

Janet Nduku Charles.
0714038304.
B. Ed science physics /chemistry MKU (2014)
M.A project planning and management UoN (2017)
" The influence of SMASSE project on the
performance of chemistry in Kitui central sub county -
kitui county.

INFLUENCE OF THE SMASSE PROJECT ON THE PERFORMANCE OF
CHEMISTRY IN THE KENYA CERTIFICATE OF SECONDARY EDUCATION
EXAMINATION IN KITUI CENTRAL SUB COUNTY, KITUI COUNTY –
KENYA

JANET NDUKU CHARLES

**A Research Project Report Submitted in Partial Fulfillment of the Requirement for
the Award of Masters of Arts Degree in Project Planning and Management by the
University of Nairobi.**

2017

DECLARATION

This is to declare that this research project report is my original work and it has never been presented to any other university for academic award.

Signature:

Date:

JANET NDUKU CHARLES
L50/85068/2016

This research project report has been submitted for examination with my approval as university project supervisor

Signature:

Date:

DR. ANGELINE MULWA
Lecturer
Department of Extra –Mural studies
University of Nairobi

DEDICATION

This research project is dedicated to my Mum Patricia Nzembi Charles, Dad Charles Ngami for their great love for Education and their effort that brought me to this University.

Brothers Eric, Mambo and Mwendwa for their prayer and support may God bless you all.

ACKNOWLEDGEMENT

I sincerely want to thank the Almighty God for the gift of life and good health he has continued to accord me. I thank God for all the blessing in my life and our family. Supervisor Dr. Angeline Mulwa for her immense and tireless efforts in guiding the writing of this project report.

I also acknowledge all the selected respondents in the education sector in Kitui Central Sub County for their patience and attention towards filling in the questionnaires as well as answering my interview questions ,without their support i could not have collected the required data.

Am also grateful to my lecturers for the wealth of knowledge they taught me on project planning and management.

TABLE OF CONTENTS

	Page
DECLARATION.....	ii
DEDICATION.....	iv
ACKNOWLEDGEMENT.....	v
LIST OF FIGURES	ix
LIST OF TABLES	x
ABBREVIATIONS AND ACRONYMS.....	xi
ABSTRACT.....	xii
CHAPTER ONE: INTRODUCTION	1
1.1. Background of the study	1
1.2. Statement of the Problem	4
1.3. Purpose of the Study	5
1.4. Objectives of the Study	5
1.5. Research Questions	5
1.6. Significance of the Study	6
1.7. Delimitation of the study.....	6
1.8. Limitations of the Study	7
1.9 Assumptions of the Study	7
1.10. Definition of key Terms	7
CHAPTER TWO: LITERATURE REVIEW	8
2.1 Introduction	8
2.2 The Concept of SMASSE project	8
2.3. Influence of SMASSE teaching methodologies on the performance of chemistry in the Kenya certificate of secondary education.	9
2.4. Influence of monitoring and evaluation of the SMASSE project by administrators on the performance of chemistry in the Kenya certificate of secondary education. .	13
2.5. Influence training of the SMASSE project on the performance of chemistry in the Kenya certificate of secondary education.	15
2.6. Theoretical Frame Work.	19

2.6.1 System approach theory.....	19
2.7 Conceptual frame work.	21
CHAPTER THREE: RESEARCH METHODOLOGY	23
3.1 Introduction	23
3.2 Research Design.....	23
3.3 Target Population	24
3.4 Sample and Sampling Procedures	24
3.5 Research Instruments.	26
3.5.1 Chemistry Teachers' Questionnaire.	26
3.5.2 Principals' Questionnaire	26
3.5.3 Students' Questionnaire.....	27
3.5.4 An Interview Schedule for Heads of Chemistry Departments	27
3.6 Piloting of the Research Instruments.	27
3.7 Validity of the instruments.....	27
3.8 Reliability of the instruments.	28
3.9 Data Collection procedure.....	28
3.10 Ethical considerations	29
3.11 Operational definition of variables.....	30
CHAPTER FOUR : DATA ANALYSIS, PRESENTATION AND	
INTERPRETATION	31
4.1 Introduction.	31
4.2 Questioner response rate.	31
4.3 Response Bio data	31
4.3.1 Gender of the respondents.	31
4.3.2 Position of the respondents.....	32
4.3.3 Teaching experience of the respondents.....	33
4.4 Influence SMASSE teaching methodologies on the performance of chemistry in the K.C.S.E.....	33
4.5. Influence of monitoring and evaluation of the SMASSE project on the performance of chemistry in K.C.S.E	35

4.6 The Influence of training of SMASSE project on Performance of chemistry in the K.C.S.E.....	39
CHAPTER FIVE : SUMMARY OF THE FINDINGS, CONCLUSIONS AND RECOMMENDATIONS.....	
5.1 Introduction	44
5.2 Summary of Findings	44
5.3: Conclusion.....	46
5.4. Recommendations	47
5.5: Suggestions for further Research	48
REFERENCES.....	49
APPENDICES	55
APPENDIX I:Letter for the school principal.....	55
APPENDIX II :Questionnaire for chemistry Teachers'	56
APPENDIX III: Questionnaire for the Principals'	59
APPENDIX IV:Students' Questionnaire	61
APPENDIX V:Interview Schedule for Heads of chemistry Department.	63
APPENDIX F: Interview schedule for QASO.....	64

LIST OF FIGURES

Table. 1.1: K.C.S.E Chemistry Performance at National level.....	3
Table 3.1: Stratified sample of the students' population	24
Table 3.2: Stratification of the target population.	25
Table 4.1 Gender of the respondents	32
Table 4.2: Position of the respondents.....	32
Table 4.3: Influence of the SMASSE teaching methodologies on the performance of chemistry	34
Table 4.4: Means of principals regarding M&E of SMASSE project.	36
Table 4.5: Average Performance for Phase one and phase two of SMASSE training	40
Table 4.6: Percentage of teachers trained on the use of ASEI-PDSI.....	42
Table 4.7: Number of cycles attended in the SMASSE project.....	42
Table 4.8: Success of the SMASSE project.....	43

LIST OF TABLES

Table. 1.1: K.C.S.E Chemistry Performance at National level.....	3
Table 3.1: Stratified sample of the students' population	24
Table 3.2: Stratification of the target population.	25
Table 4.1 Gender of the respondents	32
Table 4.2: Position of the respondents.....	32
Table 4.3: Influence of the SMASSE teaching methodologies on the performance of chemistry	34
Table 4.4: Means of principals regarding M&E of SMASSE project.	36
Table 4.5: Average Performance for Phase one and phase two of SMASSE training	40
Table 4.6: Percentage of teachers trained on the use of ASEI-PDSI.....	42
Table 4.7: Number of cycles attended in the SMASSE project.....	42
Table 4.8: Success of the SMASSE project.....	43
_Toc500315206	

ABBREVIATIONS AND ACRONYMS

ASEI-PDSI	Activity, Student, Experiment and Improvisation- Plan, Do, See and Improve
CEMASTE	Centre for Mathematics and Science Teacher Education in Africa
GoK	Government of Kenya
HOD's	Heads of Department
INSET	In-Service Education and Training
JICA	Japan International Cooperation Agency
KCSE	Kenya Certificate of Secondary Education
KESSP	Kenya Education Sector Support Programme.
KNEC	Kenya National Examination Council
NACOSTI	National Commission for Science, Technology and Innovation
QASO	Quality Assurance and Standards Officer
SMASSE	Strengthening of Mathematics and Science in Secondary Education
SPIAS	SMASSE Project Impact Assessment Survey
WECSA	Western, Eastern, Central and Southern Africa
M&E	Monitoring and Evaluation
SDG	Sustainable development goals
TIMSS	Third International Mathematics and Science Study.

ABSTRACT

The purpose of this study was to investigate the influence of SMASSE project on the performance of chemistry in the Kenya Certificate of Secondary Education in Kitui central sub-County. The problem of the study was the persistent low performance in chemistry the Kenya certificate of secondary education in public secondary schools. The objectives of the study were to establish the influence of the SMASSE teaching methodologies on the performance of chemistry in Kitui central sub county, to establish the influence of monitoring and evaluation on the SMASSE project on the performance of chemistry in Kitui central sub county and to establish the influence of training of the SMASSE project on the performance of chemistry in Kitui central sub county .The target population of the study was chemistry teachers, principals, QASO and form three chemistry students in public secondary schools in Kitui central sub- County. A both purposive and random sampling technique was used to select a sample from the population. The research instruments comprised of self-administered questionnaires and interview schedule. To ensure validity, the instruments were reviewed by the supervisor and the amendments recommended effected before the main the study while the results of the pilot study were used to determine the reliability using the Split-Half technique. Data collected was analyzed using descriptive statistics such as percentages and calculated means scores of Likert scale values. The analysed data was presented using frequency distribution tables .The study revealed that teaching methodologies has not changed despite introduction of the SMASSE project, principals and heads of departments rarely carry out monitoring and evaluation due the busy schedules and despite training on the use of ASEI-PDSI of the chemistry teachers do not prepare the ASEI lesson plans. Based on the research finding the researcher concluded that the goals of the SMASSE project have not been achieved in Kitui central sub county. The researcher recommended that the ministry of education science and technology should work in conjunction with CEMASTEIA in research and capacity building of teachers, sensitization to be done to the administrators on their role in the monitoring and evaluation of the SMASSE project. This would help to improve the influence of the SMASSE project on the performance of chemistry.

CHAPTER ONE

INTRODUCTION

1.1. Background of the study

The Kenyan government vision 2030 is in direction with the changing trends of scientific and technological innovation over the world. Innovation and research cannot be possible without emphasizing on quality education which should provide answers to modern demands resulting from social, political, cultural and technological developments (Mondoh, 2005). Chemistry is one of the subjects that give an excellent foundation for and usually a pre-requisite to all areas of science and technological innovations. Students in such areas as anthropology, sociology and psychology, law, business, engineering and medicine benefit from a solid foundation in chemistry in placement of their careers (H.O.Ds SMASSE workshop 2014).

Chemistry is widely used in everyday life in the fields of food production, medicine and general industrial production. The continuous low performance in chemistry nationally is however the major challenges faced by the Kenyan education system. Eshiwani (1993) shows the unsatisfactory and poor performance in science and mathematics. In spite of trained teachers being employment, performance in mathematics and science subjects has continually been poor over the years Birgen (2004)

The astonishing performance in Biology, Chemistry, Physics and Mathematics prompted the ministry of education and the government of Kenya to look for solutions to the problem. Among the strategies for raising quality is appropriate pre-service and in-service training (Republic of Kenya, 2005). More specifically is the enhancing of quality of teaching, learning and performance, especially in Kenya Certificate of Secondary Education (KCSE) science and mathematics. The development of comprehensive in-service training programmes should therefore be considered an urgent need.

In order to improve in Biology, Chemistry, Physics and Mathematics, the Kenyan government through the Ministry of Education Science and Technology (MOEST) in conjunction with the Japanese Government came up with Strengthening of Mathematics,

Chemistry, Physics and Biology in High school Education (SMASSE) project in Kenya. This was done through the In-Service Education and Training (INSET) of teachers. In-Service Education and Training (INSET) is one of the tactics used in order to improve skills and competences of teachers globally (Karega, 2008). INSET has had an agreement with global consensus that for better education quality, practices done in the classroom have to be improved too (Kibe, Odhiambo and Ogwel, 2008).

The Reinforcement of Mathematics and Science in Secondary Education project was thus born out of the need to improve the teaching, learning and hence the performance in mathematics and science subjects. The project was officially launched in Kenya in 1999 on a pilot basis in nine districts and was later expanded to cover the entire country in 2004 (Ngugi and Nyakwebwa, 2005).

In Kitui central sub county, the first phase of INSET was launched in April 2004 and terminated in 2007. Phase two of the training started in the year 2008 and completed in 2011. The third phase begun in 2012 and the training is on-going. Each phase of the training consists of four cycles. Here, a teacher was expected to go through the four cycles of INSET for a period of four years. One cycle lasted for utmost ten working days, conducted once a year at county level. Kitui central sub county has gone through four complete phases of the training.

