FACTORS INFLUENCING TRAINING OUTCOMES OF SECONDARY SCHOOL MATHEMATICS AND SCIENCE TEACHERS INVOLVED IN SMASSE PROJECT IN MOMBASA COUNTY.

BY

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SEPTEMBER, 2015

DECLARATION

I declare that this is my original work and it has not been presented in any University by any other person for the examination purpose.

Signature _____ DATE: _____

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D61/60699/2011

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

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Thank you all. May the Almighty God bless you abundantly.

DEDICATION

I dedicate this work and give special thanks to my husband Nicholas Ngure for being there for me throughout the entire Master's program and my wonderful son Garvin Nderitu. You have been my best cheerleaders.

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ABBREVIATIONS AND ACRONYMS

ASEI	Activity-focused, Student-centered, Experimenting and Improvisation
CBAM	Concerns-Based Adoption Model
DQASO	Director Quality Assurance and Standards Office
INSET	In-service Education and Training
JICA	Japanese International Co-operation Agency
MoEST	Ministry of Education, Science and Technology
PDSI	Plan, Do, See and Improve
SEDL	Southern Educational Development Laboratory
SMASSE	Strengthening of Mathematics and Science in Secondary School Education

ABSTRACT

The Kenya government in partnership with the Japanese government took the initiative to address the poor performance of learners in science subjects at secondary level by building the capacity of teachers. Strengthening of Mathematics and Science Secondary Education (SMASSE) in-service training has been ongoing since 2004. The in-service training intervention is constructivist, its emphasis is on Activity-focused methods, Student-Centered activities, Experimenting and Improvisation (ASEI) through the Plan, Do, See, and Improve (PDSI) approach in science classrooms, referred to as ASEI-PDSI classroom practices innovation. Despite the in-service training the performance of students in these subjects has remained low. The change facilitators very often presume that once an innovation has been adopted and the initial training has been completed, the intended users will put it into practice. Implementation of an innovation is seldom so simple without support. The main objectives of the study were to establish the factors influencing the training outcomes of Teachers on SMASSE INSET in Mombasa County. Study adapted a survey design with a sample of 65 teachers. Data was collected by the use of questionnaires. Data analysis was done using descriptive and factor analysis. The study established that the teachers' implementation of ASEI-PDSI classroom practices was partial. The main concerns of the implementers fell in three main categories; self, task and impact. Majority of teachers had self-concerns, task and impact concerns. There was a significant relationship between the teachers' attitude and the level of implementation. However there was dissonance in the teachers' positive attitude and their level of ASEI-PDSI classroom practices level of implementation, which was partial. Based on those findings, the researcher concluded that there was a significant relationship in the teachers'' attitude and their level of implementation of ASEI-PDSI classroom practices. This study overall conclusion was that the teachers are the major determinants of the implementation of the ASEI-PDSI innovation. The study recommended that the facilitators of change, need to urgently address the self and task concerns of the teachers so that they can start implementing the ASEI-PDSI classroom practices fully, there is also need to strengthen the supervision of ASEI/PDSI classroom practices implementation and further training should be provided for effective management of teachers after an in-service program. The study recommended that further studies could be carried out to investigate the teachers' level of implementation in other counties.

CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

Training outcomes of employees has been a subject of debate in Europe for over 50 years. These arose due to the pre-occupation of both academics and professional practitioners who were often too willing to engage in debate and dispute. Therefore, overall training outcomes became difficult to be effectively achieved, even with the greatest ambition and will to learn (Mullins, 2002).The effects of teacher training and qualifications on teacher and student performance in developing countries have been matters of considerable interest during the 1970's (Guthrie, 1982).Effective training does not just happen. To reach the goal of effective learning, a trainer must follow a logical and a systematic approach towards attaining such a goal. Effective learning can only result from effective training (Redekopp & Woloschuck, 1974).

An understanding of how people learn is necessary if learning is to take place effectively in an organization. It is a process of increasing ones capacity to take action (Kim, 1993) and by which a person acquires new knowledge skills and capabilities. Learning theories focus on different aspects of the learning process as applied to people in general. They describe in general terms how people learn. The constructivism theory of learning as proposed by various constructivist theorists, state that people learn through an interaction between thinking and experience, and through the sequential development of more complex structures. Experiential learning theory emphasizes that learning may be enhanced through creating an environment in which people are

stimulated to think while the theory of planned behavior predicts that the most important determinant of a person's behavior is behavioral intent.

The current trend in science education across the world, including Kenya, is to adopt the constructivist learning and teaching pedagogies (Taylor, Fraser & Fisher, 1995; Lewin, 2000; Innes, 2004). Science is very important for any country's economic development framework and Kenya's vision of becoming an industrialized nation by 2020, as well as the Kenya Vision 2030. Republic of Kenya (2012) makes emphasis on science subjects critical for the achievement of these goals. The constructivist approach to teaching and learning lays emphasis on critical thinking and problem solving skills by students whereby students plan for, direct and create their own learning. Such a classroom, demands a different role and practice for the teacher.

Approaches to improving the quality of education require the adoption of curriculum content and processes that are learner centered, recognize the diversity of learning needs and stages of cognitive, social and emotional development, and develop knowledge, skills, and attitudes required for independent learning and problem-solving. Improving the quality of education also requires access to appropriate learning resources. Training of teachers and educational managers is required to support curriculum reforms and should include modalities that strengthen teacher monitoring and support mechanisms (World Education Forum, 2000). In Kenya, the Center for Mathematics, Science and Technology Education in Africa (CEMASTEA) is charged with the responsibility of building teachers' capacities to enable them cope with pedagogical related challenges they face in the process of curriculum delivery in the area of mathematics science and technology. Currently it coordinates the Strengthening of Mathematics and Science Secondary Education (SMASSE) In-Service Training (INSET) project, which is geared towards strengthening of teaching in mathematics and science in secondary schools (SMASSE, 2002).

