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Factors Affecting The Success Of Strengthening Of Mathematics And Science Education Initiative In Secondary Schools In Koibatek Sub – County, Baringo County, Kenya

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Abstract:
Strengthening of mathematics and science education initiative was introduced to improve the performance of mathematics and science subjects. Despite the existence of the initiative for the last 13 years in Kenya, performance in these subjects remains poor. The study therefore aimed at establishing the factors affecting the success of the initiative. The specific objectives were to investigate how the attitude of teachers towards the use of initiative's teaching approaches affects the success of the initiative. Secondly, determine how the support of the school administration for the use of initiative's teaching approaches affects the success of the initiative. Thirdly, investigate how the monitoring mechanism of the use of initiative's teaching approaches affects the success by strengthening of mathematics and science education and lastly determines how students' attitude affects the success of the initiative. The study will be beneficial to the administration of schools since they will use the findings to find out the extent to which initiative's teaching approaches is implemented in the classroom and will also inform the district planning committee on the state of affairs in the use of initiative's teaching approaches in order to justify expenses used in the training of teachers. This research was conducted in Koibatek Sub - County of Baringo County. A descriptive survey design was adopted for the study. The target schools were three girls' boarding schools, three boys' boarding schools and four mixed day secondary schools out of a total of 25 schools. From the 10 schools, 10 principals, 20 mathematics and science heads of departments, 35 teachers of mathematics and science and 190 students were sampled to obtain the information out of a target population of 25 principals, 50 heads of departments, 350 teachers of mathematics and science and 5200 students. Stratified and Simple random sampling procedures were adopted to select the sample. Questionnaires were administered to the principals, heads of departments, teachers of mathematics and science and students and interview schedule was administered to the principals. To ensure validity of the instruments, expert opinion was sought. Reliability of the instruments was tested during piloting. After the piloting, the instruments were adjusted accordingly before the actual data collection. Having established validity and reliability of instruments, the researcher adopted self administering and interview data collection procedure to the sampled respondents. After collection, the data were organized to facilitate analysis. The coded data were entered into the computer using the statistical package for social science version 17.0. Analysis of data was done using descriptive statistics using frequencies, means and percentages. Results were presented in the form of tables and frequencies.

The study established that the attitude of mathematics and science teachers was fairly positive. It also found out that school administration support for mathematics and science subjects was positive. The study also found out that the attitude of students towards mathematics and science was positive. However, the positive attitude of students and mathematics and science teachers and the support of the school administration could not translate to good performance. The study established that monitoring of implementation of the initiative internally by the school administration and externally by the district quality and standards officers was minimal.

From the findings, the researcher recommends that the Teachers Service Commission should employ more teachers of mathematics and science to reduce the workload for the administration of schools so that they may have time to monitor implementation of the initiative. Employment of more of these teachers will also reduce lessons taught per week by mathematics and science teachers so that they may have adequate time to prepare for implementation of initiative's teaching approaches. Secondly, the Ministry of Education should empower district quality and standards officers financially to monitor implementation of the initiative in schools. The researcher proposes further research to be done on the attendance of Strengthening of mathematics and science education in – service and training by mathematics and science teachers visa viz school performance. Secondly, further research should be done to establish the impact of the in – service and training in Koibatek sub – county in order to justify huge financial spending on the same.

1.Introduction

1.1.Introduction

This chapter provides a description of the background of the study, a statement of the problem, research objectives, research questions, justification of the study, scope of study, limitation of the study and statement of hypothesis.

1.2.Background Of The Study

Strengthening of Mathematics and Science Education (SMASE) initiative is a joint venture between the Kenya Government through the Ministry of Education (MOE) and the Government of Japan through the Japanese International Cooperation Agency (JICA). SMASE Initiative is mainly involved in In-Service Education and Training (INSET) of serving teachers in mathematics and science in secondary and recently primary schools in Kenya. However in our case, we will discuss SMASE at secondary school level. The System of operation is through the Cascade System where the National Trainers trains the District Trainers who in turn train teachers in the whole country to implement what they learn at the INSET in the classroom.

According to Waititu (2009), SMASE came into being when the consistently poor performance in Mathematics and Science (Biology, Chemistry and Physics) became a matter of serious concern. Broad curricula, lack of facilities and inadequate staffing were always cited as the major causes of the problem. Although dismal performance in these subjects had almost been accepted as the norm in some schools, the Ministry of Education (MoE) and other stakeholders felt there had to be an intervention, hence the Strengthening of Mathematics And Science Education (SMASE) Initiative.

The SMASE team conducted a baseline survey in nine pilot districts in 1998 to determine the areas that needed intervention and come up with a strategic plan of operation. Interviews were conducted for headteachers, teachers, students, parents and laboratory assistants. More data was collected by administering questionnaires to teachers and students, lesson observation and video recording of lessons for further observations.

From the results of the survey, it was evident that there were numerous problems in mathematics and science education (CEMASTEA, 2011). Among these were those problems within the scope of SMASE Operations and others beyond the scope of the initiative. The problems within the scope of SMASE among others, includes:

Attitude towards science and mathematics ; students' attitude was generally found to be negative. This was attributed to low marks at admission, belief that the subjects are difficult, peer influence, lack of facilities, harsh teachers and theoritical approach to teaching. The teachers' attitude was generally neutral and that they were reluctant to perform experiment especially in chemistry which were deamed dangerous. Most lessons were merely teacher demonstrations. The headteachers' attitude neutral / negative as reflected by their development priorities which ranked textbooks, laboratories and laboratory equipments as low. The parents' attitude was neutral. Most were not interested in their children's performance, least of all in mathematics and science. Progress reports were not a matter of concern. Some were ignorant, others felt paying fees was their only role.

Secondly,Inappropriate teaching methodology; most were teacher centered without student involvement in the lesson, that is using talk and chalk. Thirdly, Teachers' mastery of content was found to be low and this impacted on the delivery of the content. Fourthly, Few or no interactive forums for teachers, to share on appropriate approaches in the teaching of mathematics and science.

The Activity, Student, Experiment and Improvisation (ASEI) and Plan, Do, See and Improve (PDSI) approaches to learning mathematics and science introduced through SMASE Initiative is an attempt to respond to these challenges. The acronym ASEI stands for Activity (practical work, discussion, presentations, etc) based teaching, Student-centre (use of interactive learning strategies), making Experiment effective to lesson objectives and improvisation/innovativeness to enhance curiosity and to supplement conventional resources for promoting participation of as many students in the lessons.

The PDSI stands for Plan (of lesson activities and flow based on learners needs and abilities), Do the lesson activities systematically, **S**ee learner's growth in knowledge, skills and attitudes at all stages of lessons and Improve instructional process based on evaluation results (Waititu,2009). This was an attempt to make learning of mathematics and science student- centred as opposed to teacher centered as traditionally was. Student-centered learning is a pedagogical paradigm shift that is currently attracting immense attention. SMASE INSET is found on the premise that a teacher is made in the classroom, not in the lecture halls in colleges and universities. Its activities aim at strengthening of mathematics and science education.