The first cycle emphasizes on achieving a positive attitude towards Biology, Chemistry, Physics and Mathematics education on both teachers and the students. Cycle two consists of activities on specific areas which are considered not handled well by the teacher. In this cycle, teachers have an opening to apply principles' of Activity, Student, Experiment and Improvisation - Plan, Do, See and improve (ASEI-PDSI) approach .Cycle three centers on making the classroom activities real. The fourth cycle emphasizes on improving classroom ASEI-PDSI approach.

The goals of SMASSE project are meant to enhance the performance of Biology, Chemistry, Physics and Mathematics related subjects in the internal and external examinations, positive attitude change among teachers and students and also enhanced student's participation and involvement in the classroom instruction (SMASSE Project, 2008). Studies made by Birgen, 2004; Owiti, 2008 claim that in spite of the above intentions of SMASSE project, student's performance in chemistry is unsatisfactory. The Kenya National Examinations report released on April 2017. The report stated that the overall mean nationally in Chemistry was 19.80% (Kenya National Examination Council, 2008). The statistics indicated that out of the 22 subjects in the curriculum, chemistry was the one that students performed poorly. The uproar on the poor performance in chemistry has continued through the years (as shown on table 1.1). In spite of gradual improvement, the performance is still poor.

Table. 1.1: K.C.S.E Chemistry Performance at National level

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Mean score	34.0	37.0	39.0	38.0	49.0	50.8	45.1	38.2	49.8	47.3	55.9	49.0	64.3

Source: Kenya National Examination Council Reports (2004-2014)

The table 1.1 shows the dismal performance (below average) in chemistry. This provoked the scholar to conduct a study on influence of SMASSE project in the teaching and learning of chemistry in high schools of Kitui central Sub-County in Kitui County. The researcher did a study on the degree to which ASEI-PDSI approach is and can be implemented in the teaching space and the influence it has on the performance of chemistry in the KCSE in Kitui central sub county. The researcher is motivated to find a solution for this gradual poor performance science subjects and especially chemistry in secondary education and more so in Kitui central sub county.

1.2. Statement of the Problem

The Ministry of Education acknowledges the significance of mathematics and of science in the society by making it one of the compulsory subjects in the education curriculum offered in the Kenya schools both at primary and secondary levels (Kenya Institute of Technology, 2002).

The government has been putting strategies to improve performance of science subjects together with mathematics related subjects in fulfillment of the Kenyans vision 2030 and the sustainable development goals (Kenya Vision 2030). The Japanese government has been supporting the government of Kenya through the ministry of education science and technology by financing and carrying out in-service training of science and mathematics teachers. The SMASSE project has been implemented in the whole country after successful piloting in some districts.

In Kitui County, INSET was started in April 2004 in Mulango Girls High School being the INSET centre. Since then, four complete phases of the training have taken place and there has been continuous trainings on different aspects on the instruction of mathematics and science. About 80 percent of the practicing teachers of chemistry in Kitui central sub county have been trained in the SMASSE INSET. Human resource and material means have already been invested in order to make the project a success. The materials that should be there facilitate the project are available at the SMASSEINSET resource centre which is easy to get to by science (chemistry) teachers in Kitui central sub county.

The long term and the short term goals of the SMASSE project once achieved then the performance of chemistry in KNEC in Kitui central sub county is expected to improve. The studies was expected at assessing the influence of SMASSE project on performance and establish whether the objectives of the project have being achieved in Kitui central sub county or not. The statement of the problem addressed in this research study was the persistent low performance of chemistry in the Kenya Certificate of Secondary Education in Kitui central sub county.

1.3. Purpose of the Study

The main aim of this study was to establish the influence of SMASSE project on the performance of chemistry in the Kenya certificate of secondary education in Kitui central sub county.

1.4. Objectives of the Study

The specific objectives of this study will be :

- (i) To establish the influence of SMASSE teaching methodologies on the performance of chemistry in K.C.S.E in Kitui central sub county public secondary schools.
- (ii) To establish the influence of monitoring and evaluation of the SMASSE project by administrators on the performance of chemistry in the Kenya certificate of secondary education in Kitui central sub county public secondary schools.
- (iii) To establish the influence of training of the SMASSE project on the performance of chemistry in K.C.S.E in Kitui central sub county public secondary schools.

1.5. Research Questions

This study was guided by the following research questions:

- (i) What is the influence of SMASSE teaching methodologies on the performance of chemistry in Kitui central sub county?
- (ii) What is the influence of monitoring and evaluation of the SMASSE project on the performance of chemistry in Kitui central sub county?
- (iii) What is the influence of training of the SMASSE project on the performance of chemistry in Kitui central sub county?

1.6. Significance of the Study

Research shows that policy implementation is the greatest determinants of success in school reforms (Wafubwa2014) .CEMASTIA through the ministry of education science and technology is doing capacity building on the youth through innovation and research for the countries realization of sustainable development goals (SDG). The current study is therefore necessary to find out whether the goals of SMASSE project are being achieved in Kitui central sub county or not. It is hoped that the results will be beneficial to individuals who develop the curriculum, students and teachers as well.

The performance of mathematics and science may improve because the teachers will be able to use proper methodologies in the classroom instruction and will be in a position to address any challenges they come across in the use of ASEI- PDSI of the SMASSE project. Curriculum that can be implemented using the available resources will be put in place by curriculum developers. The findings from the study may help in addressing the problem of low performance in chemistry in Kitui central sub county -Kitui County, Kenya.

1.7. Delimitation of the study

The study was conducted in 32 public secondary schools of, Kitui central Sub-County. The main focus of this study is to determine the influence of the implementation of SMASSE project on the performance of chemistry in KCSE in Kitui central sub county. The methodologies in the teaching and learning of chemistry and the supervision of ASEI-PDSI approach by school heads, heads of science department (HODs) and Quality Assurance and Standards Officer (QASO). A sample of 203 form three students, twenty chemistry teachers, ten HODs and nine principals and one QASO. The researcher collected the data using questionnaires and interviews.

Additionally, the study precisely assessed the influence of the implementation of SMASSE project on the performance of chemistry in KCSE in public secondary schools in Kitui central sub county.

1.8. Limitations of the Study

The study largely relied on the honesty of the respondents (principals, teachers, QASO and students) from whom data was collected. In some schools chemistry teachers and students were uncooperative, thereby consuming more time than anticipated, also the constraints of time due to tight schedules and financial limitation due to high cost of living. The constraint of time was resolved by using a sample for the study while the financial constraint was addressed by using the available resources for the study.

1.9 Assumptions of the Study

The study was based on the assumption that all the schools that were selected for the study had qualified teachers who have attended the SMASSE INSET and also that the Implementation of the SMASSE project has taken place in all the public schools in Kitui central sub-county.

1.10. Definition of key Terms

Teaching methodology- These are principles and methods used by teachers in the classroom instruction of chemistry.

Training – This is teaching or developing oneself or others any skill and knowledge that relate to specific useful competencies.

Monitoring- Monitoring is a continuous assessment that aims at providing all stakeholders with early detailed information on the progress or delay of the ongoing assessed activities,

Evaluation – It is a systematic and objective examination concerning the relevance, effectiveness, efficiency and impact of the activities in the light of specified objectives.

Performance of chemistry - These are the outcomes that indicate the extent to which a student has accomplished the specific goals in the learning of chemistry.

CHAPTER TWO

LITERATURE REVIEW

2.1 Introduction

This chapter covers the literature connected to SMASSE project. The review was based on the objectives of the study and focuses mainly on monitoring and evaluation of the ASEI- PDSI approach of the SMASSE project, teaching methodologies, influence of the SMASSE project on the performance and the teacher training on the performance of chemistry in KCSE in Kitui central sub county.

2.2 The Concept of SMASSE project

Strengthening of Mathematics and Science in Secondary Education project was started in order to enhance teachers teaching methodologies in the classroom and hence improve the performance of science and mathematics in secondary schools. (SMASSE Project, 2008). This particular project was meant for majority of the African countries especially the developing countries which have problems when it comes to resources. It puts emphasis on reinforcing education in the existing structures by enforcing mobilization and sensible utilization of the available resources. This project was seen to be the right solution for the Kenyan education system to change the theoretical methodologies of teaching and enhance scientific research, innovation and the use of available resources in the teaching and learning of science and mathematics. (Eshiwani,1993).

The SMASSE project addressed the challenge of quality teaching in the classroom (SMASSE project, 2004). The theory under SMASSE project is action research which needs a corresponding formation of practice and theory. The project calls for student centered methodologies in teaching and learning of science and mathematics (ASEI-PDSI approach). This approach has borrowed a lot from the classroom instruction of chemistry in Japanese system of education, where the teacher facilitates the learning of chemistry and the learners are fully involved the lesson i.e in preparation practical lessons, discussions of findings and making conclusions of the observations made during the lesson. (Stigler & Hiebert,1999).

The SMASSE project is aimed at equipping the teacher with skills of effective lesson delivery in the view of improving learner participation, use of available resources to innovate resources for instruction in the classroom (Stigler & Hiebert, 1999). The replication on the design of SMASSE-WECSA (Western, Eastern, Central and South Africa) projects showed that SMASSE project is important and reliable in comparison to the global trends. It is also designed to state the sustainability and rights of teachers in terms of mastery of content. (SMASSE Project, 2008).

2.3. Influence of SMASSE teaching methodologies on the performance of chemistry in the Kenya certificate of secondary education.

A lot of concern has been raised concerning performance in Chemistry. Studies done by the Third International Mathematics and Science Study (TIMSS), gave shocking results on the performance of chemistry in Taiwan, China, Japan and United States. United States students lag behind their counterparts from other states from as early as fifth grade. Science tests of achievement tested in United States gave poor results and were comparable to the class with the lowest score in Japan (Stevenson & Stigler, 1992). The TIMSS research clearly shows that low performance in science subjects is not only a challenge in developing countries but also in developed countries.

Japan was able to emerge the best performing country in Mathematics and science due to the way teachers handled their classes, especially Chemistry lessons (Stevenson & Stigler, 1992). In Japan, a lesson was organized in such a way that it provided an environment in which the teacher could interact with the students in the given subject. Teachers divided their lessons to class work and seat work (Stigler & Hiebert, 1999). Class work was the time when the teacher worked with the students and normally led the discussions. Activities done in this setting include learning a new idea, doing practical work, solving problems together, reviewing a concept learnt earlier on or sharing solutions on problems students are working on. Seat work was the time when students worked individually or in groups on the work given to them. Stigler & Hiebert (1999). In a Japanese class it was noted that students did a lot of chemistry unlike United States and Germany which had the teacher in control at all times. In Japan, teachers believed that

students would learn more if they first struggled with a problem. Participating in a discussion would solve the problem. The teacher would add on the pros and cons of different methods of solving the problem together with the association between them.

SMASSE conducted a baseline survey in pilot counties in Kenya. They found out that there were diverse challenges in mathematics and science in high school education. The problems identified included unsuitable teaching approaches and mastery of the vital content of the subjects (Kanja, Iwasaki, Takuya & Atsumi, 2001). The INSET curriculum was established to reinforce teacher capabilities through addressing selected topics on attitude, mastering vital content, pedagogy and developing teaching materials. SMASSE aimed at reaching out to teachers since they spent more time with students. Majority of them were content driven, with the perception that finishing the syllabus was important and the same as teaching. The curricular that teachers use does not address concerns on secondary school teaching. Theories used in the curricular are outdated and not currently applicable in a classroom setting (CEMASTE, 2010). That is the reason why pedagogy is the main topics spoken about during training. Mastery of the content is also addressed since teachers are not mastering the content which often leads to a teacher misleading the students unknowingly.

Teachers have been found to be too teacher centered as per conventional approaches of teaching. The teacher considers him/herself as the active recipient while the students are the passive ones. (Wambui & Wahome, 2006). Wambui & Wahome claim further that the concern has been majored on how to make chemistry more fun and lively. Teachers using the teacher centered approach have a negative impact on the learners' attitude since the students will find chemistry boring. Good land (1984) stated in his research titled "A place called school" that teachers talked to the kids more. The students stated that physical education, industrial and fine art were the only classes where the students had hands on activity, In these subjects they were more active participants . Mayer & Moreno (2003) defined meaningful learning as deep comprehension of the material which consists of having relevant information in both visual working memory and auditory working memory, attending to salient aspects of the presented material, organizing

information into a coherent mental structure and integrating it with relevant prior knowledge. Mayer (2001) proclaims that multimedia learning in combination with animation and narratives generally leads to good performance on retention tests better than when information is presented in narration or text alone.