1.1.1 Training Outcomes

Human resource development is concerned with the provision of learning and training opportunities in order to improve individual, team and organizational performance. It is a business led approach to developing people within a strategic framework. It involves, introducing, eliminating, modifying directing and guiding process in such a way that all individuals and teams are equipped with the skills, knowledge and competencies they require to undertake current and future tasks required by the organization (Armstrong, 2007).Training is the process of learning, a sequence of programmed behavior. It is the use of systematic and planned instruction activities to promote learning. It aims at improving performance. According to Kenneth (2001), the desired outcome of training is the acquisition of skills, knowledge and positive attitudes towards work.

The method to achieve this outcome is by communicating information, reinforcing and testing for verification. There are hard skills such as learning to perform a task and soft skills such as learning to deal with other people. To learn these skills, employees need to remember facts and use designated steps to arrive at expected outcomes of which, on evaluation, employees should pass a competency test proving skills and knowledge acquisition. The primary goal of any training program is to impart to employees a new set of KSAs, behavior, or attitudes. Training effectiveness refers to the extent to which the training objectives are achieved. In general, training effectiveness is evaluated by measuring a number of training and transfer outcomes. Kirkpatrick (1976) suggested that reactions, learning, behavior, and results are four measures that are relevant for the evaluation of training outcomes.

After training, there is need for employees to be able to put into practice knowledge gained and have the physical and mental coordination to perform. Based on expectancy theory, Noe, (1986)developed a model in which he posits that motivational factors such as trainee's attitude concerning their jobs and careers can influence training outcomes.Nevetheless the applicability and usefulness of this model, the empirical analysis between job attitudes and training outcomes is still quite limited(Holton,2005;Santos and Stuart,2003).Learning is another training outcome identified by Noe, (1986) that can be influenced by the career and job attitudes. Noe and Schmitt (1986) found a significant relationship between job involvement and other training outcomes such as motivation to learn and transfer. These results not only presume that individuals with more positive attitude towards their job are more likely to learn the training material, but are also more likely to transfer it to the job(Holton, 2005).Thayer and Teachout (1995) included overlearning, fidelity, varied practice, principles meaningfulness, self-control cues, relapse prevention, training transfer enhancing activities that should lead to better transfer outcomes, although some activities may promote short term outcomes while others may promote longer-term outcomes(Hesketh, 1997a,1997b)

1.1.2 Strengthening of Mathematics and Science in Secondary Education (SMASSE)

According to SMASSE (1999), the goal of the project was enhancing the capacity of young Kenyans in mathematics and sciences, by providing in-service education and training for serving teachers in science and mathematics in public secondary schools in Kenya. The projects main objectives were to enhance the capacity in mathematics and sciences by improving the teacher trainee's ability and skills in resource management, teaching approaches or strategies and enhancing the interaction among science and mathematics teachers. In order to achieve these objectives, SMASSE established INSETs for mathematics and science teachers at the national

level and district level in order to consequently strengthen the performance of mathematics and sciences. As a working philosophy, the SMASSE project has developed the ASEI-PDSI approach.

SMASSE's intervention strategy was a pedagogical shift, coined as the Activity-focused, Student-Centered, Experimenting and Improvisation (ASEI) through Plan, Do, See and Improve (PDSI) approach (SMASSE, 2006; 2008). The approach aims at assisting Mathematics and science teachers to shift classroom practices from content based to activity-focused teaching, from teacher-centered to learner-centered, it emphasizes careful planning of the lessons before teaching and implementation of those plans in class. According to Hord, Rutherford, Huling and Hall (2006), administrators and change facilitators presume that once an innovation has been introduced and initial training has been completed, like that of the SMASSE INSET, the intended users will put it into practice. Unfortunately the implementation of an innovation is seldom so simple. Research has shown that there are individuals, who do not use the innovation at all for months or years after an institution adapts it.

SMASSE project impact assessment indicated that the level of implementation of ASEI-PDSI classroom approaches was low and that there has been very little change in the trends of student's performance in the sciences and mathematics .The SMASSE project uses the cascade system of INSET with two levels of training, one at the national and the other at the district level. The national trainers train the district key trainers and district trainers train teachers in their respective districts. Further the SMASSE project has four cycles that cover attitude, hands-on activity, actualization and finally monitoring and evaluation. The curriculum of the INSET is based on the findings of the needs assessment conducted for each district. Cycle one lays emphasis on attaining a positive attitude towards these subjects among the stakeholders, the

teachers and the learners. In cycle two, Insets adopts a more practical oriented approach by providing hands-on experience. This cycle provides opportunities to trainees to put to practice the principles of ASEI-PDSI innovation. The third cycle focuses on classroom implementation of the ASEI-PDSI classroom practices and the fourth cycle involves monitoring and evaluation, the purpose of which is to improve the quality of the project activities.

SMASSE Project is a joined venture between the Kenya government through Ministry of Education Science and Technology (MoEST) and Government of Japan through JICA signed in 1998 for the purposes of implementation of the project initially on pilot basis. The program was to run for 5 years to 2003.In the year 2000, mid-way the pilot phase, it was extended to 6 six more districts from the initial nine pilot districts owing to success in its implementation. The pilot phase benefited 4000(20% of the target group) of teachers in the country. Buoyed by successful implementation of the pilot project, the two parties agreed to scale up the implementation of the SMASSE project activities to National scope for another 5 years (Phase II, 2003-2008).The success was mainly due to strong political support for the programme and its ownership by the ministry of Education. From January 2009, the implementation of the project activities has further scaled up to cover primary level of education.