Cannon and Newble (2000) define student-centered learning as: Ways of thinking about teaching and learning that emphasize student responsibility and activity in learning rather than content or what the teachers are doing. Essentially student-centred learning has student responsibility and activity at its heart, in contrast to a strong emphasis on teacher control and coverage of academic content found in much conventional, didactic teaching Suffice it to say, in student-centered approach to learning, teachers move from the center position to the side, from dispensers of knowledge they become advisors and facilitators of learning.

The initiative is providing in-service training to mathematics and science teachers with the purpose of enabling them to embrace teaching and learning that is student-centered.

Every teacher is expected to undergo four cycles of INSET, over a four year period. A cycle lasts ten working days, conducted once a year at district level.

The first cycle of national INSET was conducted at Kenya Science Training College (KSTC) in 1999 and district INSET in pilot districts in 2000. These districts have gone full circle, having conducted four cycles of INSET. The INSET curriculum was developed to strengthen teacher competence by addressing such areas as attitude, pedagogy/ teacher methodology, mastery of content. The four cycles or modules are:

Module 1: In the first year, the theme of training was on “Attitude change”, with objective of creating among the teachers a reason to accept teaching circumstances they find themselves in, and to do the best in those circumstances. The training explored rationale for continuous professional development and accorded participants with opportunity to own findings of the baseline survey, particularly the challenges relating to teachers. It then went on to handle topics on pedagogical issues in relation to how they limited or impeded quality learning outcomes. Such topics were: teachers’ and students’ attitudes; teaching approaches and methods; instructional design; adolescent psychology and gender issues; stress and stress management; classroom communication skills. These topics were then contextualized using some of the subject matter content which had been identified as challenging to teachers and learners.
Module 2: In the second year, the training rallied on a theme titled “Hands-on Activities”. During this training, only 3 pedagogical topics were covered: Resource utilization and Use of practical work in teaching and learning of mathematics and sciences; and ASEI Instructional design. Pedagogical topical issues in module 1 and in module 2 were contextualized in additional subject matter content identified as challenging to teachers and learners.
Module 3: In the third year, the training focused on “Actualising lesson based on ASEI – PDSI paradigm”. Hitherto, the training had been using peer teaching to exercise on desired pedagogical skills. Training in this third module moved the trainees into actual classrooms where teaching was done, with collegial support and evaluation. The actualization was strengthened by training on how to use communication skills for effective classroom interaction and also how to assess and evaluate teaching and learning process. More subject content matter among those areas that were challenging to teachers and learners was covered.
Module 4: In the fourth module, the theme was “Impact transfer”. It was tempered with review of some of the topics on pedagogical issues covered in module 1, 2 and 3, with key emphasis on how to impact on the learners.
Actualisation was then carried out again besides covering more of the content matter that had been identified as challenging to teachers and learners.
Quality Assuarance and Standards Officers workshop: Apart from practicing mathematics and science teachers who have undergone INSET training, Quality Assuarance and Standards Officers have been exposed to SMASE through workshops. QASOs are key stakeholders in the Kenya’s education system. Traditionally, their role has been to ensure quality delivery of the curriculum in the classroom. However with the coming of SMASE, QASOs have found their mandate expanded in matters beyond the classroom. QASOs coordinate SMASSE activities in the district. Their roles as coordinators include participation in the planning of INSET at district level and ensuring INSET attendance by teachers. QASO workshops have therefore proved to be a valuable source of information for effective coordination of SMASE activities and management of teachers during INSET at the district level.
Principals’ Workshop: In the SMASE initiative system, head of a School hosting an INSET Centre has responsibility of ensuring prudent utilisation of resources provided for INSET as well as ensuring quality of accommodation for the INSET participants (Waititu,2009).
The other key principal in the management of SMASE activities is the chairperson of the District Secondary Schools heads’ Association whose responsible is to sensitise all other head teachers to support the INSET activities. The duties of these two sets of principals are expounded during workshop organised for them and, which is also attended by selected head teachers, those who are thought to hold negative attitudes towards SMASE programme, those with poor school management practices; those head teachers who are very supportive and or practice good in school management.
District Education Officers’ workshop: TheDEO is the chairman of the District Planning Committee and therefore the driving force behind effective management of INSET at the district. INSET at the district level where the DEO has been active have registered high quality, turnout and participation by the teachers. So far five DEOs workshops have been held in the years 2003, 2005, 2006, 2007 and 2008. All the DEOs have been sensitized (Karega, 2008). Unlike the principals and the QASOs workshops, DEOs workshops have been held when need arises and therefore have had different themes and objectives.
In Koibatek district, teachers teaching mathematics and science have undergone SMASE INSET. The District Education Officer, Quality Assuarance and Standards Officers and Principals have undergone sensitization workshops on SMASE.

1.3.Statement Of The Problem

According to National Development Policy (Republic of Kenya, 2007), Kenya is aiming to be an industrialized country by 2030. However, Mathematics and Science subjects are poorly performed, yet industrialization relies so much on the two (Kibe et al., 2008). SMASE was introduced to improve the performance of Mathematics and science subjects. A lot of funds have been used to train teachers, DEO’s and QASO’s to implement SMASE initiative, for instance, According to the Ministry of Education budget for 2007-2010, the amount of money that would facilitate SMASE program at district level was estimated to be Kenya Shillings 100 million per year (Ministry of Education, 2007). Despite the existence of SMASE for the last 13 years in Kenya, performance in these subjects remains poor.
At the national level, the mean score for mathematics for the last three years is 22.09 %, 28.21 % in Biology, 33.23 % in Physics and 22.02 % in Chemistry. In Koibatek district, the Kenya Certificate of Secondary Education performance in mathematics for the last four years is poor with those obtaining mean score of C and below being 87.39 % in 2007, 81.74% in 2008, 82.88% in 2009 and 83.72% in 2010. In Biology, those who scored mean score C and below was 64.35 % in 2007, 88.15 in 2008, 73.57 % in 2009 and 72.34 % in 2010. In physics, those with M.S C and below were 75.99 % in 2007, 65.22 % in 2008, 78.12 % in 2009 and 76.6 % in 2010. In chemistry those with M.S C and below were 81.94 % in 2007, 83.69 % in 2008, 87.50 % in 2009 and 83.96 % in 2010.

1.4.Objectives Of The Study

The general objective of the study is to investigate the factors affecting the success of SMASE initiative in secondary schools in Koibatek sub county, Baringo county.

The specific objectives of the study include;

- To determine the extent to which teachers' attitude towards the use of ASEI/ PDSI approaches in the teaching of mathematics and science affects the success of SMASE.
- To investigate how the school administration support affects the success of SMASE.
- To determine how monitoring affects success of SMASE.
- To investigate the extent to which students' attitude affects the success of SMASE

1.5.Research Questions

To answer the above objectives, the following research questions were formulated:

- To what extent do the teachers' attitudes towards the use of ASEI/PDSI approaches affect the success of SMASE?
- How does the administration of schools support the use of ASEI/PDSI approaches affect the performance of SMASE?
- How does monitoring of the use of ASEI/PDSI approaches in schools affect the performance of SMASE?
- How does students' attitude affect the success of SMASE?