Meaningful learning is shown when a student can apply what is taught in new situations and perform better in solving problem tests when they learn with both words and pictures. Mayer, Fennell, Farmer, & Campbell (2004) quote evidence that there two significant ways in which meaningful learning can be promoted; design of activities that reduce the cognitive load and frees the capacity of the working memory in order for one to have a deep cognitive processing when learning and increase in learner's interest which inspires the learner to use the free capacity created for deep processing when learning. Interest can be motivated by presenting the material in an attractive way plus personable narration or wording. Mayer (2003) gives the cognitive methods that add to meaningful learning; integration, organization of words, selection of words and selection of images.

This study attempted to examine whether multimedia learning has any impact on the performance of chemistry. When a teacher gets ready for a student centered activity and experiments (ASEI), the main goal is to bring about meaningful learning where the student is engaged both mentally and heart activities. ASEI brings about meaningful learning through developing skills on accurate observations, inquiry of mind, making conclusions and having discussions which improve learning and development skills (SMASSE Project, 2002). This is in line with Mayer's third assumption that individuals make meaningful learning when there is important information. (Mayer,1999). ASEI-PDSI approach will enhance the capacity of students to retain content hence perform better in their examinations. This is exactly what Mayer claims that multimedia learning together with animation and narration helps improve performance on retention tests better as compared to when information is presented in narrative style alone. Meaningful learning can only take place if the teacher is in a position to design tasks that are interesting to the student. Interested can be stirred by presenting the required material in

an appealing way together with lively wording or narration. Mayer's five methods that add on to meaningful learning are encouraged by ASEI-PDSI method. This is where the teacher plans, selects and organizes significant material that will be a great addition to meaningful learning.

ASEI approach is based on the fact that students do not just copy the scientific world but have their own meaning of it (Wambui, 2005). Therefore, prospects must be provided to get a good construct of scientific knowledge through observation, prior knowledge, interaction and other mental processes. These processes give solutions and answers to important questions.

This particular principle tries to give solutions to vital questions facing educators in schools having the 21st century students. The question is how many learners can think for themselves, make better decisions, develop their expertise and skills and become lifelong students in the changing environment. Also how learners can create, find meaning to different types of information and learn (Garrison & Walter, 2000). As it is in the National Science Education Standards(National Research Council, 2000), ASEI movement is believed to enable students develop an inquisitive mind, nurture their skills on accurate observations, drawer informed conclusions and hold better discussions on development and learning of skills (SMASSE project, 2002).

This study aims at examining the influence of SMASSE project on the performance of chemistry in Kitui central sub county. ASEI-PDSI method is an approach that is student centered in which science and mathematics teachers are anticipated to embrace after attending SMASSE in-service training. The study will therefore find out whether an element of ASEI-PDSI integral in the student centered approach has improved the performance of chemistry in Kitui central sub county.

2.4. Influence of monitoring and evaluation of the SMASSE project by administrators on the performance of chemistry in the Kenya certificate of secondary education.

School heads play a significant role in the SMASSE INSET project (CEMASTE, 2010). They include Monitoring and evaluating class activities on both the trainers and the teachers who had attended INSET and managed the major county's INSET centre's; ensure teachers get the best support to apply new techniques and strategies for ASEI lessons; informing teachers who teach mathematics and science subjects on the significance of INSET and make sure they know of INSET dates so as to attend the events and ensure the teachers avail themselves for SMASSE INSET congregations.

CEMASTE did a situational analysis 2009 to establish the extent of ASEI-PDSI approach which was used in teaching. The analysis wanted to establish if the approach led to better supervision of ASEI-PDSI. According to the results, recommendations brought forward were to guide the practice on county INSET and supervision of ASEI-PDSI approach in the classroom setting (CEMASTE, 2014). Following this recommendations, CEMASTE has organized workshop for both heads of schools and HODs. The workshops were based on strengthening management of ASEI-PDSI method in the classroom setting. However, according to other studies, ASEI-PDSI method is not being managed by QASOs and school heads. For example, a study done by Rotich & Mutisya (2013) on assessment of capacity development programs in Kenya stated that ASEI-PDSI method was not managed by school heads. Applying the required change is the most difficult part of the process. Unless people use the new notion, no change will take place (Daft, 2004). Teachers who are responsible for implementing the curriculum need the support of school heads and QASOs. The main aim for this is to have access on the extent in which Chemistry lessons are supervised and better ways are sought after to strengthen management of operational implementation of ASEI-PDSI method and hence improve Chemistry performance in schools.

The teams from varied countries in the SMASSE project which have managed to implement the ASEI-PDSI method did an evaluation on problems facing ASEI-PDSI method. They were able to identify common challenges stated below; (SMASSE Project, 2008): There are many hands on activities which require learners to think and in many scenarios do not wait for the students to think and find solutions by themselves. This challenge is caused by teachers “not comprehending the importance of learners “independent thinking since many teachers still believe that their role is to provide students with the right answers. There is no relationship between scientific ideas and models and practical tasks since the link is not well structured. Activities in the lessons are at times inappropriate to the objective of the lesson. This is due to the inadequate comprehension of the ASEI-PDSI method. Other teachers seem to comprehend that for a lesson to be ASEI, it has to include practicals and experiments. They still do not see the importance of a student airing out his or her ideas. Teachers believe that lessons have been created from their own experiences back when they were students. If their lessons back then comprised of a teacher making all the points, they come and transfer it to their own classes. ASEI-PDSI method is not based on daily class activities. This problem is seen in other countries since ASEI method requires teachers to take more time with their students until they get used to the situation.

Additionally, in the above mentioned problems, teachers are yet to value the role of INSET in building a profession. This is well explained in the report for Monitoring and Evaluation published on April, 2010. It stated that the general INSET attendance was 68% of the anticipated participants and that there was recorded a wide gap in attendance in district INSET points. This is likely due to the fact that teaching is a multifaceted cultural activity which works mysteriously, beyond our consciousness (Stigler & Hiebert, 1999). Therefore it becomes hard to persuade teachers to change their way of teaching. Change takes time and is one of the problems faced by the implementation of the project. This includes introducing the new curriculum to be used to teach science and mathematics subjects.

The school heads and principals have not been supporting the project because of conflict of interest. Some school heads prefer adding more buildings and other unnecessary projects at the expense of appropriate facilities for curriculum implementation. Other principals have no idea what INSET is and this hinders them from implementing the approach (CEMASTE2010). SMASSE project report (2008) pointed out the problems met by teachers in ASEI-PDSI implementation. Some of them include time in preparation of ASEI subjects thus lagging behind in syllabus coverage, few learning resources, students not attending class regularly, negative attitude towards the subjects, no skills to improve learning materials, more work, varied learner abilities, some students not being fluent in English, big classes among others. This study evaluated the challenges faced by chemistry teachers in Kitui central sub county- Kitui County in the process of implementing the ASEI-PDSI approach and gave solutions to these challenges in order to have progressive performance of chemistry in Kitui central sub county.

2.5. Influence training of the SMASSE project on the performance of chemistry in the Kenya certificate of secondary education.

The SMASSE project assumes that teachers are made to be in the classroom, graduate teachers are employed by the teachers' service commission on behalf of the government to schools. These teachers may lack quality skills on lesson preparation, content delivery and practical skills on scientific research and innovation. The SMASSE project through INSET training equips the teachers with pedagogical skills on the aspects of research, lesson preparation, mastery of content and learner involvement in the classroom by use of ASEI –PDSI methodology of teaching. (CEMASTE2010).

ASEI method creates bridge that enables students to relay and integrate hands on activities with hypothetical knowledge. This approach advocates a change from concentrating on teachers' to concentrating on students. ASEI method emphasizes educating students and not the subject. (Stigler & Hiebert, 1999). SMASSE projects exhibits that problems facing learning innovations come from lack of proper planning and execution (Fuller, 1987). Therefore, there is dire need to give much attention to students to get involved in education process and establish their abilities.

To attain ASEI situation, the SMASSE team designed a PDSI (Plan, Do, See and Improve) method to educate. This approach ensures that the teacher plans for his or her classes and incorporates the teaching with materials, examples and other activities in the lesson. The teacher who uses the (DO) approach has to be creative for his or her lesson to be interesting. In the (SEE) section, the teacher has to check the teaching process during and after completing his or her session with the students. The teacher uses different methods and expects feedback from the students on the status of the lesson. For the (IMPROVE) section, the teacher has to evaluate and look back at the performance, assessment report and value of the lesson. The teacher also checks if the objectives for a given lesson have been achieved (Wambui & Wahome, 2006; Waititu & Orado, 2009).

PDSI is a gradual process which enables a teacher improve presentation of certain lessons and delivery of lesson content. Before the introduction of SMASSE project, teacher education had been emphasizing on the training rather than preparation of teachers (Kafu, 1996). Subsequently, it has produced local teachers who are conservative and do not embrace change. PDSI approach therefore attempts to make the education curriculum responsive to emerging trends in the society. Wabwile (2007) notes that significant effort is needed to ensure the teacher program on education is effective, has meaning and is scientific.

The goals of SMASSE project are categorized as short term and long term. The achievement of short term goals is reflected by enriched performance in exams, optimistic attitude and high students' involvement in the education and learning of chemistry in class. (SMASSE Project, 2008). The long term goals are achieved when students take careers related to mathematics and science in institutions of higher learning. This eventually will lead to realization of Kenya vision 2030 and Sustainable Development Goals. SMASSE in-service training was a timely intervention for education in the 21st century where mathematics and science education is greatly emphasized

The SMASSE project was also needed to change the teachers and students attitude. There are various notions on the word attitude in research context. Ma & Kishor (1997) view on attitude is that it is the most powerful aspect which is linked to achievement. The daily perspective of attitude refers to an individual's fondness or dislike of a conversant target (Hannulla, 2002). This research study describes attitude as an emotional outlook on Chemistry similar to how it's used by Schenkel (2009).

In Kenya, most studies have shown that attitude is a major determinant of how one performs in the KCSE (Kenya Certificate of Secondary Education) exam (Karue, 2006; Omondi, 2010; Wanjohi, 2011; and George, James, Justus & Zachariah, 2012). These scholars agree that student's "positive attitude in science leads to improved performance in examinations. Other international studies have also noted similar findings. An example includes a study done by Shahid (2008) on students' " attitude towards chemistry in Pakistan discovered that positive attitude influences achievement on students' in chemistry positively. He perceived that Chemistry is presented in class in a different way hence perceived differently by the students. This happens even if the teachers think they are teaching Chemistry in an authentic way. Instead of the students understanding the subject their teachings alienate students from it.

Recently, studies were done on SMASSE project in Kenya on the attitude of children towards learning chemistry. The findings revealed that SMASSE project had a constructive impact on the attitude of students towards Chemistry. For instance, Langat (2009) carried out a study on the effect of SMASSE-INSET on teaching mathematics and science subjects. Langat (2009) used a descriptive survey design using form four students as the population. The form four students were from Bomet County in the year 2008. The findings states that the attitude students had on Chemistry had greatly improved. However, the improvement in attitude had not changed the performance. Same results have been seen on studies done by Ndiku (2011), Olick (2012) and Libiru (2012). All these scholars agree that SMASSE training brought in positive impact on student's attitude but no significant influence on their performance.

According to situational analysis, CEMASTEAs reports that (HOD's workshops, 2014) optimistic attitudes towards Chemistry leads to better performance. For example, a study was done by SMASSE project impact survey (SPIAS). The survey was on how teacher involvement in the SMASSE INSET has an effect on student's attitude and involvement in class. It revealed that INSET gave birth to better, superior students with optimistic attitudes to both science and mathematics subjects (CEMASTEAs, 2010). In spite of the statement that SMASSE operational training has brought in an optimistic impact on attitude of student's on teaching Chemistry, the poor performance in Chemistry has not changed as shown from KCSE analysis (Table 1.1). This is a clear indication that SMASSE goals have not been fully met even though it has been on existence for more than 10 years.