1.2 Research Problem

The outcomes of any training program and transfer of knowledge from training to the job for any organisation is very crucial since a huge fraction of the budgets is provided for staff training. A common experience is that learning from a formal training program is not carried back for application on the job. The estimates are that only about ten percent of training is effectively transferred to the workplace (Detterman, 2003).Training being a strategic component for any

professional requires that everything possible should be undertaken to ensure that the desired level of what has been learnt by the teachers in SMASSE INSETS is applied in class. The overall Goal of SMASSE has been to contribute towards upgrading the capability of young Kenyans in the fields of Mathematics and Sciences. The verifiable indicator on this, being the performance of the students in National examination in Science and Mathematics. However since onset of SMASSE in 2004, the performance in the respective subjects has not seen much improvement in Mombasa County. According to Mombasa County District Quality Assurance and Standards Office (DQASO), (2014) the performance index of sciences and mathematics at KCSE level is below five out of the possible twelve.

The level of implementation of ASEI-PDSI attributes in the county district schools is at 45% (DQASO) monitoring and evaluation report, 2014).The SMASSE INSETS takes place at Coast Girls high school, Serani and Shimo-la –Tewa high school. The attendance of teachers decreases year by year despite the government involvement as a matter of policy (DQASO, 2014).A number of studies have been undertaken on factors affecting training outcomes. Guthrie (1982) on his study on reviews of teacher training and teacher performance concluded that, there is a positive relationship between teachers' general education and professional training as independent variables and teacher performance as a dependent variable. But the nature of the relationship is complex and varies considerably between different educational, social and cultural contexts. (Joyce and Shower, 1981) on their study, observed that the literature on teacher training seems to indicate that mastery of teaching skills can be accomplished through the use of combination of three training elements, the study of the theory underlying the skills, the opportunity to observe multiple demonstrations and practice and feedback under simulated conditions or in the classroom.

Locally (Ndirangu, 2013) did a study on the factors influencing teachers' level of implementing of SMASSE in Nyeri County, based on her findings the level of implementation of the ASEI-PDSI classroom practices was partial and the most significant variable influencing the implementation was the attitude of teachers. (Mutambuki, 2014) also did a study on the effect of SMASSE project on performance of mathematics in secondary schools, concluded that the SMASSE structure affected performance of mathematics and that the structure needs to be changed to enhance more efficiency. Various researches have been done on the impact of SMASSE INSET on performance of science and mathematics however little consideration has been put on factors influencing the knowledge gained, skills and attitude acquired on training, in relation to the INSET objectives.Therefore the study sought to identify factors influencing the implementation of ASEI-PDSI classroom practices of SMASSE INSET in Mombasa County. This problem statement was guided by the question, what are the factors influencing training outcomes of secondary school science teachers on SMASSE INSET project in Mombasa County?

1.3 Objective of the Study

To determine the factors influencing training outcomes of science and mathematics teachers of SMASSE INSET project in Mombasa County.

1.4 Value of the Study

The study sought to provide an understanding of the perceived factors affecting effective training outcomes of ASEI-PDSI classroom practices of SMASSE INSET in Mombasa County. The ASEI-PDSI approach is a learner centered teaching methodology in sciences and mathematics, which if implemented effectively, should significantly improve the learners' performance in

Kenya Certificate of Secondary Education in the subject areas. The study can be of use in creating awareness to teachers so as to be able to utilize the resources available through SMASSE. The results of this study give an insight in a number of areas, about the SMASSE INSET. It gives details the components of the ASEI-PDSI approach that are useful or confusing to the implementers.

The study reveals the degree to which the teachers are actually implementing the ASEI-PDSI approach. By considering the teachers' concerns, it will provide an outline for future in-service and staff development in innovation implementation issues for the innovators. It also presents information for programme administrators in SMASSE, to uncover areas that need greater depth in initial training sessions at the national level, as they prepare to take SMASSE to the primary schools. The study findings can be used to justify whether the amount of money the government of Kenya is investing in the implementation of SMASSE is well spent.

The study findings may provide curriculum developers at the Kenya Institute of Education (KIE), with the pertinent problems which characterize the implementation of training programmes.It will help education stakeholders to find ways of making SMASSE more relevant to enhance teaching of mathematics and sciences. Researchers will gain theoretical and practical experience on the factors affecting transfer of knowledge from training to the job hence enable the researcher to make recommendations on enhanced performance of teachers and also indicate various areas in training that needs to be addressed and studied further by future researchers.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

This chapter focuses on literature related to the study presented by various researchers, scholars and authors. It is organised as follows, theoretical review that focuses on learning theories and theory of planned behaviour. This is followed by empirical review, then components of training outcomes and factors affecting training outcomes.

2.1 Theoretical Foundation

The study was informed by learning theories and theory of planned behavior**.** However, each of these learning theories focuses in different aspects of the learning process. These theories are concerned with:

2.1.1 Constructivism Theory of Learning

The constructivism theory of learning, as proposed by various constructivist theorists, notably Jean Piaget (Pollard, 2006). According to Piaget (1970), people learn through an interaction between thinking and experience, and through the sequential development of more complex structures. Piaget asserts that knowing is not a copy of reality. He further stresses that to know an object or an event is not simply to look at it and make a mental copy or image of it but to modify, to transform the object and to understand the way the object is constructed.

When children encounter a new experience they both accommodate their existing thinking to it and assimilate aspects of the experience. In constructivism, learners construct meaning from

input by processing it through existing cognitive structures and then retaining it in long-term memory (Okere, 1996). Constructivists view learning as depending on the degree to which learners can activate existing cognitive structures or construct new ones to subsume the new input (Bartlett, 1932).