1.6.Justification

The findings of this study will be useful to different stakeholders of SMASE initiative in different ways:

School administration: The Principal, Deputy Principal and the Heads of Departments will use the findings to reflect on the extent to which the ASEI/PDSI approaches are used in schools. The findings will also provide valuable information on the factors that are affecting the success of ASEI/PDSI approaches in the teaching of mathematics and sciences.

District Planning Committee (DPC) and Centre for Mathematics, Science and Technology Education in Africa (CEMASTEA): The DPC and CEMASTEA will use the findings to improve on SMASE curriculum to make the initiative successful. The findings will also give a reflection to DPC and CEMASTEA on the state of affairs in the use of ASEI/PDSI approaches in order to justify expenses used in training teachers.

The Government: It will use the findings to formulate policies that will lead to effective teaching of sciences and mathematics through the use of ASEI and PDSI approaches which is essential in the achievement of vision 2030.

1.7.Scope Of The Study

The study was carried out in Koibatek sub - county, Baringo County. It covered the factors affecting the success of SMASE initiative, teachers' attitude towards the use of ASEI/PDSI approaches in teaching mathematics and science, the monitoring of ASEI/PDSI approaches, support of administration in the use of ASEI/PDSI approaches in teaching mathematics and how students' attitude towards mathematics and science affects success of SMASE. Access to research participants in the research was enabled through the school's administration.

1.8.Limitations Of The Study

The study had limitation. The administration of schools and teachers were suspicious as to the intention of the study. It led to hesitation in releasing vital information which will assist in achieving objectives of the study. The researcher overcame suspicion by assuring the administration and the teachers that the information collected will only be used for research purpose.

2.Literature Review

2.1.Introduction

This chapter describes the literature review on the relevant area; its intention is to identify the missing gaps and to provide a rationale for the current study. The literature was reviewed from textbooks, journals, magazines and internet. A critical review was provided to show the areas left out by the previous authors whom the current study is trying to bridge.

2.2 Theoretical Review

<u>2.2.1.Factors Affecting The Success Of Projects</u>

Different researchers have tried to determine the factors for a successful project for a long time. Lists of variables have been abounded in the literature, however, no general agreement can be made. Five major groups of independent variables, namely, project - related factors, project procedures, project management actions, human-related factors, and external environment are identified as crucial to project success.

Several authors have discussed the importance of clearly defining goals at the outset of the project. Morris (1983), classified the initial stage of project management as consisting of a feasibility decision. Are the goals clear and can they succeed? Bardach's (1977) six-step implementation process begins with instructions to state the plan and its objectives. For both these authors , project Mission has been found to refer to the condition where the goals of the project are clear and understood, not only by the project team involved, but by the other departments in the organization. Underlying themes of responses classified into this factor include statements concerning clarification of goals as well as belief in the likelihood of project success.

Project schedule refers to the importance of developing a detailed plan of the required stages of the implementation process. Ginzberg (1979) has drawn parallels between the stages of the implementation process. Kolb and Frohman's model of the consulting process views planning as a two-directional stage, not only as necessary to the forward-going change process, but as an additional link to subsequent evaluation and possible re-entry into the system. Wutt further emphasizes the importance of process planning, breaking down planning into four stages: formulation, conceptualization, detailing, and evaluation. Further, the schedule should include a satisfactory measurement system as a way of judging actual performance against budget and time allowances.

The need for client consultation has been found to be increasingly important in attempting to successfully implement a project. The "client" referred to here is anyone who will ultimately be making use of the result of the project, as either a customer outside the company or a department within the organization. Indeed, Manley found that the degree to which clients are personally involved in the implementation process will cause great variation in their support for that project. Client Consultation expresses the necessity of taking into account the needs of the future clients, or users, of the project. It is, therefore, important to determine whether clients for the project have been identified. Once the project manager is aware of the major clients, he is better able to accurately determine if their needs are being met.

An important, but often overlooked, aspect of the implementation process concerns the nature of the personnel involved. Personnel issues includes recruitment, selection, and training. In many situations, personnel for the project team are chosen with less-than-full regard for the skills necessary to actively contribute to implementation success. Some current writers on implementations are including the personnel variable in the equation for project team performance and project success. Hammond (1979) has developed a contingency model of the implementation process which includes "people" as a situational variable whose knowledge, skills, goals, and personalities must be considered in assessing the environment of the organization. Further, it is important to determine whether project management has built sufficient commitment toward project success on the part of team members.

It is important that the implementation be well managed by people who understand the project. In addition, there must exist adequate technology to support the project. Technical Tasks refers to the necessity of not only having the necessary personnel for the implementation team, but ensuring that they possess the necessary technical skills and have adequate technology to perform their tasks. Steven Alter, writing on implementation risk analysis, identifies two of the eight risk factors as being caused by technical incompatibility: the user's unfamiliarity with the systems or technology, and cost ineffectiveness.

It is importance to determine whether the clients for whom the project has been initiated will accept it. client acceptance refers to the final stage in the implementation process, at which time the ultimate efficacy of the project is to be determined. Too often project managers make the mistake of believing that if they handle the other stages of the implementation process well, the client (either internal or external to the organization) will accept the resulting project. In fact, as several writers have shown, client acceptance is a stage in project implementation that must be managed like any other. As an implementation strategy, Lucas discusses the importance of user participation in the early stages of system development as a way of improving the likelihood of later acceptance. Bean and Radnor (1979) examine the use of "intermediaries" to act as a liaison between the designer, or implementation team, and the project’s potential users as a method to aid in client acceptance.

2.2.2.Attitude Of Teachers And Success Of SMASE Initiative

Laycock and Munro (1966) citing Hilgard (1956) defined attitude as being “An orientation towards or away from some object, concept or situation and a readiness to respond in a predetermined manner to related object, concepts or situations.” New-Comb (1949) was also cited by Laycock et. al. (1966) as defining attitude as follows: “ An attitude is not a response, but a more or less persistent respond in a given way to an object or situation.”

Ngatia (1981) noted that, “Attitude have a direct bearing on behaviour.” He further observed that; an individual’s attitude has an indispensible function towards the individual’s behaviour.

These definitions and discussions indicate that attitude play a great role in an individual’s tendency towards or away from an object, concept, or situation if an individual is given a choice. Hence its relevance to our research problem. If a teacher has a negative attitude towards the use of ASEI/PDSI approaches, this would be evidenced by their tendency to move away from it, that is, avoid using the approaches. If on the other hand, a teacher had a positive attitude towards the use of ASEI/PDSI, this would be made evident by their tendency to use them when one has a choice to do so.

If it can be ascertained that teachers have a negative attitude towards the use of ASEI/PDSI, it can easily be predicted how they (teachers) are likely to behave if they are provided with the apparatus and chemicals to be used in classroom teaching. A good step, therefore, is to change their attitude towards these approaches. Similarly, if it can be ascertained that their attitude towards the approaches is positive, then the logical step here is to avail the necessary apparatus, chemicals and all the support.