On a follow up activity of the SMASSE project, SMASSE Kenya did a Monitoring and Evaluation exercise on the application and effect of ASEI-PDSI teaching approaches in schools. The project confirmed that there was a positive effect on teachers' attitude especially those who had attended SMASSE sessions before. The teachers who had undergone training had a positive attitude towards their work and had already improved on how they conducted their lessons, especially practical lessons in Chemistry. Through this, student also improved on how they participated in class (SMASSE Project, 2008). The overall impact of the training on teachers showed that teachers were more consistent, were keener, attended to students more, were more confident carrying out practical sessions, tried new techniques and faced various challenges; one being lack of resources (CEMASTEAs, 2010).

Overall impact on the students showed that they started being more active in class and started showing more concern together with being responsive in class. They attended Chemistry classes regularly, had neat and prompt assignments, had discussions even after class time and took their interest beyond class. This means that they grew more curious and related what was taught in Chemistry class to real life and their dream careers. The students were more encouraged and even worked in teams as well as individual work. Students were provided with opportunities to be able come up with key capabilities such

as solving problems, applying information and synthesis (Waititu & Orado, 2009). JICA and GoK did a study on the success of the SMASSE project and they rated SMASSE program successful.

JICA has had technical cooperation and has been able to expand with primary teachers for both mathematics and science. INSET for primary science and mathematics teachers began in the year 2009 and ran for 5 years. (CEMASTE,2010). From the literature above, SMASSE has had a positive impact on education and teaching of mathematics and sciences in the various member states. The scholar is therefore interested in examining whether the same impact has been experienced in Kitui central sub county or not. The major goal for the researcher is to determine the influence of SMASSE project on the performance of chemistry in KCSE in Kitui central sub county public secondary schools.

2.6. Theoretical Frame Work.

Theoretical framework is defined as a collection of interrelated ideas based on theories (Kombo 2006). The researcher uses the system approach theory to explain the expected influence of SMASSE in the performance of chemistry in Kitui central sub county.

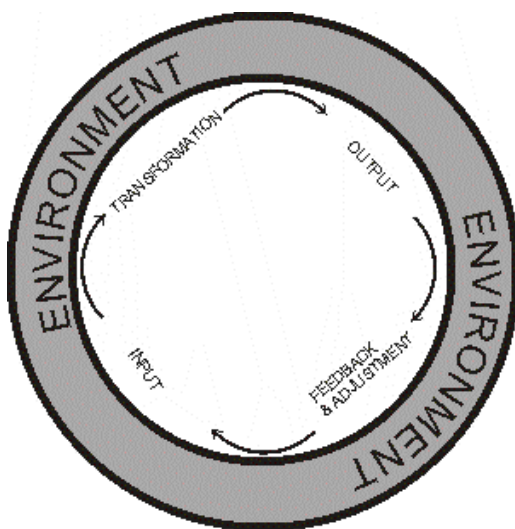
2.6.1 System approach theory

The study utilize a systems view of education adapted from (Benathy,1973) and as cited in (Hunkins, 1990) it, enables one to utilize a system approach which has emanated from organizational theory,(Kaufman1972) noted that a system approach is an overall process by which needs are identified problems selected, requirements for problems resolution determined, solutions chosen from alternatives, actual methods and means obtained and implemented results evaluated and revision enacted.

The model depicts five major processes; Inputs, transformation, output, feedback and adjustments. Input processes refer to those operations that enable information to be taken from the environment or a system and introduced into the transformational phase, transformation refers to those processes that work upon the data furnished in the system.

Output processes subsume those operations that identify and assess the result of transformation process and outside environment. Feedback and adjustments activates analysis and interpretation of information such that adjustments can be introduced into the overall functioning of the system, that is, if such, modifications are necessary (Banathy,1973) as cited in (Hunkins,1980).

Fig 2.1. **Model of general system operations.**



Source: adapted from developing a system view of education by (Bannathy,1973)

One can employ the above model to determine the type of data to be processed. For example in this study the data to be processes will be for Form three students, to assess the influence of SMASSE project on the performance of chemistry in public secondary schools in Kitui central sub county in relation to the students entry behavior, teaching methodology and monitoring evaluation that takes place during the implementation of the SMASSE project.

Output processing would refer to the performance of chemistry subject in relation to other subjects as a result of the transformation phase and the impact of the knowledge on the outside environment. Lastly there is a room for feedback and adjustments after examining performance of the student in the subject and also the number tertiary institutions which takes as back to the input process.

2.7 Conceptual frame work.

The conceptual frame work shows how the dependent variable relates to the independent variable and also how the moderating variables relate to the independent variable.

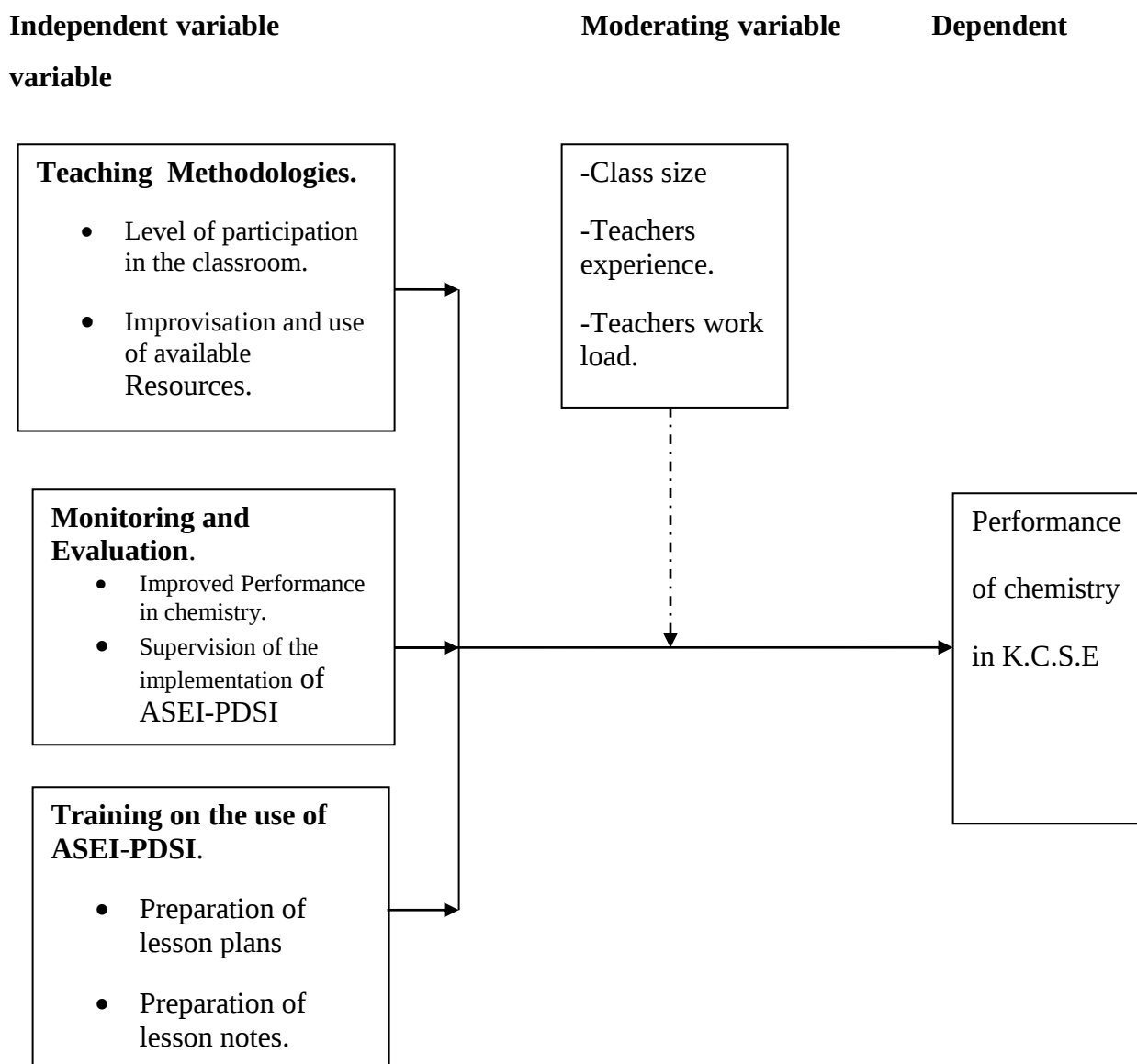


Figure 2.2. Conceptual frame work.

The study conceptualizes that independent variables influence the dependent variables, Reichel and Ramey (1987)

Teaching methodologies- performance of chemistry highly depends on the teaching and learning methodologies employed by the teacher. The teacher should select teaching methodology which are learner centered to improve the involvement of the learners in the lesson.(Mayer ,1999).

Monitoring and Evaluation- monitoring and evaluation of the implementation of the SMASSE project leads to improved performance in chemistry which translates to high enrolment of university related courses.(CEMASTTEA ,2010).

Training on the use of ASEI-PDSI- training during SMASSE INSETS puts emphasize on making of lesson plan, writing lesson notes and general teacher preparedness before going for a class.(CEMASTEIA , 2010)

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter lays out research methodology describing procedures and techniques that will be used in carrying out the study. It deals with the following aspects: research design, the study area, the study population, sample and sampling procedures, instruments of data collection, data collection procedures, validity and reliability of research instruments.

3.2 Research Design

Mugenda and Mugenda [2007] pointed out that a research design is the description of the procedure that followed in carrying out a study. Kothari [2004] defines research as the arrangement of conditions and analysis of data in a manner that aims to combine relevance to the research purpose. Nwadiutonkpa, [1997] defines research design as a structure or plan of a research- what to do and how to do it. It involves the structuring of variables in a manner that enables their relationships to be determined.

The study used a descriptive survey design which is a process of collecting data in order to answer questions concerning the current status of the subjects in the study (Orodho, 2005). Descriptive survey design was employed because it guarantees breadth of observation and also provide for the accurate descriptive analysis of characteristics of a sample which can be used to make inferences about population (Kerlinger, 1973). The design used when collecting information about people's attitudes, opinions, habits or any of the variety of education or social issues (Orodho& Kombo, 2002). The researcher was interested in finding out the influence of SMASSE project on the performance of chemistry by collecting information on the attitudes, opinions and habits of students, teachers of chemistry, heads of science department (HODs), principals" and quality assurance and standards officers (QASOs).

3.3 Target Population

Kitui central sub county consists of 32 public secondary schools. The study subjects consisted of 724 form three students from 32 public secondary schools, 20 chemistry teachers, nine HODs, nine principals and one Quality Assurance and Standards Officer QASO. The form three students were selected for the study because of their longer exposure of the school curriculum and had interacted with chemistry content more than the form one and two students. Exempted were the candidates preparing for the final KCSE exam. Teachers of chemistry and heads of chemistry department were chosen to take part in the study population because they are involved in the implementation of the ASEI-PDSI methodology in the classrooms after undergoing the SMASSE training. The principals and QASOs were part of the study population because they carried out M&E of the implementation of the SMASSE project.

3.4 Sample and Sampling Procedures

A sample is a part of a statistical population with properties to be studied to gain information about the whole population (Webster, 1985). Sampling is a process of selecting a representative a number of objects from a population such that the selected group contains elements with characteristics found in the entire group (Orodho& Kombo, 2002). 203 students was sampled from the entire population of boys' school, the girls' school and mixed day schools using random sampling technique. The sample was as shown in

Table 3.1: Stratified sample of the students' population

School category	Population	Sample
Boys' school	161	45
Girls' school	167	47
Mixed schools	396	111
Total	724	203

The study sample of 203 students was obtained basing on the guidelines given cited in Mugenda & Mugenda (1999) and by Brown (1998). According to Gay (1981), 30 percent or more are required for co relational research; 10-20 percent of the accessible population for descriptive research and at least 30 percent per group for experimental studies. However, according to Brown (1998), the sample size depends on the situation and on the statistics that is involved. They both agree that the rule of thumb is to obtain as big a sample as possible. This study was therefore guided by the rule of thumb to obtain a sample of 203 students which represented 28% of a total population of 724 form three students (Mugenda & Mugenda, 1999; Brown, 1998).

Purposive sampling was used to obtain nine principals, nine HODs, 20 chemistry teachers, nine classrooms for participation and one QASO. Purposive sampling was used because the study targeted principals who had attended workshops on SMASSE INSET. Purposive sampling is a method of sampling where the researcher selects the sample based on his/her judgment. (Orodho, 2005). Nine HODs and twenty chemistry teachers who had attended SMASSE training and teaching form three class were purposively chosen for the study.