2.1.2. Experiential Learning Theory

Experiential learning theory emphasizes that learning may be enhanced if through facilitation-creating an environment in which people may be stimulated to think and act in ways that will help them to make good use of their experience (Reynolds, 2002). The individual has freedom of choice and action, the capacity to initiate rather than simply respond to circumstances (Cole, 2002). The key to this model is that it is a simple description of how experience is translated to concepts which are then used to guide the choice of new experience. It combines the characteristics of both class room and problem types of learning.

It is also important that it encompasses both inductive and deductive learning. It is the process in which the learner experiences an event or stimulus and draws a conclusion from it. For example, some rule or guiding principle. Deductive learning, by contrast, commences with the rule or principle (theory), which is subsequently applied by the learner. Kolb stressed the continuous nature of the learning process and emphasized the central position of the individuals needs in governing the direction of learning. To learn effectively, individuals must shift from being observers to participants, from direct involvement to a more objective and analytical detachment.

Every person has his or her own learning style and one of the most important arts that trainers have is to adjust their approaches to the learning styles of trainees. Trainers must acknowledge

these learning styles rather than their own preferred approaches. According to Honey and Mumford, (1996) there was a further developed analysis of learning styles: activists who involve themselves fully without bias in new experiences and revel in new challenges, Reflectors who stand back and observe new experiences form different angels. They collect data, reflect on it and come to a conclusion. Theorists adapt and apply their observations in form of logical theories and tend to be perfectionists and last but not least we have pragmatists who are keen to try out new ideas, approaches and concepts to see if they work

2.2 Theory of Planned Behavior

The individual's intention to perform a behavior is a combination of his or her attitude towards performing the behavior, the prevailing subjective norms and the perceived behavioral controls on the individual (Brainmarket, 2002). This theory predicts that the most important determinant of a person's behavior is behavioral intent. The scientific bases of transfer of knowledge from training to the job studies originated in planned behavior theory whose origins were in the field of social psychology as a predictor for behavior.

The theory provides a model for viewing forces arrayed for and against an initiative that would cause significant change. Brainmarket (2002) implied that it is almost mathematical in that the sum of the vectors (for and against) will determine the outcome. This complexity of causation in terms of the number of variables both inhibitors and facilitators makes transfer a difficult problem to conceptualize and therefore address. In other words, if one could solve the transfer problem, a majority of organizational problems would be minimized or cease to exist. Several models have been developed to try to understand the transfer phenomena.

2.3 Empirical Review

Since the inception of 8-4-4 system of education in Kenya, the teaching of Mathematics and science subjects has become a matter of debate due to poor performance in the National examinations by many candidates (Shiundu, 1992). This is an indication that the teaching and learning of these subjects in secondary schools has not been well. It is important that teachers identify the teaching and learning problems in Mathematics and seek solutions to this perennial problem. According to the Organization for Economic Cooperation and Development (1998), professional development signifies any activity that develops an individual's skills, expertise and other characteristics as a teacher. Development is achieved through a set of planned activities that are aimed at moving teachers to more responsible positions within the school system (Parker & Harley, 1999) In-service education and training is any vocational training acquired during employment (Calderhead, 1992). It is meant to enhance the skills, knowledge and understanding of teachers for effective classroom practices (Republic of Tanzania, 2010). It further provides 3 opportunities for professional development to teachers in order to raise their academic qualifications to competently address the educational challenges and compete effectively in the open labor market. From this perspective INSET of teacher is a lifelong learning process which begins with the initial preparation that a teacher receives at a teachers‟ college and continues until retirement. It is an ongoing process of education, training, learning, and support activities that takes place in either external or work-based settings (school-based) of the teacher. Calderhead, (1992) observes, in-service education and training helps teachers to expand their current knowledge of a subject, develop new knowledge and engage with colleagues at their current school and other schools. Furthermore, it helps them to plan and develop their own work thoroughly. They may also become more conscious of strategies for change and curriculum

development trends. In addition, teachers may acquire skills in research and decision making at various levels. In-service education supports the professional development of teachers throughout their working lives (Joan, 1991). It is provided to serving teachers and may take place at any time either as a full time study or as a part time study.

In Kenya, the SMASSE INSET is undertaken on a part time basis and teachers attend the training during holidays. According to Shiundu (1992), the purposes of in-service education and training can be summarized as being: extension of knowledge; consolidation and reaffirmation of knowledge; regular acquisition of new knowledge; acquaintance with curricular developments; acquaintance with the psychological developments; acquaintance with the sociological basis of education; acquaintance with the principles of organization and administration; repetition or extension of original pre-service teacher education after intervals; acquaintance with new teaching and learning resources; introduction of new methods of teaching; understanding new relationships between teachers and learners; development of teaching and evaluation techniques; and acquaintance with and participation in educational research. As Burges (1993) observes, in-service education and training may be taken since knowledge changes and this necessitates the need for teachers to be updated. Secondly, techniques of teaching change. If new tools are devised for teachers it is vital that they should be given really wisely planned courses on their value and their limitations.

Thirdly, the society changes with time. The growth of technology produces new problems and if our citizens are to be aware of them and be prepared to cope with them, then fresh demands are inevitably placed on those who teach. Fourthly, teachers themselves change. With experience some teachers develop new interests in special fields. In addition, schools themselves change. For instance, a teacher faced with the challenges of a widely mixed ability group will require in-

service training for him or her to cope. Finally, in-service education and training can do much to bridge the gap in communication which tends to develop in our educational system. The gulf between knowledge generated through research and practice can only be bridged through in-service training

Shiundu (1992) argue that no teacher can claim to be fully equipped with knowledge sufficient to last him/her throughout his/her teaching career; in-service education and training is therefore a necessary part of a teacher's teaching career. However, warns that in-service training for teachers has its own problems (www.abebooks.com). The failure to relate in-service to pre-service training is one of the most significant problems. A closely related problem is that of the relationship between teacher preparation programmes and actual practice. The reason for this unfortunate condition, he argues, is that in-service and pre-service education programmes have worked separately rather than together. In Kenya, the Ministry of Education, Science and Technology (MoEST) has a framework for INSET. This is based on the recommendations of the Master Plan on Education and Training(MPET), Kenya, 1997-2000 which states that among other things, teaching and learning transactions will be made more learner-centred through development of focused in-service courses for teachers. It is for this reason that MoEST has made the SMASSE INSET one of the investment programmes in the Kenya Education Sector Support Programme (KESSP 2005-2010).