Laycock and Munro (1966) noted that, “An individual’s attitude is not open to direct observation as is their height or the color of their eyes. Instead, attitudes are established through the inferences made by an observer as they examine the individual’s behavior which, of course can be observed directly.” This illustrates clearly that there is an emotional as well as an intellectual component to attitude. Trainers of SMASE, principals and teachers of mathematics and science preach the need to use ASEI/PDSI approaches to facilitate student centered learning process and to make learning interesting, but they may not embrace the practice themselves.

2.2.3.Management Support And Success Of SMASE Initiative

As noted by Schultz and Slevin (1987), management support for projects, or indeed for any implementation, has long been considered of great importance in distinguishing between their ultimate success or failure. Beck (1983) sees project management as not only dependent on top management for authority, direction, and support, but as ultimately the conduit for implementing top management's plans, or goals, for the organization. Further, Manley shows that the degree of management support for a project will lead to significant variations in the clients' degree of ultimate acceptance or resistance to that project or product.Top Management Support refers to both the nature and amount of support the project manager can expect from management both for himself as leader and for the project. Management's support of the project may involve aspects such as allocation of sufficient resources (financial, manpower, time, etc.) as well as the project manager's confidence in their support in the event of crises.

Principals of schools play key role in the success of SMASE for they are the Chief Executive Officers in their schools. Their decisions in the prioritization of initiatives in schools, for instance, purchase of basic apparatus, equipments and chemicals to be used in the teaching of mathematics and science, significantly affect results in these subjects and hence the success of SMASE. The construction of laboratory in school is a decision a principal needs to prioritize for it has direct bearing on performance in science. The availability of adequate teachers teaching mathematics and science in school is a responsibility principals of schools have to ensure for the success of SMASE. Where the teachers are inadequate, the few available teachers will be overloaded with lessons and hence less time available to prepare ASEI lesson plans and use them in class. If the teachers are enough in a school, they will have adequate time to prepare ASEI lesson plans and use them in class for they have optimum lessons.

A principal of school that support the success of SMASE is evidenced by availability of adequate teachers of mathematics and science, apparatus and chemicals and laboratory in school, while the one that do not suport have few or no teacher of mathematics and science, avail few or no apparatus and chemicals or do not avail these items regularly as required. The school with a principal that do not support the success of SMASE do not have a laboratory.

2.2.4.Monitoring And Success Of SMASE Initiative

Monitoring represents an on – going activity to track project progress against planned tasks. It aims at providing regular oversight of the implementation of an action in terms of input delivery, work schedules, targetted outputs etc. Monitoring and Feedback also refers to the project control processes by which at each stage of the project implementation, key personnel receive feedback on how the project is compared to initial project. Making allowances for adequate monitoring and feedback mechanisms gives the project manager the ability to anticipate problems, to oversee corrective measures, and to ensure that no deficiencies are overlooked. Schultz and Slevin (1975) demonstrate the evolving nature of implementation and modelbuilding paradigms to have reached the state including formal feedback channel between the model builder and the user. From a budgeting perspective, Souder et al. (1975) emphasize the importance of constant monitoring and "fine-tuning" of the process of implementation. For the model, Monitoring and Feedback refers not only to project schedule and budget, but to monitoring performance of members of the project team. Monitoring continuously tracks performance against what was planned by collecting and analysing data on the indicators established for monitoring and evaluation purposes. It provides continuous information whether progress is being made towards achieving results (outputs, outcomes, goals) through record keeping and regular reporting systems.

Monitoring looks at both programme processes and changes in conditions of target group and institutions brought about by program activities. It identifies strengths and weaknesses in a program. The information generated from monitoring enhances learning from experience and improves decision making. Monitoring of the use of ASEI/PDSI approaches in the teaching of mathematics and science at school can be done by the principal, deputy principal or heads of department. Through monitoring, reasons for non use of these approaches can be obtained with a view of overcoming the challenges experienced. If from monitoring, it is found out that the approaches are implemented, the administration of the school will find ways of even improving it more. Schools with monitoring mechanisms will realise success in the performance of mathematics and science than schools without.

2.2.5.Students' Attitude And Success Of SMASE Inititive

Attitude is a central part of human identity. Everyday people love, hate, like, dislike, favour, oppose, agree, disagree, argue, persuade etc. All these are evaluative responses to an object. Hence attitudes can be defined as, "a summary evaluation of an object of thought" (Bohner & Wänke, 2002). They are inclinations and predispositions that guide an individual's behaviour (Rubinstein, 1986) and persuade to an action that can be evaluated as either positive or negative (Fishbein & Ajzen, 1975). Attitudes develop and change with time (Rubinstein, 1986). According to Multicomponent model of Attitude (Eagly & Chaiken, 1993), attitudes are influenced by three components. They are cognitive (beliefs, thoughts, attributes), affective (feelings, emotions) and behavioural information (past events, experiences) (G. Maio, G. R. Maio, & Haddock, 2010).

When reviewing literature on students' attitude towards mathematics and science, it reveals that several factors play a vital role in influencing students' attitude. These factors can be categorised into three distinctive groups. Firstly, factors associated with the students themselves. Some of these factors include students' mathematical and science achievement score (Köğce et al, 2009), anxiety towards mathematics and science, students' self efficacy and self concept, extrinsic motivation (Tahar et al, 2010) and experiences at high school (Klein, 2004; Bobis & Cusworth, 1994). Secondly, the factors that are associated with the school, teacher and teaching. Some of these factors that influence attitudes are teaching materials used by teacher, teachers' classroom management, teachers' content knowledge and personality, teaching topics with real life enriched examples, other students' opinions about mathematics and science courses (Yilmaz, Altun & Olkun, 2010), teaching methods, reinforcement (Papanastasiou, 2000), receiving private tuition

(Köğce et al, 2009), teachers' beliefs towards mathematics and science (Cater & Norwood, 1997) and teachers' attitude towards mathematics and science(Ford, 1994, Karp, 1991).

Thirdly, factors from the home environment and society also affect students' attitude towards mathematics and science. Factors such as educational background of parents, occupation of parents (Köğce et al, 2009) and parental expectations (Tobias, 1993) play a crucial role in influencing students' attitude towards mathematics and science. Due to these several factors students have different attitude towards mathematics and science.

More often, the public image of mathematics is labeling it as a difficult, cold, abstract, theoretical and ultra rational subject (Ernest, 2004).

2.2.6.Conceptual Framework

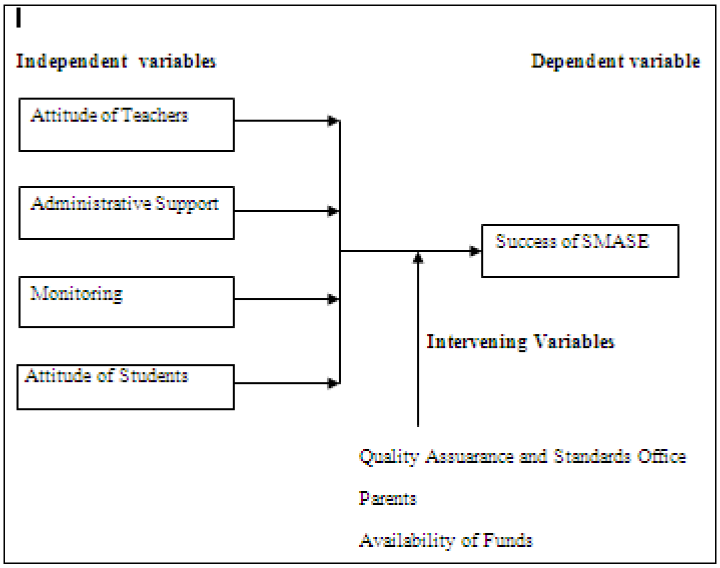

Figure 1: Conceptual Framework Of The Study Variables

However for our study, we will not discuss the intervening variables of the research study.