Table 3.2: Stratification of the target population.

Sample	Target population
Principal	9
H.O.Ds	9
Teachers of chemistry	20
Students	203
Q.A.S.O	1
Total	242

3.5 Research Instruments.

Questionnaires and interview were used in data collection for the study. The questioners were for the teachers, principals and students. The heads of chemistry department and quality assurance officer participated in the interview. The researcher was guided by a unstructured questions to get the opinions of the respondent. The instruments are further discussed below.

3.5.1 Chemistry Teachers' Questionnaire.

A questionnaire for teachers of chemistry was used to establish teachers' self-perception on the use of ASEI-PDSI methodology in the classroom instruction of chemistry. Great emphasis was in areas such as: lesson plan preparation using ASEI procedure, students' participation and involvement in group work, practical activities, innovation and creativity on the use of locally available materials. There were 9 statements in the questionnaire. 5-point Likert scale was used to rate each statement ranging from "Strongly Disagree" with a score of 1 to "Strongly Agree" with score of 5. The chemistry teachers were required to tick in the box corresponding to their option.

3.5.2 Principals' Questionnaire

The principals' questionnaire was used to obtain information on principals' perception on the monitoring and evaluation or supervision of ASEI-PDSI approach of the SMASSE project. The principals were required to rate the various aspects of supervision which included: encouraging teachers to use teaching/learning resources effectively and checking whether resources were used effectively, encouraging teachers to make lesson plans and checking the professional tools used by the teachers and observing chemistry teachers lessons. There were 13 statements in the questionnaire; each was rated on a 5-point Likert type of scale ranging from "Strongly Disagree" with a score of 1 to "Strongly Agree" with score of 5. The principals were required to tick in the box corresponding to their option.

3.5.3 Students' Questionnaire

Questionnaire for students was used to determine students' opinions on the teaching and learning of chemistry in the classroom. Areas focused in the questioner included self perception on the understanding of chemistry, students altitude on the subject and frequency of practical activities and other aspects of learning inside and outside the classroom. Each statement in the questioner was rated on a 5-point Likert scale from "Strongly Disagree" with a score of 1 to "Strongly Agree" with a score of 5. The students were required to tick in the box corresponding to their option.

3.5.4 An Interview Schedule for Heads of Chemistry Departments

Interview schedule was used to obtain data from the heads of departments on their perception on the use of ASEI-PDSI in the classroom and also monitoring and evaluation of the implementation of the SMASSE project in their respective schools. The indicators of the practice of ASEI-PDSI included lesson planning, improved performance indices in chemistry at KCSE, increased practical activities , more student involvement in the lesson, use of group work and increased frequency of practicing lesson outside the classroom. The responses from the interview were summarized and presented.

3.6 Piloting of the Research Instruments.

This involves pre testing of the instruments. The questionnaires were pre-tested in the selected schools of Kitui central sub county. Pre testing of the research instrument was important since it helped to improve on the items that were not clear.

3.7 Validity of the instruments.

Validity is the degree to which a test measures what is supposed to measure Mugenda, (2000). To achieve the validity of the research instrument for this study the researcher conducted a pilot study in one of the schools in Kitui Central Sub-County. The findings of the pilot were not included in the final study. After scrutiny, through close consultation and expert judgment of the supervisors the researcher amended the instruments to ensure content and criterion validity.

3.8 Reliability of the instruments.

Reliability is the Pearson's measure of the degree to which a research instrument yields consistent results after a repeated trial (Mugenda and Mugenda 1999). Test – retest method was used to measure reliability of instruments; involved administering the same instrument twice to the same group within two weeks. Reliability correlation coefficient (r) was calculated using the product moment correlation coefficient.

To test for reliability, a pilot study was carried out in one of the schools using 15 form three students and two teachers of chemistry. The test retest method was employed within a period of two weeks and the spearman's correlation coefficient of value of 0.81 was obtained from items on the student's questionnaire and 0.86 on the teacher's questionnaire indicates that the data was highly reliable.

3.9 Data Collection procedure

The researcher personally collected the data through the use of self-administering of questionnaires and carrying out interview. She gathered the primary data from the respondents.

Library research was used to provide views of other researchers and authors concerning the study topic. The secondary data was collected from the UoN library and from the internet. The data collected from the questionnaires was analyzed using both descriptive and inferential statistical techniques. Frequencies, percentages, means and standard deviations were employed for the descriptive statistics while one way ANOVA was used for inferential statistics. Data collected was coded and entered in the computer for analysis using the Statistical Package for Social Scientists (S.P.S.S) to generate tables. Data from interviews was analysed qualitatively in an on-going process as the themes and sub-themes emerged from data.

3.10 Ethical considerations

The researcher sought permission to carry out the research from the relevant authorities such as NACOSTI, County Director of Education to give consent for the study to be carried out. A letter of information providing details of the study and the appropriate consent letter was distributed to potential participants and an explanation given for their being sampled. The potential participants were then given a verbal explanation of study objectives. For the respondents to be interviewed, the researcher requested them for the appropriate time when they can be interviewed. The researcher ensured that respondents' identity and schools were not be disclosed and information gathered was be used for academic purpose only. According to Maseko (2002), researchers are ethically obliged to possess a high level of competence and skill in undertaking a study. On that basis the researchers maintained a healthy relationship with each participant and exhibit a high degree of trust throughout the study.

3.11 Operational definition of variables

Objectives	Variable	Indicators	Scale	Tools of analysis	Data analysis
To establish the influence of SMASSE teaching methodologies on the performance of chemistry in Kitui central sub county.	<u>Dependent</u> Performance of chemistry in the K.C.S.E <u>Independent</u> Teaching methodologies	(i)improvisation using available resources (ii)Learner participation in the classroom	Ordinal scale	• Mean • Percentage	Descriptive
To establish the influence of M&E of the SMASSE project by administrators in performance of chemistry in Kitui central sub county.	<u>Dependent</u> Performance of chemistry in the K.C.S.E <u>Independent</u> Monitoring and evaluation.	(i)Improved performance (ii)Supervision of the implementation of ASEI PDSI.	Ordinal scale	• Mean • Percentage	Descriptive
To establish the influence of training of SMASSE project on the performance of chemistry in Kitui central.	<u>Dependent</u> Performance of chemistry in the K.C.S.E <u>Independent</u> Training of the SMASSE project	(i) Preparation of lesson plans. (ii) Mastery of content (iii)Preparation of lesson notes	Ordinal scale	• Mean • Percentage.	Descriptive

CHAPTER FOUR

DATA ANALYSIS, PRESENTATION, AND INTERPRETATION

4.1 Introduction.

This chapter discusses the presentation and interpretation of the study findings. The purpose of the study was to establish how chemistry in Public secondary schools was being performed upon introduction of SMASSE project in Kitui central sub county. This study narrowed down to the Public secondary schools in Kitui Central Sub County. The analysis and discussion of the results was in line with the study objectives.

4.2 Questioner response rate.

A sample of 232 questionnaires was used in the study. These were stratified for different categories and the response rate was evaluated for each category as follows:

Chemistry teacher (17), principals (9) , and the students (182) . This made a sample of 208 out of 232 sampled plus (9) H.O.Ds and one (1) QASO who participated in the interviews. The total sample for this study was 218 which were satisfactory for the study.

4.3 Response Bio data

The demographic characteristics of the respondents were analyzed including: Gender, position and working experience.

4.3.1 Gender of the respondents.

The gender of the respondents was sought and the results tabulated as shown in the Table 4.1

Table 4.1 Gender of the respondents

Gender	Category			Percent %
	students	teachers	QASO	
Female	95	19		52.3
Male	87	16	1	47.7
Total	182	35	1	100

Female respondents were found to be 52.3 % while the male respondents were 47.7%. This was so because there were many girls than boys in form three 2017 from the selected schools. Also the female teachers were many than male teachers because in the recent female are being incorporated as principals, H.O.Ds.

4.3.2 Position of the respondents

The position of the respondents was as shown in the Table 4.2 The positions were categorized as follows: chemistry teachers, school principals, students and the QASO.

Table 4.2: Position of the respondents

Position	Frequency	Percent %
QASO	1	0.46
Principal	9	4.13
H.O.D	9	4.13
Chemistry Teachers	17	7.8
Students	182	83.49
TOTAL	218	100

The students respondents formed 83.49 % of the respondents while the chemistry teachers 7.8%, principals 4.3%, H.O.Ds 4.3% and the QASO 0.46%. The students formed the highest group of respondents because they are the major players in the implementation of the SMASSE project.

4.3.3 Teaching experience of the respondents.

From the analysis of the principals' questioner, teachers of chemistry questioner and data collected from the H.O.D s interviews, all the principals had been in the teaching profession for more than ten (10) years. The H.O.Ds and the teachers of chemistry it was varied.

4.4 Influence SMASSE teaching methodologies on the performance of chemistry in the K.C.S.E

This study was established to determine the influence of SMASSE teaching methodologies on the performance of chemistry in public secondary schools in Kitui Central Sub-County. In order to rate the performance in the aspects of ASEI-PDSI approach in lessons, teacher's questionnaires was used and the results of the same were presented in the Table 4.3

Table 4.3: Influence of the SMASSE teaching methodologies on the performance of

chemistry			
Statements	n	MEAN	
I prepare and use the ASEI lesson plan in the teaching of chemistry.	20	1.30	
Students are involved and participate in group discussions.	20	4.40	
Practical activities are done weekly and the students are involved in the preparation.	20	3.00	
The students carry out the experiments while I supervise and facilitated the experiment.	20	3.90	
The students make observations during the experiments	20	4.50	
The students are involved in the discussion and drawing of conclusion of the experiment	20	4.50	
There is creativity and innovation on the use locally available materials when carrying out a practical lesson in the classroom.	20	3.00	
I carry out some lessons outside the classroom.	20	1.90	
I face challenges in the preparation and the use of ASEI-PDSI method of teaching.	20	3.00	
MEAN OF MEANS		3.92	

The findings in Table 4.3 gives 3.92 as the total mean of means which is slightly high mean as compared to the one measured on a five-point Likert -like scale. Although there were some areas where teachers had challenges with the practice of ASEI-PDSI methodology, the findings suggests that they had a positive perception on its practice. Item 1 which gave mean of 1.30 and asked about the preparation of ASEI plan in

teaching sought to evaluate the frequency of the use of ASEI lesson planning by the teachers. From the analysis ,mean of 1.30 shows that chemistry teachers in the Kitui central sub county rarely prepared the ASEI lesson plan .On item 8 which was to determine whether teacher conducted lessons out of class gave the mean of 1.90 which simply indicated that chemistry teachers did not conduct lessons out of class occasionally .On item 9 which was determine whether chemistry teachers faced challenges in the implementation of the ASEI-PDSI approach gave the mean of 3.00.This indicated that teachers faced some challenges in the implementation of the teaching approach .There was recorded high scores in the items 2,5 and 6 recording the highest mean of 4.25.This indicates that there was involvement of learners in the prediction of the lesson activities, making observations in practical lessons and explanation of the observation in class. In item 7 which sought to determine whether teachers had witnessed any creativity in their students gave the mean of 3.00. This showed that the use of ASEI-PDSI had a positive impact on students as it slightly improved their creativity in regards to chemistry.

4.5. Influence of monitoring and evaluation of the SMASSE project on the performance of chemistry in K.C.S.E

So that the major problems encountered by the administrators in the strive to put into action the plan of ASEI-PDSI was established, this study looked into a number of principals' perceptions regarding to their demographic background, for instance, the number of years in teaching and sex. An analysis of information from the principal's well-structured questionnaire was done to determine the range of supervision on chemistry lessons. Regarding some items relating to problems arising when putting in to action the ASEI-PDSI plan, an analysis of information got from the QASO and head of departments through an interview was done which was then presented as shown below.

Table 4.4: Means of principals regarding M&E of SMASSE project.