2.4 Components of Training Outcomes

According to Kenneth (2001), the desired outcome of training is the acquisition of skills, knowledge and positive attitudes towards work. The method to achieve this outcome is by communicating information, reinforcing and testing for verification. After training, and there is

need for employees to be able to put into practice knowledge gained and have the physical and or mental coordination to perform. There has been far less research on the formative processes that take place for participants prior to and following on, from employee training delivery. One of the key measures of success in training and education is to meet the skills and knowledge needs with a supply of appropriately qualified labor and change in attitude. Attitude change in training is related to the feelings about success of achieved outcomes (Keller, 1983).

Honey and Mumford (1996) defined learning as a process by which a person acquires and develops new knowledge, skills and attitudes. It is goal directed, based on experience, impacting on behavior and cognition with relatively stable changes. Leaning occurs therefore, when people can demonstrate that they know something that they didn't know before insights, (realizations as well as facts) and when they can do something they could not do before (skills). It is both a process and an outcome concerned with knowledge, skills and insight that seek to achieve set goals and accomplish specific tasks of organizational development initiatives. Skills are built progressively by repeated training or other personal employee experiences on the job or off job which may be manual, intellectual, mental or social.

2.5 Factors Affecting Training Outcomes

There is a variety of theoretical and empirical approaches that examine the issue of training transfer (Baldwin & Ford, 1988; Geilen, 1996; Huczynski & Lewis, 1980; Kontoghiorghes, 2004). These studies distinguish three categories of factors affecting training transfer at work. These factors include, factors concerning the trainee, factors concerning the training and the planning of the training program; and organizational factors affecting the transfer as well as the training and the trainee.

2.5.1 Trainee Characteristics

Research has shown that the characteristics of the trainee's personality directly affect the training process and training transfer (Ford et al., 1992; Warr et al., 1999). The ability of the person to learn, synthesize, and connect what he has learnt to practice and transfer the skills and knowledge to work is the second factor for training transfer (Robertson & Downs, 1979). Previous studies have identified the following trainee characteristics as affecting training transfer: the motivation of the person to learn and transfer the skills to his work (Facteau et al., 1995; Kontoghiorghes, 2002); his perception of opportunities to apply the new skills (Noe, 1986); his personal career goals (Tziner et al., 1991); the perception of the trainee regarding the management of his career goals through training (career utility), as well as the goals directly connected to his work (job utility) (Clark et al., 1993); and organizational commitment (Facteau et al., 1995; Kontoghiorghes, 2002).Numerous studies have found individual trainee differences can determine the amount of information learned during training and transferred to the job.

2.5.2 Training Design

In order to achieve successful training transfer to the workplace, the training program must be relevant to the job (Axtell et al., 1997; Kontoghiorghes, 2002; Rouiller & Goldstein, 1993). However, it is not enough for the content of training to be relevant. The trainee must also understand the relationship between training and work practice to be able to make the transfer (Bates et al., 1997). The planning of the training program is very important for its total success and therefore for training transfer at work. The goals and the extent of training, the training methods and means, as well as the training place and equipment, are important factors related to training program planning. The content of the training must emphasize both theoretical and

practical aspects, as well as the acquisition of knowledge and skills (Gauld & Miller, 2004). The quality and depth of learning depend on the characteristics of the design and delivery of the training.

Baldwin and Ford (2008) proposed a model of factors in the training process that can affect transfer. According to this model, transfer will be enhanced when the training design includes identical elements, the general principles of a skill are taught, a variety of stimulus conditions are presented in the training to increase generalizability, and, generally, distributed training practices are used. Poor instructional design skills are also in evidence in the use of instructional strategy for all types of learning outcomes (e.g., lecturing), failure to ensure that the conditions for learning for a particular type of learning outcome are present, teaching at a rule or procedural level instead of giving general and deeper principles, failure to give multiple examples and non-examples of concepts in a variety of contexts, providing inadequate practice time and poor feedback, or employing inadequate test designs (Smith-Jentsch, Salas & Brannick, 2001).