2.3.Critique Of The Existing Literature

Diferrent researchers have determined that success (or failure) of projects depends on project procedures, project management actions, human related factors and external environment and identified these as crucial to project success. However no general agreement can be made as to whether these are the only contributory factors to the failure of projects. There is absence of literature on more difficult challenges like shortage of qualified teachers and facilities to teach science and maths courses, which are increasingly attracting many students. At secondary level, for example, available reports indicate severe staff shortage yet student population is increasing. This raises the fundamental question about the quality of learning.

A report published by the Department of Higher Education (Science and Technology) indicates that all public secondary schools are facing serious shortage of science and maths teachers; there is 1 teacher for 70 students. Yet international standards provide for a ratio of 1:30 for humanities and 1:25 for sciences. Matters are worse for the newly established or district schools, as they cannot attract qualified teachers, let alone science/maths teachers.

The reason for this state of affairs is the low pay package and lack of facilities which make science and maths teaching unatractive. The almost free secondary school education system that was introduced in 2002 has brought in no additional incomes, but have raised enrolment and compromised quality. This calls for time to explore viable options to fund schools so that they can attract top notch mathematics and science teachers and offer efficient learning inputs.

2.4.Summary Of Literature Review

The government of Kenya recognizes the important role science and mathematics should play in the realization of vision 2030; to become a globally competitive and prosperous country by 2030. This has been reflected in the amount of resources both human and otherwise that are channeled towards enhancing the teaching and learning of science and mathematics at all levels of the education system. At secondary school level, there have been a number of intervention strategies that the government has put in place to ensure effectiveness in the teaching/learning of these subjects. In addition to strategies such as: providing schools with qualified mathematics and science teachers and improving their remuneration and terms of service; providing schools with science equipment and even constructing laboratories, the government has also institutionalized In-service Education and Training (INSET) of serving science and mathematics teachers under Strengthening of Mathematics and Science Education (SMASE) initiative and quite a substantial amount of the Ministry of Education's budget goes towards this course (MoE, 2005). The INSET under SMASE was to raise relevance and quality in secondary education. INSET is one of the approaches employed to up-grade teachers' skills and competence the world over (Karega 2008) and is in conformity with worldwide consensus that improving quality of education depends on improvement of quality of classroom practices (Kibe et el 2008). Indeed cases have been noted of schools where there were qualified teachers or adequate equipment and materials, yet students' achievement in the mathematics and science subjects had not been necessarily high (Kibe, et el 2008). On the contrary, there were poorly endowed schools in terms of facilities and scholarly material, yet they posted relatively better examination results owing to effective teaching and management of learning environment.

In the process of developing the SMASE INSET curriculum, a pedagogical paradigm of "ASEI" movement by application of "PDSI" approach, was constructed. This paradigm, around which the training was to rally the teachers, espouses learner – centered methods where learners are actively involved in the learning process rather than being passive receivers of knowledge, with the teacher guiding the learning process. The curriculum enhances teachers' attitudes, pedagogical knowledge and skills; content mastery and skills of making and utilizing teaching/learning aid and materials.

The effect of application of ASEI & PDSI pedagogic paradigm in the teaching practices can make mathematics and science subjects to become more relevant to learners, more practical and therefore more interesting, less expensive and more accessible. Teachers improve their skills in work planning, monitoring learning achievement, self and collegial follow–through and follow–up lesson evaluation and utilization of feed back to improve subsequent lessons.

The activities of the Initiative aim at strengthening the teaching and learning of mathematics and sciences. The teachers are empowered through INSET to use student interactive teaching methods and equipping the teachers with necessary skills for classroom practices so as to put emphasis on interactive teaching and learning. Waititu (2008), notes that the INSET generally accords teachers opportunity to explore ways of; Creating opportunity for learners to take responsibility for their own learning, Employing inquiry-based approach as opposed to recipe-type experiments, using interactive learning methods, Improvising not only to augment conventional equipment, apparatus/materials but also to arouse interest and curiosity among learners, drawing content and examples from the learners' real life experiences in order to capture their interest and imagination, enhancing ability and appreciation for work planning with specific reference to sequencing,learning concepts, activities and events, systematic execution of the learner-centred teaching/learning process, evaluation of the teaching-learning process against lesson objectives and outcomes and enhancing content mastery and ability to incorporate cross cutting issues.

Because of the above reasons, the application of ASEI/PDSI approaches in the teaching of mathematics and science can improve performance of these subjects greatly if the attitude of the teacher is positive, the administration supports the use of the said approaches, that an effective monitoring mechanism is in place to check on the use of the approaches and if the attitude of the students is positive.

2.5.Research Gaps

Many researchers have done a lot of work on the factors affecting the success of projects. Many of these projects are non educational in nature. However, very little has been done on the factors that affect the success of SMASE initiative. The dismal performance in mathematics and science subjects in the country of which the initiative was meant to address is a clear testimony of this fact. The little research that has been carried out has not addressed the factors that affect the success of SMASE initiative and therefore this research will fill the gap.

3.Methodology

3.1.Introduction

This chapter provides information on the research design, population, sampling frame, sample and sampling technique, data collection procedure and data processing analysis. It will also include reliability and validity of the instruments.

3.2.Research Design

This study used descriptive survey design. The design was appropriate for the study because it gave the factors that affect the success of SMASE in different schools at a point in time. It is useful because it provides a snapshot of what is going on with a variable of interest. Access to research participants in the research was made possible through the Ministry of Education. Quantitative research was conducted, using in-depth interviews as a primary source of data (Smith, Thorpe and Lowe, 1997).

3.3.Population

The study targeted 25 secondary schools in Koibatek sub – county and out of these, 4 girls boarding school, 3 boys boarding school and 3 mixed day secondary schools were sampled. The population of the study included all principals, deputy principals, heads of departments, teachers and students in secondary schools in Kenya. Target population included principals, deputy principals, heads of departments, teachers and students in secondary schools in Koibatek sub - county, Baringo county. It targeted a population of 25 principals, 25 deputy principals, 50 heads of departments, 350 teachers and 5,200 students.