Statement	11 to 15 years	Above 15 year.
I am aware of the SMASSE INSET	5.00	5.00
All teachers in my school have attended all the SMASSE INSET.	2.85	3.50
I provide resources necessary for the ASEI-PDSI lessons to my teachers.	4.28	4.30
I supervise the use of resources in the implementation of the SMASSE project	3.14	3.00
Teachers prepare ASEI lesson plans for use in the classroom instruction.	4.00	4.00
I often check all professional documents as required by the employer.	4.28	4.50
I do chemistry lesson observation so as to put in action the lesson plans of ASEI.	2.00	2.00
The interest of students in the learning of chemistry has highly developed.	3.71	4.00
Use of ASEI-PDSI methodology has led to improved performance in chemistry.	2.78	3.00
SMASSE INSET has led to creativity and innovation among the students.	3.23	3.52
SMASSE project has encouraged teamwork among teachers	3.51	3.50
The goals of the SMASSE project have been achieved	2.30	2.53
I advocate for more-in-service training like SMASSE.	5.00	5.00
MEAN OF MEANS	3.54	3.68
OVERALL MEAN	3.61	

The findings of Table 4.4 shows that analysis of principals self-perception basing on teaching experience gave a mean of 3.50 for principals who had taught for a period of 11-15 years and those who had taught for more than 15 years depicting a 3.68 mean. Principals with teaching experience of above 15 years had a higher mean which implies that the longer the period of stay in the profession the more positive the principals become about the supervision of ASEI-PDSI approach of the SMASSE project. An overall mean of 3.61 implies that principals supervised the implementation of ASEI PDSI of the SMASSE project. After analyzing the questionnaire however, it was found out that there was need to check on a number of aspects basing on certain particulars in the questionnaire. The second Particular of the questionnaire established to which extend the SMASSE training was implemented by the chemistry teachers' through their commitment. 2.85 was the mean given by the principals who had taught for a period ranging 11 to 15 years while on the other hand them that had taught above 15 years presented 3.50 as the mean. It is the duty of principals in every school to enforce SMASSE training and making sure that all of their teachers in the departments of science and mathematics are seriously part of the training. However, the results are evident that the school principals have not fully enforced this discipline. Particular number seven established how keenly the principals monitored chemistry lessons.

The respondents who had taught for a period of 11 to 15 years depicted 2.00mean while on the other hand those with 15 years and above showed a 2.00 mean. From this finding, it shows that principals having a long teaching experience did not influence the effectiveness and enforcement of chemistry lessons. It was just the same as that of the less experienced. The heads of the schools just enforcing preparation of ASEI lesson plan will be of no use if they are not put into action in teaching the students. From the analysis above, it is clear that as much as the approach of ASEI-PDSI implementation is being supervised by principals so as to make it a success, they are as well encountering numerous difficulties to perform this task. Supervision of chemistry lessons by principals has therefore not helped teachers overcome the challenge of implementing ASEI lessons.

Analysis of the responses from nine HODs was done based on emerging themes which related to the challenges in preparation of ASEI lesson plans, engaging learners in classroom and making use of resources that could be easily gotten and easily available. All the nine HODs observed that chemistry tutors met a lot of difficulties in establishing ASEI-PDSI technique. A number of difficulties highlighted included the following: limited time frames to come up with the plans, due to heavy workload, inadequate materials for teachers to use to direct and teach students on various topics for better understanding of the students, inadequate knowhow to come up with relevant materials to help in teaching purposes, negative attitude towards chemistry by some students, large class sizes which hindered teacher from attending to individual learners and nature of examinations which tested more on theoretical work and not practical scientific concepts, thus forcing the teachers to teach students focusing on the examination which hardly touches on the scientific concepts.

After the H.O.Ds in charge of chemistry were required to offer their views to solve the difficulties that were put in place, 33% of them pointed out that there should be a guideline on operations of every study so as to cater for the time that could have been used in lesson planning. A small number (22%) of the HODs suggested that more school based training to be done so as to offer teachers with a platform of understanding the ASEI-PDSI approach application.

All HODs suggested that so as to lower the great burden the few employed teachers face in their duty execution, there was need for more teachers to be put on board by the TSC. Most HODs (77 %) suggested that teachers who attend SMASSE training to be rewarded with some amount of cash for their motivation purposes. All HODs suggested that the training of ASEI-PDSI approach should begin both in universities and colleges for teachers to gain a deeper and concrete understanding of the concepts and its application in learning for teaching the students. Most HODs (89%) suggested that to ease Monitoring and Evaluation by the head of schools as well as other officers involved in this task, there was a need for them to have well known all concerning the ASEI lessons.

Quality assurance officer conquered with the teachers leading the offices of Chemistry that there were challenges. The officer revealed this through an interview conducted where he affirmed that there was a lot of misunderstanding of ASEI-PDSI approach and that little was known about SMASSE-INSET especially those which are humanity based. This consequently affected the concepts M&E and its supervision as well. Further, the officer established that wrong perceptions and inadequate knowledge about QASOs on M&E of ASEI-PDSI caused a lot of difficulties in the M&E of the implementation of SMASSE project.

The QASO further suggested that emphasis and a lot of seriousness on teachers embracing SMASSE INSET attendance was key and the head of schools should enforce it. Mobilizations to be done through organizing conferences and workshops for training the parties involved regarding ASEI-PDSI approach. Chemistry teachers to improvise new techniques to do away with the negative perceptions of teachers regarding the lesson M&E which could be through lesson study groups. This study results found out that to put in place ASEI-PDSI approach, teachers face a lot of difficulties just the same as the ones established from a study done in year 2008 on SMASSE project. This current study affirmed that when putting in place ASEI-PDSI approach, the teachers encounter a number of difficulties; it also offered solutions to the difficulties which majorly looked on training of chemistry teachers on student-centered teaching methodologies, in order to improve the performance of chemistry in KCSE in Kitui Central Sub-County.

4.6 The Influence of training of SMASSE project on Performance of chemistry in the K.C.S.E

In order to assess how training on the use of ASEI-PDSI of the SMASSE project had influence on students' performance in chemistry and to generate answers to the third research question which was what is the influence of training on the performance of chemistry in Kitui central sub county? KCSE results from 2004 to 2012 were analyzed and the HOD's were questioned. The performance analysis in chemistry in the 32 public secondary schools was done by establishing the trend in Performance.

During the introduction of this teaching approach there was attitude change from teachers and students in form four were in their preparation for KCSE exams. Although it was introduced in the year 2004 the impacts of the training were reflected 2 years later in the year 2006 as it was so surprisingly that there was negative deviation between the years 2004 and 2005.

In 2009 there was recorded an improvement but it was followed by a drop in 2010 when the second phase of training was in progress. After that drop there was seen improvement on 2011,2012,2013,2014, and 2015 though some few fluctuations can be observed. From when this program began in the year 2004, 2009 was the only year that recorded a very impressive improvement with the highest mean ever achieved. From the graph it is seen that in Kitui central sub-county the performance of chemistry is not even average. In Kitui central, this approach of SMASSE INSET has been conducted in all the phases with more than 70% of teachers been trained on it. The first phase was from 2004-2007 as each phase **covers** a period of 4 years and the second phase was conducted in the years between 2008-2011. Those teachers who had missed out in the first phase were trained during the second phase. The average score of the SMASSE training for both of the two phases was calculated to give two sets of scores as shown below.

Table 4.5: Average Performance for Phase one and phase two of SMASSE training

Phases	Maximum	Minimum	Mean	Standard deviation
Phase 1 (2004-2007)	43.08	39.92	41.5	4.205
Phase 2, (2008-2011)	42.89	35.56	39.23	5.308

The mean scores were calculated in order to determine if there was any progress that was achieved after the first phase of training. The mean score for first phase was 41.5 and the mean score for the second phase was 39.23. The difference of 1.73 indicates that there was improvement after the first phase of training. From this analysis it can be seen that the introduction of the SMASSE INSET in Kitui central sub county may not have really

improved the students' performance in chemistry. Langat (2009, Ndiku (2011) Sifuna & Kaime (2007) and Afubwa (2014) had similar findings that SMASSE project had not improved the performance of science and mathematics in KCSE.

To corroborate the aforementioned, the interview that was conducted among the chemistry HODs indicated that the contribution of the SMASSE INSET in improvement chemistry performance was very little in schools. HODs and the teachers of chemistry attributed their performance to commitment, intrinsic motivation and hard work and not as a result of SMASSE INSET. He said "our chemistry teachers are paid for the extra coaching they give to the weak students and this has always boosted our performance in chemistry, SMASSE training has got nothing to do with the mean we got in chemistry."

The interview also revealed that the concentration of teachers was more on the most examined areas and thus an improvement in the schools mean was attributed to the teacher's efforts to repeatedly and continuously teaching the most examinable areas and not because of the use of the ASEI-PDSI as it is advocated by SMASSE INSET. This might be because of the nature of education system in Kenya that is more exam oriented than the acquisition of knowledge, skills or values. That is, great emphasis is laid on passing of exams. From the 10 chemistry HODs who were interviewed 44% stated that there was great improvement in performance in chemistry in their schools but they could not associate the improvement with the ASEI-PDSI teaching approach. The other 55% were all from mixed schools and the performance lacked steadiness.

The heads of departments in the institutions indicated that SMASSE INSET had insignificant impact on improving the performance of chemistry in the public secondary schools in Kitui central sub county. There is need therefore for chemistry teachers to be involved in the entire project from planning to implementation for them to own the project and implement it in the classroom instruction to improve the performance of chemistry in Kitui central sub county.

Table 4.6: Percentage of teachers trained on the use of ASEI-PDSI

Use of ASEI-PDSI	Frequency	percentage %
Trained	25	70
Not trained	10	30
Total	35	100

The findings of Table 4.6 indicate that 70% of the teachers had been trained on the use of ASEI PDSI of the SMASSE project and only 30% of the sampled teachers had not been trained. This was after the analysis of the principals' questionnaires, teachers' questionnaires and interview from the H.O.Ds. However the performance of chemistry in Kitui central sub county was still low despite a high percentage of teachers having been trained.

Table 4.7: Number of cycles attended in the SMASSE project

Number of cycles attended	Frequency	Percentage %
Four	8	25
Three	10	30
Two	12	35
One	3	6
None	2	4
Total	35	100

Teachers' questionnaires were also analyzed in order to establish the number of cycles each teacher had attended during SMASSE INSET. The findings of Table 4.7 indicate that 25% of the chemistry teachers had attended the four cycles ,30% had attended three cycles, 35% had attend two, 6% had attended only one cycle and 4% had not attended the SMASSE training at all and mostly those who had been employed in the last two years. Although 70% of the teachers had been trained on the use of ASEI PDSI of the SMASSE project not all the teachers had attended all the cycles of the training. Not attending all the cycles did not affect the performance of chemistry in Kitui central sub county. Most teachers associated their performance with high levels of motivation and thorough revision after completing the syllabus.

Table 4.8: Success of the SMASSE project

SMASSE	project	Percentage success %
Frequency		
Highly successful	3	10
Moderately successful	25	63
Not successful	7	27
Total	35	100

Principals questionnaire, teachers questionnaire and information collected from H.O.Ds interviews was analysed to establish the level of success of the implementation of the SMASSE project in Kitui central sub county based on the Likert-like scale of 1-5. The findings of Table 4.8 indicate that 10% of the teachers said that the project was highly successful, 63% said the project was moderately successful and 27% of the teachers felt that the project was not successful. Training of the use of ASEI-PDSI of the SMASSE project was moderately successful and had low impact on the performance of chemistry in Kitui central sub county.

CHAPTER FIVE

SUMMARY OF THE FINDINGS, CONCLUSIONS AND RECOMMENDATIONS.

5.1 Introduction

This chapter presents the summary of the data findings on influence of strengthening mathematics and science secondary education project on the performance of chemistry in the Kenya certificate of secondary education examination in Kitui central sub-county ,Kitui county – Kenya, discusses and concludes every objective: find out the influence of challenges faced by administrators in the monitoring and evaluation of the implementation of the ASEI PDSI of the SMASSE project on the performance of chemistry in Kitui central sub county. Assess whether SMASSE INSET had improved the teaching methodologies in teaching and learning of chemistry in Kitui central sub county, establish whether ASEI PDSI of the SMASSE INSET had improved the performance of chemistry in KCSE in Kitui central sub county and to assess the influence of training on the use of ASEI PDSI of the SMASSE project on the performance of chemistry in Kitui central sub county.