2.5.3 Organizational Characteristics

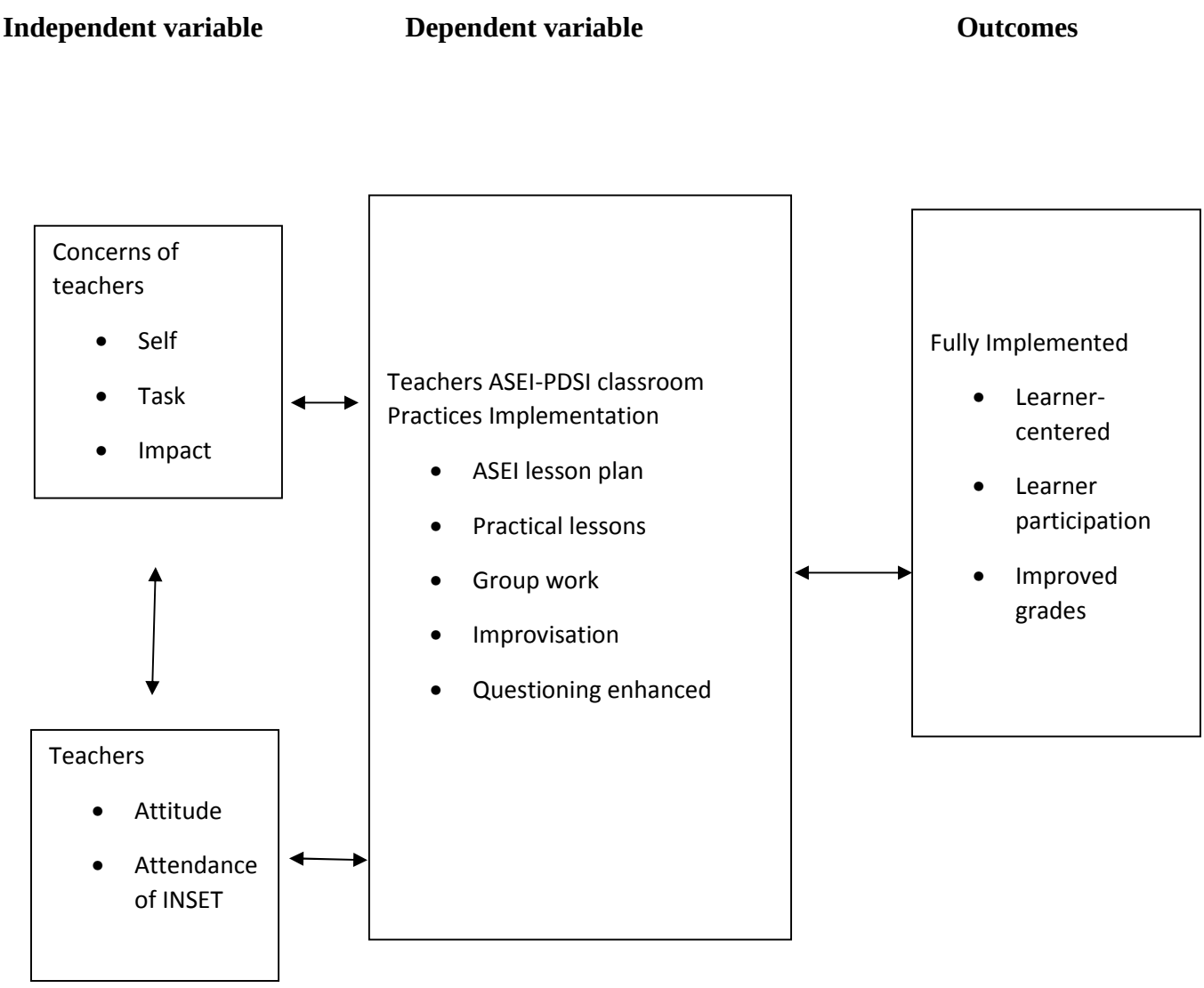
The prevailing organizational climate concerning new knowledge and skills greatly influences whether the transfer will be made or not (Rouiller & Goldstein, 1993; Tracey et al., 1995). A supportive climate increases the adoption of transfer strategies by the trainees as well as the transfer in general (Burke & Baldwin, 1999).Superiors and colleagues are another important factor mentioned in the literature as affecting training transfer (Baldwin & Ford, 1988; Goldstein and Musicante, 1986; Noe & Schmitt, 1986). The existence of available equipment used at work will affect the training transfer. Culture will or will not allow the employee to experiment on his new skills in his working position. An organizational culture emphasizing performance

orientation values training and learning and taking initiatives (Javidan, 2004). Moreover, in a highly humane-oriented organizational culture, practices reflect individualized consideration and informal relationships provide development opportunities to employees (Kabasakal & Bodur, 2004, p. 596). Thus, we expect that in performance-oriented and humane-oriented organizational cultures there will be more opportunities for employees to experiment and transfer newly acquired knowledge and skills.

2.6 Conceptual Framework

Based on the theory and the literature review, the relationship between the variables can be represented diagrammatically in the conceptual framework as shown in Figure 2.1. The conceptual framework shows the relationship between variables that influence the teachers' level of implementation of the ASEI-PDSI science classroom practices. Teachers' level of implementation is the dependent variable. The frame work indicates that the teachers' level of implementation of ASEI-PDSI classroom practice emanates from the following variables: the concerns of the implementers which fall in three categories: self, task and impact concerns, and the attitude of the teachers. These are the main constructs chosen for this study. These independent variables will influence the level of implementation of the ASEI-PDSI classroom practices. Figure 2.1 represents the relationship between these independent variables and the process of ASE/PDSI implementation in the classroom by the teachers and how it affects the level of implementation.

Figure 2.1 Conceptual Framework



Source: Researcher, 2015

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives details of the methodology that was used in the study. This were guided by the objectives of the study outlined in chapter one. The chapter gives details on the research design, study population, sample size and sampling procedure, data collection and data analysis.

3.2 Research Design

This study used a survey design. According to Kothari (2004), survey design is concerned with recording, analysing and interpreting conditions that either exist or existed. In this design, the researcher did not manipulate the variable or rearrange events to happen. Surveys are only concerned with conditions or relationships that exist, opinions that are held and process that are ongoing. Survey research was suitable for this study because it a one period survey. This design was appropriate for the study because the researcher was establishing the degree of relationship between and among the variables, such as, the Level of Implementation of the ASEI-PDSI innovation among various science subjects and the concerns among the different subject teachers in sciences and mathematics. Survey design, according to Best and Kahn (2007), is also concerned with hypotheses formulation and testing of the relationship between non-manipulated variables. The study sought to test the relationship between various variables and the teachers' level of implementation ASEI-PDSI classroom practices in secondary schools in Mombasa County.