3.4.Sampling Frame

Strata	Target schools	Sample size
Girls Boarding	6	4
Boys Boarding	5	3
Mixed Day	13	3
Mixed Boarding	1	0

Table 1: Sample Size
Source: District Education Office – Koibatek (2013)

The principals and their deputies were sampled using purposive sampling procedure. According to Mugenda and Mugenda (1999), purposive sampling allows a researcher to use respondents (the principals and their deputies) who have the required information with respect to the objectives of the study. The sampling of 20 heads of departments, 50 teachers and 258 students were obtained using simple random sampling design where every teacher and student had an equal chance of inclusion in the sample (Kothari, 2009) and involved assigning a number to every member of the population groups in every school and writing on a piece of paper. The pieces of paper were then placed in a container, then one piece after the other was picked at random and the participant corresponding to the number picked was included in the sample (Mugenda and Mugenda 1999).

3.5.Sample And Sampling Technique
The study adopted two sampling procedures. Stratified sampling was used to select schools. Simple random sampling techniques was used to select a sample in the target population which comprised principals, deputy principals, heads of departments, teachers and students. This method will give each respondent an equal chance of being selected.

3.6.Instruments
The study used two types of instruments; questionnaires and an interview schedule. The questionanaires were closed ended. Closed ended questionnaire captures quantitative data which allows for statistical analysis. The use of a questionnaire is preferred because it is time saving and allows for the collection of data from the relatively large number of respondents and it is for this reason that Kathuri & Pals (1993) observed that questionnaires are used to collect basic descriptive information from a broad sample. They are also least costly and easy to quantify and summarize the results (Bell, 1993 & Kane, 1995). The Likert type scale used comprised five (5) response categories namely: S.A = Strongly Agree, A= Agree, N = Neutral, D=Disagree, S.D= Strongly Disagree.

3.7.Reliability And Validity Of Instruments
Validity is the extent to which an instrument measures what it purports to measure (Kimberlin & Winterstein, 2008). Content validity of the research instruments was established through constructive criticism from experts who have extensive experience and expertise in questionnaire construction. Reliability of the instruments is the extent to which any measuring procedure yields the same results on repeated trials. The reliability of the instruments was improved through piloting in some schools. The schools used during piloting were not used during collection of data.

3.8.Data Collection Procedure
In preparing to collect data, the researcher acquired research introduction letter from Jomo Kenyatta University of Agriculture and Technology authorizing him to conduct research. He then made courtesy call at the District Education Office (DEO) – Koibatek to give him/ her introductory letter. The DEO then wrote a letter to introduce the researcher to the selected secondary schools principals. The researcher then paid a courtesy call and rung some principals to explain the purpose of the study, organize for administration of the questionnaires to the respondents. On the agreed scheduled dates the researcher then visited the respective schools and collected data from respondents.
After the researcher briefed the respondents on the purpose of the study and instructions regarding expected information from the questionnaires, he administered the questionnaires to the principals, heads of departments, teachers and students and collected them immediately after the respondents have responded to the items. The interview schedule for the principal was administered through an interview approach. All respondents were assured of confidentiality in all information that he/she provided to the researcher.

3.9.Data Processing And Analysis
The first thing the researcher did with his data was tabulate the results for the different variables in the set of data. This process gives a comprehensive picture of what the data looks like and assist in identifying patterns. It was done by constructing frequency and percent distributions. A frequency distribution is an organized tabulation of the number of individuals or scores located in each category
In analyzing the quantitative data collected using questionnaires, descriptive statistics was run. The qualitative data which was collected using the interview guide was also analyzed. Using SPSS version 17.0 programs, descriptive statistics was used to analyze quantitative data collected using the questionnaire. Data was organized, summarized and descriptive statistics comprising mean responses, median responses and standard deviation worked out. The statistics was presented on contingency tables in such a way that

it becomes easier to understand and conclusions drawn based on the research objectives regarding factors affecting the success of SMASE initiative. The data was then used to run descriptive statistics.

4.Research Findings And Discussion

4.1.Introduction

This chapter gives the findings of the research. The findings from the respondents on the various research variables are provided as found out from the research. The chapter also presents the findings of the response rate and demographic data. The responses were analyzed using descriptive statistics and data presented in tables.

4.2.Mathematics And Science Teachers' Attitude And Success Of SMASE

In order to answer the research question which addressed teachers' attitude towards the use of ASEI/PDSI approaches, and hence the success of SMASE, teachers were given items in which they were required to state the extent to which they agreed or disagreed with the item statement. The scoring was on the scale of 1 to 5 where: 1 = Strongly Disagree; 2 = Disagree; 3 = Neutral; 4 = Agree; 5 = Strongly Agree. The researcher administered questionnaires to 30 respondents out of which 18 were male and 12 female teachers of mathematics and sciences. The male respondents comprised 62.1 %, while the female comprised 37.9 % of the total respondents. All the respondents filled in the questionnaire

89.6 % of the mathematics and science teachers who filled the questionnaires generally agreed that they involved their students in experiments, with the highest percentage (100 %) of them having teaching experience of 0 – 2 years. 83.4 % of the respondents with teaching experience of between 10 – 15 years agree that they involve their students in experiments whereas 16.6 % disagree.

65.5 % of mathematics and science teachers agree that ASEI/PDSI is working in school whereas 24.1 % disagree on this, 10.9 % were neutral. 50 % of these teachers with working experience of between 10 – 15 years disagree that the approaches are working in school. These findings show that as the teaching experience of teachers advances, they embrace less of SMASE teaching approaches than those that are still young in the profession. On whether ASEI/PDSI are a waste of time, 62 % disagreed on this whereas 26.1 % agreed that it is a waste of time. On preparation of ASEI lesson plan, 37.9 % disagreed that they prepare, whereas 31 % were neutral on this. 32 % of mathematics and science teachers agreed that they prepare the ASEI lesson plan. This shows that few teachers prepare an ASEI lesson plan which guides them on implementation of SMASE teaching approaches.

On improvisation of teaching and learning materials every lesson, 62.1 % of mathematics and science teachers agreed that they improvise whereas 10.3 % disagreed on this and 27.6 % were neutral. Improvisation of apparatus is part of SMASE teaching approaches that require teachers to improvise in case the apparatus are not available but can be improvised. 75.5 % of mathematics and science teachers agree that they evaluate their teaching every lesson whereas 6.9 % disagree on this and 17.2 % were neutral. Evaluation after every lesson gives the teacher an opportunity to improve in the subsequent lessons. 72.4 % of mathematics and science teachers agree that they do experiments regularly in science whereas 13.7 % disagree on this and 13.8 % were neutral. 73.9 % of the respondents agree that SMASE adds to knowledge whereas 10.3 % disagree and the same percentage was neutral. 72.4 % of these teachers agree that SMASE solves problems in teaching whereas 10.3 % disagree and 17.2 % were neutral.

On average 53.3 % of mathematics and science teachers had positive attitude towards SMASE whereas 46.7 % had neither positive nor negative attitude towards the same. These findings show that more of attitude change needs to be done on teachers who have not undergone the "attitude change" cycle of SMASE.

