics				

How do you rate your methodology on teaching physics content using the statement below?

Please tick the appropriate

Key

SD (Strongly disagree) D (Disagree) A (Agree) SA (Strongly Agree)

Item no.	Statement	SD	D	A	SA
10	Teachers prepare more practical work and less theoretical lessons				
12	The teachers modify and simplify experiments				
13	Many tests and quizzes are important for checking students achievement during learning and teaching physics				

How do you rate your actual teaching of physics content using the statement below?

Key

SD (Strongly disagree) D (Disagree) A (Agree) SA (Strongly Agree)

Item no.	Statement	SD	D	A	SA
1	Teacher should involve and consider his/her learners during planning for the physics lesson				
2	Teacher improvise for the learning material where conventional materials are not available				
3	Proper planning and trying out of experiments is necessary before a physics lesson commences				
5	Students should be given tasks to solve in groups				
6	Teacher should give immediate feedback on performance to be acted upon there and then				
7	Teachers should encourage learners to relate what they learn in class with daily life experiences				
8	Teachers should encourage space for reflection process and transferability				
9	Teachers should provide opportunity for learners to demonstrate their understanding				
10	After every experiment students should be involved in making summary				
11	Before introducing any topic it is necessary for the teacher to assume students know nothing about the topic				
12	Teacher should give notes during lessons				
13	Teachers should vary homework tasks, which are meaningful and consolidate classroom learning				

How do you rate the impact of SMASSE induction on teaching of physics content using the statement below?

Key

SD (Strongly disagree) D (Disagree) A (Agree) SA (Strongly Agree)

Item no.	Statement	SD	D	A	SA
1	Physics lessons are now interesting and lively				
2	Physics teachers encourage further investigation in subject matter covered in class				
3	Students are keen on physics lessons				
4	Physics grades have greatly improved				
5	More students are keen on taking physics				
6	Physics has made more students now opt for science based careers				
7	There is more interest in physics related activities like science congress and science symposium				

How do you rate your attitude on SMASSE in physics induction using the statements below?

Key

SD (Strongly disagree) D (Disagree) A (Agree) SA (Strongly Agree)

Item no.	Statement	SD	D	A	SA
1	SMASSE is yet another burden forced onto physics teachers which cannot be coped with				
2	Physics teachers were eager and encouraged to attend all the insets				
3	Physics teachers were motivated to attend the first inset because the school gave them a token in form of money				
4	Physics teachers voluntarily opted to attend other cycles after the first cycle				
5	Some physics teachers opted not to attend other cycles after the first one because they knew the content matter of their subjects and were taught by their colleague teachers				
6	Physics teachers are talking about SMASSE and taking it seriously				
7	Head teachers are spending more on physics in chemicals and apparatus after the cycle than before				
8	The mean score is on an upward trend in physics				
9	Physics has since the last cycle invited head teacher to observe their exciting methods after using non conventional apparatus				
10	SMASSE activity should continue in Marakwet West Sub-county				

APPENDIX III: HOD PHYSICS QUESTIONNAIRE.

SCHOOL: _____

KCSE PHYSICS RESULTS ANALYSIS

	ENTRY	A	A-	B+	B	B-	C+	C	C-	D+	D	D-	E	MS	MG
2009															
2010															
2011															
2012															