5.2 Summary of Findings

There was lack of improvisation in most of the lessons and teacher preparedness lacked among many teachers. SMASSE project and particularly the use of ASEI-PDSI approach was aimed at enabling teachers to use available resources in order to supplement the little from government. Teachers in Kitui central sub county not putting in do not place ASEI lessons nor did they work with the available resources around them clearly confirms that ASEI-PDSI methodology was not well established in the schools.

Teachers need to be seriously sensitized on the establishment of ASEI-PDSI approach during their lessons with students and regarding the support of the currently on ground CEMASTE group provision as well as the SMASSE project. SMASSE INSET should not be done away with when developing and revising the school curriculum but should be approved and put in place by the curriculum developers.

On the influence of the M&E by administrators on the implementation of the SMASSE project on performance of chemistry, the research question asked was, “What is the influence of monitoring and evaluation of the implementation of the SMASSE project?” HODs, and QASO were asked questions through interviews and it was noted that, principals had a lot of difficulties in establishing their role in the implementation of the SMASSE project. Majority (80% of the HODs established that for the SMASSE training to be successful and purposeful, there was need to solve the difficulties first. Mostly, the difficulties that came out strongly were the ones on training of teachers during the INSETS; follow up activities after training, improvisation of locally available materials, heavy workload and preparation of ASEI lesson plans. Some (44.4%) agreed that the current education systems and other occurrences in Kenyan schools could hardly support ASEI-PDSI technique although it is an excellent and very creative approach. It was noted that this could only be possible upon completely making the education system to be favorable in that it can offer platforms for creativity and equip students with skills required in the 21 first century.

This was the question answered in line with the training on the use of ASEI-PDSI of the SMASSE project: What is the influence of training on the use of ASEI-PDSI of the SMASSE project on the performance of students in chemistry in the KCSE? The study established that initiating SMASSE INSET had no positive impact in the way chemistry was performed. In the year 2004, is when it was initiated in Kitui central sub county. In 2007, is when the first round of training was done. In 2008, the second part was set in which was done up to 2011. Independent sample t- tests and paired samples correlation tests were used to analyze and weigh the performance of the two phases. A strong positive correlation of 0.848 was given on the two parts when measurement was done using a paired samples correlations test while on the other hand t-tests gave a p-value which was greater than 0.05. Therefore, it is evident that there is a negative relationship between the training phases and performance of students. The training in phase one and two did not affect students’ performance positively. This project aimed at addressing the unsatisfactory performance in science and mathematics. The trends in the performance is

dismal despite the fact that it is now ten years since implementation of the project in Kitui central sub county.

The purpose of this project focused on assisting teachers to overcome the wrong attitudes and help chemistry students perform better and point on other difficulties. The pattern of performance is dismal despite the fact that it is now ten years since implementation of the project. Teacher training on the use of ASEI PDSI of the SMASSE project has slight improvement on the performance of chemistry in Kitui central sub county.

5.3 Conclusion

It was established that very few teachers embraced ASEI-PDSI methodology while teaching in the classroom instruction regarding to chemistry which had resulted to no significance positive change on the performance of chemistry in Kitui central sub county. Teaching and learning of chemistry methodologies in Kitui central sub county remained to be the same outdated and non-problem-solving ones.

The study established that though principals carried out the M&E on the implementation of the ASEI –PDSI they still faced challenges in areas such as: inadequacy of resources, lesson plan preparation and observation, and time challenges as most of them had busy schedules. Classroom teachers of chemistry also faced challenges in areas such as: heavy workloads hence no enough time to prepare ASEI lesson plan. Other challenges included lack of teaching and learning resources for use by the student and in other cases students lacked interest in the subject which contributed to low performance of chemistry in Kitui central sub county.

Despite the SMASSE INSET it was noted that the performance in chemistry had not improved. This study also found out that SMASSE project had no positive impact on the performance of chemistry in the KCSE in Kitui central sub-county secondary schools.

Comparing the first phase of training (2004-2007) and second phases of training (2008-2011) of the SMASSE project, there was very slight difference that was not significant for the two phases of training on the KCSE mean scores. Evidently therefore, the SMASSE training targets and achievements have not been achieved in Kitui central sub county and therefore the need ASEI-PDSI methodologies to be implemented by teachers in classrooms in more serious ways. Teacher training on the use of ASEI PDSI and principals' monitoring and evaluation on the implementation of ASEI PDSI of the SMASSE project in Kitui central sub county had no positive significance difference on how students performed in chemistry in KCSE.

5.4. Recommendations

The study recommends the following in regard to the objectives of the study:

SMASSE INSET should enhance teaching methodologies in the teaching and learning of chemistry especially on areas regarding: preparation of lesson plan, lesson notes, group discussions and getting the students to participate in the learning session through presentation. To achieve this, teachers will need to be involved in lesson studies while other teachers observe their lesson presentation, this way they will commit themselves to this project.

Teachers (HODs) of science and mathematics and teachers of chemistry should be made aware of the significance of planning which involves arranging teaching and learning materials before lesson time.

The ministry of education science and technology should work in conjunction with CEMASTEAM team in research and capacity building of teachers in areas such as team teaching and team building and also lesson observation to enhance mastery of content. Sensitization should also be done to administrator's e.g the school Principals and QASOs on their role in the M&E and supervision of the implementation of the SMASSE project. Awarding of certificates of attendance should be done in order to motivate the teachers to attend the SMASSE INSET. Also teachers to be given allowances during the INSET to cater for their basic needs and not forcing them to board on the school dormitories.

5.5 Suggestions for further Research

Here are some recommendations based on the findings:

- The present study focused in a small area, Kitui central sub county therefore the study recommends a further research be done whole of Kitui County.
- Similar studies to be carried out in mathematics, biology and physics subjects.

REFERENCES

- Birgen, P. (2004). *Teachers Image .Vol 9*. Nairobi, Kenya: Oakland Media Services.
- Brown, D.J, (1998). *Understanding Research In Second Language Learning*. New York. Cambridge University Press.
- CEMASTE. (2009). *Report on Secondary Schools Situational Analysis*. Nairobi: CEMASTE.
- CEMASTE.(2010). *Monitoring and Evaluation report on District INSET*. Nairobi: CEMASTE
- Cooper, R., Slavin, R.E., & Madden, N.A. (1998). Success for All: Improving the quality of implementation of whole-school change through the use of a national reform network. *Education and Urban Society*, 30 (3), 385-408.
- Draft L.R., (2004) *Organizational Theory and Design*. 8th Edition U.S.A. Thomson South-Western.
- Eshiwani, G.S. (1993). *Factors influencing performance and learning of mathematics among Secondary schools in Kenya*. Nairobi, Kenya: Bureau of educational research.
- Fuller, B (1987). *Raising school quality in developing countries. What investments boost learning?* Rev. Education Res.5
- Garrison, R., & Walter, A. (2000). *Transactional approach on teaching and learning, A framework for adult and higher education*. Elsevier science ltd.
- George, N.R., James., M.M. Justus, N.R. & Zacharia, K.M. (2012). *Students and teachers attitude towards mathematics- Maara district*. Chuka University- Kenya: Unpublished M.ED Thesis,
- Gluckman, P. (2011). *Looking Ahead: Science Education for the Twenty-First Century: A report from the Prime Minister's Chief Science Advisor*. Auckland: Office of the Prime Minister's Science Advisory Committee.
- Goodland, J. (1984). *A place called school*. New York: MC Graw Hill. Hannula, M. (2002). *Attitude Towards mathematics: Emotions, Expectations and values*. Netherlands: Kluwer Academic publishers.

- Government of Kenya.(2005b). Sessional Paper No.1 of 2005 on A Policy Framework on Education, Training and Research. Nairobi: Government Printer.
- Homa Bay District Development Plan.(2002-2008). Government printers, Nairobi.
- Japan International cooperation Agency. (2004). The history of Japan's initial experience with technical development cooperation in basic education: A case of Ghana. *Journal of international cooperation in education* 8(1).
- Kafu, P. A (1996).Future development in education technology.Eldoret: Moi University.
- Kanja, C., Iwasaki,H.,Takuya B. &Atsumi, U. (2001). For the reform of mathematics education in Kenyan secondary schools.A *journal of international development and cooperation*, vol 7 no 1 p 67- 75 (200101).
- Karega,M. (2008). *Increasing Effectiveness of South-South Cooperation: the Case of SMASSE Kenya and SMASE-WECSA*, A paper Presented at the Workshop for Practitioners of South-South and Triangular Cooperation During the Fifth Annual United Nations Day for South-South Cooperation on 18 December 2008 at U.N. Headquarters/New York).
- Karue, M. (2006). Factors associated with poor performance in day secondary schools in Embu district. University of Nairobi: Unpublished PH.D Thesis,
- Kenya institute of Education (2002).Mathematics syllabus for Kenya Certificate of Secondary Education. Nairobi: Kenya Literature Bureau.
- Kenya National Examination Council.(2008). *KCSE Examination candidate performance Vol 1*.Nairobi: Government printer.
- Kenya National Examination Council. *KCSE Examination Reports from 2004-2011*: Nairobi Government printers.
- Kenya vision 2030. (2008-2012). *Towards a globally competitive and prosperous nation*. Government of the republic of Kenya.
- Kerlinger, F. N. (1973). Foundation of Behavioural Research. New York: Subject publications.
- Kibe, Odhiambo & Ogwel (2008), *Impact of SMASSE INSET on students' capacity through improved teaching and learning in the classrooms*, a paper presented at the 8th Regional conference for SMASSE WECSA, Nairobi.

- Kusek, Z.J & Rist, C.R. (2004). Ten steps to Results – Based Monitoring and Evaluation. Washington DC: The World Bank.
- Langat, R.K. (2009). Impact of SMASSE INSET on students’ attitude and performance in Mathematics in secondary schools in Bomet district: Moi University. Unpublished M.ED Thesis,
- Liburu, M.L. (2012). The impact of SMASSE project on the teaching and learning of Mathematics in Tigania West District since 2004. Moi University: Unpublished M.ED Thesis.
- Ma, X., & Kishor, N. (1997). Assessing the relationship between attitude towards mathematics and achievement in mathematics: A meta analysis *Journal of Research in mathematics education* 28: 26-47.
- Math and Science Forum (2013). <http://mathforum.org/> retrieved on 13th January 2014.
- Mayer, R. E. (1999). Research-based principles for the design of instructional messages: The case of multimedia explanations. *Document Design*, 1, 7-20.
- Mayer, R. E. (2001). *Multi - media learning*. New York: Cambridge University Press.
- Mayer, R. E. (2003). Elements of a science of e-learning. *Journal of Educational Computing Research*, 29(3), 297-313.
- Mayer, R. E., & Moreno, R. (2003). Nine ways to reduce cognitive load in multimedia learning. *Educational Psychologist*, 38(1), 43-52.
- Mayer, R. E., Fennell, S., Farmer, L., & Campbell, J. (2004). A personalization effect in Multimedia learning: Students learn better when words are in conversational style rather than formal style. *Journal of Educational Psychology*, 96(2), 389-395.
- Mintezes, J., Wandersee, J. & Novak, J. (Eds.) (1998). *Teaching science for understanding*. San Diego, Ca: Academic Press.
- Mondoh, H.O. (2005). *Methods of Teaching chemistry :A Handbook for Teachers And Students*. Egerton University Press, Njoro.
- Mugenda, M.O., & Mugenda, G.A. (1999). *Research Methods. Quantitative and Qualitative Approaches*. Nairobi; African Centre for Technology Studies.
- Mugenda, M.O., & Mugenda, G.A. (2003). *Research methods: Quantitative and Qualitative Approaches*. Nairobi: Acts Press.