	S.A	**A**	**N**	**D**	**S.D**
1. I always involve my students in experiments	44.8	44.8	3.4	6.9	
2. ASEI/PDSI approaches are working in school	13.8	51.7	10.3	24.1	
3. ASEI/PDSI are not a waste of time	24.1	37.9	13.8	17.2	6.9
4. I do prepare ASEI lesson plan	6.9	24.1	31.0	31.0	6.9
5. I require laboratory in most of my lessons	24.1	44.8	3.4	27.6	
6. I improvise teaching materials every lesson	6.9	55.2	27.6	10.3	
7. I evaluate my teaching after every lesson	20.7	55.2	17.2	6.9	
8. We perform experiments regularly in science	10.3	62.1	13.8	10.3	3.4
9. SMASE adds to knowledge	34.4	44.8	10.3	10.3	
10. SMASE solves problems in teaching	31.0	41.4	17.2	6.9	3.4
Average responses	**3.3**	**50.0**	**46.7**		

Table 2: Mathematics And Science Teachers Summary Of Responses

4.3.School Administration Support And Success Of SMASE

The school administration includes the principals, deputy principals and the heads of departments. A total of 8 principals responded to the questionnaires and interview schedule of which 5 were male and 3 were female. 16 heads of department of mathematics and science responded to the questionnaires of which 7 were male and 9 female. All the respondents filled in the questionnaires.

Out of 8 principals that filled in the questionnaires, 37.5 % were either science or mathematics teachers, whereas 62.5% were teachers of other subjects. It was found out that 37.7 % were teaching between 19 and 27 lessons while 50 % were teaching over 27 lessons per week. This workload is on the higher side as preparation of SMASE teaching approaches requires a lot of time and thus the lessons per week should be less. On whether SMASE is working in school, 62.5 % agreed while 37.5 % were neutral. 87.5 % of the principals agreed that they remind teachers on the use of SMASE approaches in the teaching of mathematics and science whereas 12.5 % were neutral. 75 % of the principals who answered the questionnaire have been sensitized about SMASE whereas 25 % have not. This clearly shows that they know what is expected of them in as far as SMASE implementation is concerned. 87.5 % of the principals agreed that chemicals and apparatus required for experiment are always available on time while 12.5 % were neutral. 87.5 % of the principals agreed that all apparatus and equipment required in school are available, whereas 12.5 % were neutral. For SMASE to be effective equipments and apparatus should be available for the students to perform hands on activities. On whether the school has a laboratory, 87.5 % agreed while 12.5 % were neutral on this. 87.5 % of the principals agreed that the textbook – student ratio in mathematics and science is as recommended by the Ministry of Education, while 12.5 % were neutral. The apparatus, laboratory and good textbook – student ratio shows clear priorities the principals have on improvement of mathematics and science.

In general, it can be concluded that the principals support SMASE in schools by providing the apparatus and equipments required in the teaching of science and SMASE. They also avail the textbooks and laboratory and remind teachers on the use of SMASE approaches in the teaching of mathematics and science in schools in Koibatek secondary schools.

The heads of departments in their response, agreed with the above. On the number of lessons taught per week, the heads of department teaching between 8 – 12 lessons per week were 6.3 %, 13 – 18 lessons per week were 12.5 %, 19 – 27 lessons per week were 56.3 % and those teaching over 27 lessons per week were 25 %. On the number of years as head of department, 56.3 % had served for between 0 – 2 years, 31.3 % had served for between 3 – 5 years and 12.5 % had served for between 6 – 9 years.

	S.A	**A**	**N**	**D**	**S.D**
1. SMASE is working in school	6.3	43.8	18.8	0	31.3
2. I always remind teachers the need to use ASEI/PDSI approaches in teaching mathematics and science	12.5	62.5	12.5	12.5	
3. I have undergone SMASE sensitization	50.0	25.0	12.5	0	12.5
4. The chemicals and apparatus required for experiments are always available on time	62.5	25.0	12.5		
5. All the required apparatus and chemicals are available in school	50.0	37.5	12.5		
6. The school has a laboratory	62.5	25.0	12.5		
7. The textbook – student ratio for mathematics and science is as recommended by Ministry of Education	37.5	50.0	12.5		
Average responses		**100**			

Table 3: School Administration Support Summary Of Responses

4.4.Monitoring And Success Of SMASE

The researcher asked the school administration whether there is monitoring mechanisms existing in the school on the use of ASEI/PDSI approaches, 35.5 % agreed on this item while 10.8 were neutral and 53.7 % disagreed on this. This shows that more than half of the schools do not have a monitoring mechanism to check whether what is expected to be done in the teaching of mathematics and science is actually done in class. On whether the school administration regularly monitors the use of ASEI/PDSI approaches, 28.4 % agreed, 11.8 % were neutral while 59.8 % disagreed on this. From the number of lessons taught per week by the administration and the teachers of mathematics and science, it is clear that regular monitoring of implementation of SMASE teaching approaches will be ineffective because of the high work load of the administration and teachers of mathematics and science. The researcher further wanted to know if the information collected from monitoring process is used to improve on the use of ASEI/PDSI approaches, 30.6 % agreed, 10.3 % were neutral while 59.1 % disagreed on this. This is true because the monitoring which is supposed to be used to give feedback is poorly done.

The researcher asked the school administration whether the monitoring of the use of ASEI/PDSI approaches is beneficial to the teaching learning process, 62.6 % agreed, 18.8 % were neutral while 18.8 % disagreed on this. The school administration acknowledges the importance of monitoring of the implementation of SMASE teaching approaches but little is done to address it due to factors like the number of lessons per week. On whether the district quality assurance and standards officers from the district education office visits the schools to monitor the use of ASEI/PDSI approaches, 18.8 % agreed, 25 % were neutral and 56.3 % disagreed that these officers regularly visits their schools to monitor SMASE. The DQASO have a role of overseeing the implementation of SMASE teaching approaches by regularly visiting schools, but from the response, this is not effectively done.

The average response was 12.3 % were neutral and 87.7 % disagreed that there is monitoring mechanism on the use of ASEI/PDSI approaches in the teaching of mathematics and science in Koibatek sub – county.

	S.A	A	N	D	S.D
1. I have a monitoring mechanism existing in school on the use of ASEI/PDSI approaches	10.3	25.5	10.8	43.3	10.1
2. I regularly monitor the use of ASEI/PDSI approaches	12.3	16.1	11.8	32.4	27.4
3. The information collected from monitoring process is used to improve on the use of ASEI/PDSI approaches in teaching mathematics and science	9.6	21.0	10.3	37.3	21.8
4. The monitoring of the use of ASEI/PDSI approaches by the administration is beneficial to teaching/learning process	40.1	22.5	18.8	10.1	8.7
5. DQASO visits schools to monitor the use of ASEI/PDSI approaches	8.8	10.0	25.0	32.2	24.1
Average responses			**12.3**	**87.7**	

Table 4: Monitoring Of SMASE Summary Of Responses

4.5.Students Attitude And Success Of SMASE

The number of students who filled in the questionnaires was 177 out of which 84 were male and 93 female students which represented 47.5 % and 52.5 % respectively. All the respondents filled in the questionnaires. From the findings, 86.5 % were found to like mathematics, 10.2 % were neutral and 3.4 % disagreed. In science 89.3 % agreed, 9.6 % were neutral and 1.1 % disagreed that they liked sciences. When the students were asked whether they participate actively in mathematics lessons, 77.3 % agreed, 16.9 % were neutral while 5.7 % disagreed. On whether the students enjoyed mathematics especially when there are experiments, 76.1 % agreed, 13.0 % were neutral and 10.8 % disagreed. In sciences, 93.8 % agreed, 5.1 % were neutral and 1.1 % disagreed that they enjoyed sciences especially when there are experiments.