3.3 Study Population

Given that the main purpose of the study was to determine the factors influencing training outcomes of SMASSE INSET, the study target population was 325 science and mathematics teachers in the 33 public secondary schools in Mombasa County that have attended the SMASSE INSETS by November 2014 according to data availed by DQASO.

3.4 Sample Size and Sampling Procedure

According to Mugenda and Mugenda (1999), a sample of 10% is considered representative. However, Balian (1988) proposes a percentage adjustment of 10% to 30% to initial sample sizes to compensate for attrition, respondent refusal to participate, or other circumstances which gives an upward adjustment. The study therefore used a sample size of 65 teachers out of the 325 respondents for the survey design study, which falls within the proposed range. Simple random sampling was be used to select a study sample from the list of SMASSE trained teachers in the county. The list of SMASSE trained teachers to be used as a sampling frame was obtained from the DQASO. Simple random sampling is important in reducing the influence of extraneous variables in a study (Mugenda & Mugenda, 2003). Balloting was be used to randomly pick the sample of 65 teachers. This procedure is justified for selection of small samples as opposed to the use of tables of random numbers (Peil, 1995).

3.5 Data Collection

The study used questionnaires as the primary data collection instrument. The questionnaire was divided into four sections representing the various variables such as, the Level of Implementation of the ASEI-PDSI classroom practices among various science subjects and mathematics and the concerns among the different subject teachers in mathematics, Biology, Chemistry and Physics.

These sections were, Section A containing items on the demographic data of the teachers. Section B containing 18 items adapted from the CBAM model based on the teachers' concerns about the ASEI-PDSI classroom practices. Section C containing 17 items on the teacher's attitude towards the implementation ASEI-PDSI classroom practices. Section D contains the Level of Implementation of the ASEI-PDSI classroom practice

Each section of the chosen study, included closed structured and open ended questions which sought the views, opinion, and attitude from the respondent which might not have been captured by the researcher. The questions was designed to collect qualitative and quantitative data. The open ended questionnaires gave unrestricted freedom of answer to respondents. The questionnaire was administered through drop and pick method to the science and mathematics teachers trained in SMASSE.

3.6 Data Analysis

Once the questionnaires were collected, they were checked for completeness and to determine whether an acceptable sample can be obtained in terms of the proportion of issued instruments. The data collected from the field was assessed and comparison made so as to select the most accurate and quality information from the feedback given by various respondents. Descriptive statistics analysis was employed. The quantitative data was coded to enable the responses to be grouped into various categories. Descriptive statistics such as frequency distribution, per cents means and standard deviation was calculated. These were used mainly to analyse the demographic and school information of the head teachers and teachers. Factor analysis was also used to establish the parameters of independent variables that have the highest weight.

CHAPTER FOUR

DATA ANALYSIS AND DISCUSSION

4.1 Introduction

This chapter gives a detailed outlook of the data analysis as pointed out in chapter three with emphasis on the findings of the analysis. The chapter first analyses the response rate and the demographic characteristics of the respondents to establish the credibility of the respondents thus validity of the study. This is followed by descriptive analysis of the study items in terms of mean and standard deviation. Finally, a factor analysis is carried out to determine the factors that have more weight on the independent variable.

4.2 Response Rate

From a sample of 65 respondents, 62 questionnaires were returned. However, 4 questionnaires were found invalid during the sorting thus a total of 58 questionnaires were used for the study making a response rate of 89.23%. Since this is within the 67% accepted threshold for a scholarly study (Baruch & Holtom, 2008), the analysis was carried out.

4.3 Demographic Characteristics of the Respondents

The demographic characteristics of the respondents was used to determine suitability for the study and used gender, qualification, length of service, lessons taught per week, responsibilities in school and other responsibilities.

4.3.1 Gender

Table 4.1 shows that the study used 46.2 % female respondents and 53.8% male respondents. This implies that the respondents were evenly distributed among the genders thus the outcome of the study would not be compromised by gender bias.

Table 4.1 Gender

Gender	Frequency	Percent
Female	22	45.0
Male	34	52.5
Total	56	97.5

4.3.2 Academic Qualification

Table 4.2 shows that 6 respondents had diploma, 6 had Bachelor of Science Degree and Post Graduate Diploma in Education, 34 had bachelor of education Degree, 4 had Master of Science degree and 8 Master of Education degree. This can be summarized to mean that 6 respondents had diploma qualification, 40 had bachelor's degree and 12 had masters. This implies that the respondents had sufficient education to respond adequately to the questionnaire.

Table 4.2 Academic Qualifications

Qualification	Frequency	Percent
Diploma	6	10.3
B.Sc. + PGDE	6	10.3
B.Ed.	34	61.5
M.Sc.	4	4.9
M.Ed.	8	12.8
Total	58	100.0

4.3.3 Length of Service

Table 4.3 shows that 3 respondents had taught for 2 years and below, 2 for 4 years, 4 for 5 years, 3 for 8 years, 18 for 9 years, 12 for 13 years, 11 for 16 years, 2 for 18 years and 3 for 20 years and above. This implies that the respondents were evenly distributed among newly recruited teachers to seasoned teachers thus covering many different categories of teachers. It also means that the respondents had taught long enough to respond adequately to the research items.

Table 4.3 Length of service

Years of service	Frequency	Percent
2	3	5.2
4	2	3.4

5	4	6.9
8	3	5.2
9	18	31.2
13	12	20.8
16	11	19.1
18	2	3.4
20	3	5.2
Total	58	100

4.3.4 Work load

This item was used for internal consistency which is a test for validity and reliability**.** Table 4.4 below shows that 22.9% of the respondents had 22 lessons and below in a week while the remaining 87.1% of the respondents had between 23 and 30 lessons in a week. This implies that the respondents had high workloads with 36.8% of the respondents having lessons above the 27 lessons per week maximum workload stipulated by the relevant authorities. It was seen to correspond to the items testing on workload thus indicated that the study met the validity and reliability thresholds.