- National Research Council. (2000). *How people learn*, Washington DC: The National academic press.
- Ndiku, L. (2011). Mathematics teachers' attitude towards the SMASSE-INSET in Nandi central district, Kenya. Eastern African University. Kenya: Unpublished M.ED Thesis.
- Ngugi & Nyakweba. (2005) *Understanding SMASSE PROJECT*; a paper presented in Uasin-Gishu district SMASSE INSET cycle 2.
- Njuguna, B. M. (1999). The findings from baseline studies by SMASSE Project, SMASSE Project bulletin: Unpublished.
- Ogwel, A. (2011). Enhancing Teachers capacity through In-service Education and Training: *A reflection on the projects for Strengthening Mathematics and Science Education*. Kenya: CEMASTE A.
- Olick, A. (2012). The impact of SMASSE training programme on the Mathematics Performance in secondary schools in Bomet district, Kenya: Unpublished M.ED Thesis.
- Omondi, O.K. (2010). Teaching and learning resources and academic performance in Secondary schools in Bondo district of Kenya. Kampala International University, Uganda: Unpublished PH.D Thesis.
- Orodho, A. J., & Kombo D. K. (2002). *Research methods*. Nairobi: Kenyatta University, Institute of Open learning.
- Orodho, J. A. (2005). *Elements of Education and Social Science Research methods* Nairobi. Masola publishers.
- Oso, W.Y. & Onen, D. (2005). *A general Guide to Writing Proposal and Report, a handbook for beginning researchers*. Uganda: Copyright, 2008.
- Owiti, D.S.O. (2008). Mathematics teaching in secondary schools in Nairobi and Mombasa Districts: Students' perspective. Moi University: Unpublished PhD Thesis.
- Porter, T. (1996). *Why study mathematics*. Retrieved on 13th January 2014 from t.porter@bangor.ac.uk

- Republic of Kenya, (2005). *Sessional Paper No1 of 2005 on a Policy Framework for Education, Training and Research*. Nairobi: Government Printer.
- Rotich, K. & Mutisya, S. (2013). Evaluation of capacity development programs in Kenya: a case of SMASSE INSET for science teachers. *International Journal of Social Sciences and Entrepreneurship*, 1 (3), 273-288
- Schenkel, B. (2009). The impact of attitude towards mathematics on mathematics performance. Marietta College, Ohio: Unpublished M.ED Thesis.
- Shahid, M., & Syedza, S. (2008). *Pakistan Economic and social Review* Vol 46, No 8 (Summer, 2008) pp78-83.
- Sifuna, N., & Kaime, J. (2007): The effect of in-service education and Training (INSET) Programmes in Mathematics and science on classroom interaction. A case study of Primary and Secondary Schools in Kenya. *African Education Review*.
- SMASSE project. (2002). *Report on the 4th workshop on effective operations and management of SMASSE project*. Nairobi: SMASSE project.
- SMASSE project. (2004). *Sixth stake holders workshop on effective management of SMASSE project*. Nairobi: SMASSE project.
- SMASSE project. (2008). Statistical Analysis of SMASSE Impact Assessment Survey. Nairobi: SMASSE project.
- SMASSE RWANDA. (2010). *Strengthening Mathematics and Science in Secondary Education*. Rwanda : SMASSE project.
- Stevson, H.W., & Stigler, J.W. (1992). *The learning gap: why our schools are failing and what we can learn from Japanese and Chinese education*. New York:
- Stigler, J., & Hierbert, J. (1999). *The teaching Gap. Best Ideas from the World's Teachers for Improving Education in the Classroom*. New York: Free press.
- Wabwire, J. (2007). Mathematics and Science teachers' perception and expectations of SMASSE In-service Training. A case study of Trans- Nzoia District. Unpublished M. philthesis. Nairobi: Moi University
- Waititu, M., & Orado, G. (2009). *Managing Teachers and instruction of mathematics and Science: Lessons from SMASSE Experience in capacity development*, Kenya: CEMASTEAM.

- Wambui, N. N. (2005). *A study of mathematical achievement using the climbing method in Kenyan secondary schools*. SMASSE project.
- Wambui, N.N., & Wahome,N. (2006). SMASSE project .*tsubuki journal of educational study of mathematics*. Retrieved from tsukuba.ac.TP/math/symp2006/nui,pdf.
- Wanjohi, C. (2011). Performance determinants of KCSE Mathematics in Nyamaiya division. Kampala International University, Uganda: Unpublished M.ED Thesis.
- Webster, S. (1985). *Educational Research: Competence for Analysis and Application*, 6th Edition. New Jersey: Macmillan.

APPENDICES

APPENDIX I: Letter for the school principal

**JANET NDUKU CHARLES
UNIVERSITY OF NAIROBI
P.O. BOX
NAIROBI**

DATE

THE PRINCIPAL

Dear sir/ Madam,

RE: ACADEMIC RESEARCH.

I am a post graduate student at the University of Nairobi taking Masters of Arts Degree course in Project Planning and Management. I am required to carry out a research on **“The influence of Strengthening of Mathematics and Science (SMASSE) project on the performance of chemistry in Kitui central sub county public secondary schools.**

The purpose of this letter is to request you to allow me to collect the required information from teachers and students in your school.

Attached are copies of my research abstract, questionnaires and a letter from the university.

Thank you in advance,

Yours faithfully,

JANET NDUKU CHARLES.

L50/85068/2016

APPENDIX II :Questionnaire for chemistry Teachers'

The purpose of this questionnaire is to solicit information on the implementation of ASEI- PDSI approach in the teaching and learning of chemistry in secondary schools. The aim is to find out the extent to which teachers use the ASEI-PDSI methodology in the classroom instruction in the teaching and learning of chemistry and the impact on the performance of chemistry in KCSE.

Then information you will provide will be confidential. Kindly give a genuine opinion on each of the statements by ticking in the corresponding appropriate box.

SECTION A: DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENTS

1. What is your gender?
 - a. Male
 - b. Female
2. What is your age bracket?
 - a. Below 20 years
 - b. 21-30 years
 - c. 31-40 years
 - d. Over 40 years
3. What is your highest academic qualification?

PGDE/ DIPLOMA (), BED (), MASTRES DEGREE (),
4. For how long have you been in the teaching profession?

1 to 5 years (), 5 to 10 years (), 11 to 15 years (), Above 15 years ()

Section B

5. Have you attended SMASSE training?

YES () NO ()
6. How many SMASSE training cycles have you attended? SMASSE Training

All the four cycles ()

Three cycles ()

Two cycles ()

One cycle ()

None ()

7. What can you say about the success of the implementation of the SMASSE project in a scale of 1-5?

Highly successful [4-5] () moderately successful [2-3] () not successful () [1]

8. What can you say about the influence of training on the use of ASEI –PDSI of the SMASSE project on the performance of chemistry in your school?

High() Low ()

9. To what extend do you think the SMASSE project has influenced the performance of chemistry? Briefly explain.....

.....

Section C

10. The statement below relate to the self-perception towards teaching methods of chemistry

Where:

NA means **Not at All**

R stands for **Rarely**

S means **Sometimes**

O means **Often**

A means **Always**

Give only one response among the five alternatives provided.

Statements relating to teachers of chemistry teaching methodologies and supervision of the implementation of the SMASSE project.

Statements relating to teacher teaching methodology in the teaching and learning of chemistry.	NA	R	S	O	A
1.I prepare and use the ASEI lesson plan in the teaching of chemistry.					
2) Students are involved and participate in group discussions.					
3. Practical activities are done weekly and the students are involved in the preparation.					
4) The students carry out the experiments while I supervise and facilitated the experiment.					
5) The students make observations during the experiments					
6) The students are involved in the discussion and drawing of conclusion of the experiment					
7) There is creativity and innovation on the use locally available materials when carrying out a practical lesson in the classroom.					
8) I carry out some lessons outside the classroom.					
9) I face challenges in the preparation and the use of ASEI-PDSI method of teaching.					

APPENDIX III: Questionnaire for the Principals'

This questionnaire intends to find out the principals perception on the influenced of the M&E of of the SMASSE project on the performance of chemistry in KCSE.

Kindly give your genuine opinion on each of the statements. All the information given will be handled ethically.

SECTION A: DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENT.

3. What is your gender?

a. Male ()

b. Female ()

4. What is your age?

a. 21-30 years ()

b. 31-40 years ()

c. Over 40 years ()

(2) What is your highest academic qualification?

PGDE/ DIPLOMA (), BED (), MASTRES DEGREE (),

(3) For how long have you been in the teaching profession?

11 to 15 years (), Above 15 years ()

SECTION B

The statements below relate to supervision/monitoring and evaluation of the implementation of the SMASSE project in secondary schools.

SA means **Strongly Agree**

A stands for **Agree**,

U means **Undecided**,

D means **Disagree**

SD means **strongly Disagree**

Give only one response among the five alternatives provided.

Statements regarding M&E of the SMASSE project.	SA	A	U	D	SD
1) I am aware of the SMASSE INSET					
2) All teachers in my school has attended all the SMASSE INSET.					
3) I provide resources necessary for the ASEI-PDSI lessons to my teachers.					
4) I supervise the use of resources in the implementation of the SMASSE project.					
5) Teachers prepare ASEI lesson plans for use in the classroom instruction.					
6) I often check all professional documents as required by the employer.					
7) I do chemistry lesson observation to ensure the implementation of the ASEI lesson plans.					
8) students have developed interest in the learning of chemistry					
9) Use of ASEI-PDSI methodology has led to improved performance in chemistry.					
10) SMASSE INSET has led to creativity and innovation among the students.					
12) SMASSE project has encouraged teamwork among teachers					
13)The goals of the SMASSE project have been achieved.					

APPENDIX IV: Students' Questionnaire

Dear student

The aim of this questionnaire is to collect information about the performance of Chemistry in secondary schools in Kitui central sub county. The participants are form three students who take chemistry as one of their examinable subjects in the KCSE. The information you will provide will be kept confidential and will be used to improve the performance of chemistry in Kitui central sub county.

SECTION A: DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDENT.

Gender:

Male ☐

Female ☐

Category of your school

Mixed day school ☐

Boys ' Boarding school ☐

Girls ' Boarding school ☐

SECTION B

The statement below relate to the your general attitude and performance in chemistry where **SA** means **Strongly Agree**, **A** stands for **Agree**, **U** means **Undecided**, **D** means **Disagree**

SD means **Strongly Disagree**.

You are required to tick on the item which describes your feeling towards teaching, learning participation and performance in chemistry. Give your genuine opinion on the statements as all answers are right Please tick inside the box corresponding to your response.

Item describing students' attitude and performance in chemistry

Students attitude toward chemistry	SA	A	D	U	SD
1) My relationship with teachers of chemistry teachers is good.					
2) our chemistry teacher involves us in the whole lesson.					
3) We always do some activities during chemistry lessons using the locally available materials.					
4) Group discussion in chemistry are interesting and the teacher doesn't need to supervise us.					
5) Chemistry assignments although quite involving I am motivated to answer them.					
6) I intend to take a chemistry related career in future.					
7) chemistry is not as difficult as others have been saying					
8) My performance in chemistry is better compared to other subjects.					
9) I should have dropped chemistry if it was optional.					
10) I do not understand anything during chemistry lessons					

APPENDIX V: Interview Schedule for Heads of chemistry Department.

1. Are you aware of the SMASSE INSET?
2. How can you rate the success of SMASSE project in Kitui central sub county?
3. What is your comment on the following aspects of the SMASSE project?
 - a) Teacher participation during INSET.
 - b) Administration support to the SMASSE project.
 - c) Teacher methodology and inclusivity in the instruction of chemistry.
4. What is your role as an HOD in the implementation and M&E of the ASEI-PDSI methodology of the SMASSE project?
5. Do you face challenges in the supervision of the implementation of the ASEI-PDSI methodology?
6. What is the impact of the SMASSE project on teachers of chemistry performance targets?
7. Do you think SMASSE project has improved the performance of chemistry in your school?
8. What is your observation on the use of ASEI-PDSI methodology in the classroom instruction of chemistry in your school?
9. What is the general altitude of the teachers to attendance to SMASSE INSET and training?

APPENDIX F: Interview schedule for QASO

1. What role have you played in the implementation of ASEI-PDSI approach in secondary schools of Kitui central sub county?
2. How often do you monitor the use of ASEI-PDSI approach in secondary schools of Kitui central sub county?
3. What mechanisms do you employ in order to effectively manage the implementation of ASEI-PDSI approach in secondary schools?
4. What are some of the challenges faced in trying to ensure that ASEI-PDSI approach is implemented?
5. What is your opinion on teachers' willingness to use of ASEI- PDSI methodology of instruction in the classroom?
6. What is your comment on the sustainability of the ASEI-PDSI methodology in Kitui central sub county?
7. How can ASEI-PDSI methodology be implemented in Kitui central sub county?
8. What is your observation on the use of ASEI-PDSI approach in Kitui central?