The students were asked whether mathematics should be made optional which 24.8 % agreed, 7.3 % were neutral while 67.8 % disagreed on this. The students were further asked whether their score in mathematics are usually low, 35.6 % agreed, 21.5 were neutral while 42.2 % disagreed on this. In sciences, 21.7 % agreed, 28.0 % were neutral while 49.7 % disagreed that their scores in sciences are usually low. On whether the students like their mathematics teachers, 91.4 % agreed, 4.5 % were neutral while 4.0 % disagreed. In sciences, 92.0 % agreed, 4.5 % were neutral while 3.5 % disagreed that they like their science teachers. 65.3 % of the students agreed that their teachers of science use materials that make the subject interesting and enjoyable, 17.5 % were neutral while 16.9 % disagreed. In mathematics 61.4 % agreed, 16.4 % were neutral while 22 % disagreed that their teachers of mathematics use materials that make the subject interesting and enjoyable.

Students were also asked if they like their mathematics teachers, 91.4 % agreed, 4.6 % were neutral and 4.0 % disagreed. In science, 92.0 % agreed, 4.6 % were neutral and 3.5 % disagreed that they like their science teachers. On whether the students were doing many sums in mathematics every day, 57.1 % agreed, 31.1 % were neutral and 10.7 % disagreed on this item. The researcher further asked the students whether they like the way their mathematics teacher teaches them of which 75.7 % agreed, 14.7 % were neutral and 8.5 % disagreed on this. In science 80.8 % agreed, 9.6 % were neutral while 8.4 disagreed that they like the way their science teachers teaches them science. The average response for this variable is 77.4 % agreed and 22.6 % were neutral. In general, it can be concluded that the attitude of students to mathematics and science is positive.

	S.A	A	N	D	S.D
1. I like mathematics	60.5	26.0	10.2	1.1	2.3
2. I like science	48.6	40.7	9.6	0	1.1
3. I participate actively during mathematics lessons	48.3	29.0	17.0	4.0	1.7
4. I enjoy mathematics lessons especially when there are experiments	46.0	30.1	13.1	6.8	4.0
5. 4. I enjoy science lessons especially when there are experiments	75.1	18.6	5.1	0	1.1
6. According to me mathematics should be made optional	15.8	9.0	7.3	14.7	53.1
7. Our teachers of science use materials that make the subject interesting and enjoyable	34.1	31.3	17.6	9.1	8.0
8. Our teachers of mathematics use materials that make the subject interesting and enjoyable	31.8	29.5	16.5	14.2	8.0
9. My score in mathematics is usually low	10.9	25.3	21.8	17.8	24.1
10. My score in science is usually low	5.7	16.0	28.0	26.3	24.0
11. I like my mathematics teachers	65.1	26.3	4.6	2.3	1.7
12. I like my science teachers	63.8	28.2	4.6	0.6	2.9
13. I do many sums in mathematics every day	26.3	31.4	31.4	7.4	3.4
14. I like the way my teachers teaches us mathematics	48.0	28.6	14.9	4.0	4.6
15. I like the way my teachers teaches us science	47.4	34.3	9.7	5.7	2.9
Average responses	**2.3**	**75.1**	**22.6**		

Table 5: Students' Attitude Summary Of Responses

5.Summary, Conclusions, Recommendations And Suggestions For Further Research

5.1.Introduction

This chapter gives the summary of the findings of the research and the conclusions that can be made from the research. It further gives recommendations from the conclusions that have been made and lastly give suggestion for further research. This was based on the research findings that is presented and discussed in the previous chapters.

5.2.Summary

From the findings it is evident that the attitude of mathematics and science teachers tends towards being positive, it shows that there are still possible room for improvement so that performance of mathematics and sciences are consequently improved.

Secondly, the school administration provides the necessary support in terms of provision of apparatus, equipments, mathematics and science textbooks, and construction of laboratory where students can perform experiments. This support is crucial for good performance in mathematics and science to be realized.

Thirdly, monitoring of the use of ASEI/PDSI approaches in the teaching of mathematics and science both at school level and from external are wanting. The school administration which is supposed to monitor SMASE internally are reluctant in doing this which leads to questions of whether the SMASE teaching approaches are really implemented at the school level or not and if it is implemented, is it done the right way as intended by SMASE. The DQASO are also not overseeing the implementation of SMASE as expected of them.

Fourthly, it is interesting to note that despite the low performance of students in Koibatek sub -county in mathematics and science, the attitude of the respondents of this study is fairly positive. This is the right attitude for good performance as the students like mathematics and science, their teachers and the way they teach them which makes them participate actively during lesson time.

5.3.Conclusions

From the summary above, it can be concluded that teachers of mathematics and science tends towards having a positive attitude towards the use of ASEI/PDSI pedagogy in the teaching of mathematics and science and therefore this factor does not affect the success of SMASE in Koibatek sub - county.

Administration of schools support towards SMASE is positive as they strive to provide the materials necessary for the teaching of mathematics and science in schools and therefore this factor does not affect the success of SMASE in Koibatek sub - county.

Students' attitude towards mathematics and science is positive and therefore this factor does not affect the success of SMASE in Koibatek sub – county.

The monitoring of the implementation of SMASE teaching approaches in secondary schools in Koibatek sub – county is minimal and this has affected the success of SMASE.

5.4.Recommendations

From the conclusions above, the following recommendations can be made to address the poor performance in Koibatek sub – county;

The Teachers Service Commission (TSC) should employ more mathematics and science teachers to reduce the workload taught by these teachers so that they can have humble time to adequately prepare for ASEI/PDSI lessons which is time consuming. The attitude of mathematics and science teachers can be improved by ensuring that all these teachers attend SMASE cycle on attitude change.

The administration of schools is encouraged to motivate the teachers of mathematics and science to embrace the use of ASEI/PDSI approaches in the teaching of their subjects so that better results can be realized.

The Teachers Service Commission (TSC) should employ more teachers to reduce the lessons taught per week by the administration of schools so that they can have time to monitor the implementation of ASEI/PDSI approaches in the classroom. Secondly, the Ministry of Education should empower DQASO financially so that they can monitor the implementation of SMASE in schools frequently with a view of ensuring that implementation is effective. CEMASTEA should also monitor the implementation of SMASE in schools to ensure that whatever they envisaged in SMASE is attained.

The attitude of students towards mathematics and science is positive. The teachers should use this attitude to encourage and motivate the students to turn around the performance of mathematics and science in Koibatek sub – county.

5.5.Suggestions For Further Research

There is need to investigate the attendance of SMASE INSET by mathematics and science teachers visa viz school performance. Further there is need to find out the impact of SMASE INSET in Koibatek sub – county in Baringo county.

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