Table 4.4 Number of lessons in a week

Workload	Frequency	Percent
14.00	1	1.8
16.00	2	3.5
17.00	2	3.5
18.00	1	1.8
20.00	3	5.3
21.00	2	3.5
22.00	2	3.5
23.00	2	3.5
24.00	4	7.0
25.00	8	14.0
26.00	9	15.8
27.00	8	14.0
29.00	4	7.0
30.00	9	15.8
Total	**57**	**98.2**

4.3.5 Responsibility within the School

Table 4.5 shows that all the 58 respondents were subject teachers. It also shows that out of these 58, 9 also doubled up as class teachers, 14 as subject heads, 20 as head of departments and 2 as deputy principals. A deeper analysis of this trait showed that 18 respondents had three different responsibilities mostly serving as subject teachers, class teachers and subject heads or heads of departments. This excludes other duties such as clubs and societies as well as co-curricular responsibilities. This implies that the respondents were from all levels of responsibilities thus had sufficient knowledge to enable them respond adequately to the research items.

Table 4.5 Responsibility within the school

Responsibility within school	Frequency	Percent
Subject teacher	58	100
Class Teacher	9	15.5
Subject head	14	24.1
Head of Department	20	34.5
Deputy Principal	2	3.4
Principal	0	0
Total	103	100

4.3.6 Other Responsibilities

Table 4.6 below shows that the 10 of the respondents were SMASSE trainers, 11 subject panel members, 12 science congress officials and 18 KNEC examiners in the science subjects. This thus implies that the respondents were of greater knowledge of both the subject content and curriculum requirements as well as the aspects of SMASSE relevant to the study. The respondents had sufficient knowledge of the concerns of study.

Table 4.6: Other responsibilities

Other Responsibilities	Frequency	Percent
SMASSE trainer	10	17.2
Subject panel member	11	19.0
Science Congress Official	12	20.7
Examiner	18	31.0
Total	51	87.9

4.4 ASEI – PDSI classroom practices

The table 4.7 was used to rate the teachers concerns and needs towards implementation of ASEI-PDSI classroom practices. A Likert scale was used such that completely irrelevant items=0 and other items represented the concerns in varying degrees of intensity**.**

Table 4.7 ASEI- PDSI Classroom practices

Item	N	Mean	Standard deviation
I am concerned about my attitude towards the ASEI-PDSI classroom practices	58	3.16	1.98
I do not even know what the ASEI-PDSI paradigm entails	58	1.21	1.16
I am concerned about not having enough time to organize myself each day using ASEI-PDSI approach.	58	4.48	1.94
I would like to help other departments in their use of the ASEI-PDSI classroom practices approach	58	3.38	2.05
I have a limited knowledge about the ASEI-PDSI Paradigm	58	1.82	1.73
I would like to know the effect of the SMASSE training on my professional status.	58	4.48	2.23
I am concerned about the conflict between my interests and my responsibilities when using ASEI-PDSI approach	58	2.44	2.21
I am concerned about how the ASEI-PDSI approach affects students.	58	4.44	1.96
I am not concerned about this ASEI-PDSI approach.	58	1.56	1.97
I would like to discuss the possibility of using the ASEI-PDSI approach more.	58	4.07	2.29
I am concerned about my inability to manage all the ASEI-	58	4.07	2.28

PDSI classroom practices required.			
I would like to know how my teaching or administration is supposed to change with the use of ASEI-PDSI approach.	58	4.33	2.13
I am concerned about evaluating my impact on students using ASEI-PDSI classroom practices.	58	4.56	1.93
I am completely occupied with other things I have no room to implement ASEI-PDSI approach.	58	2.28	2.21
I would like to excite my students about their part in the ASEI-PDSI approach.	58	4.56	2.12
I am concerned about the time spent working with non-academic problems related to this ASEI-PDSI approach.	58	2.74	2.24
Coordination of tasks and students is taking too much of my time.	58	3.64	2.31
I would like to know how this ASEI-PDSI approach is better than what we have heard earlier.	58	4.28	2.42

Table 4.7 shows that the respondents indicated that it was true that they were concerned about evaluating their impact on students using ASEI-PDSI classroom practices (M=4.56, SD=1.93) liked to excite their students about their part in the ASEI-PDSI approach (M=4.56, SD=2.12), were concerned about not having enough time to organize themselves each day using ASEI-PDSI approach (M=4.48, SD=1.94) would like to know the effect of the SMASSE training on their professional status (M=4.48, SD=2.23), concerned about the conflict between their interests and their responsibilities when using ASEI-PDSI approach (M=4.44, SD=1.9), concerned about how the ASEI-PDSI approach affects students (M=4.44, SD=2.21), would like to know how

their teaching or administration is supposed to change with the use of ASEI-PDSI approach. (M=4.33, SD=2.13), would like to know how this ASEI-PDSI approach is better than what they had heard earlier (M=4.28, SD=2.42) would like to discuss the possibility of using the ASEI-PDSI approach more(M=4.07, SD=2.29), concerned about their inability to manage all the ASEI-PDSI classroom practices required (M=4.07, SD=2.28) Coordination of tasks and students is taking too much of their time (M=3.64, SD=2.31), would like to help other departments in their use of the ASEI-PDSI classroom practices approach (M=3.38, SD=1.97), concerned about their attitude towards the ASEI-PDSI classroom practices (M=3.16, SD=2.05) and concerned about the time spent working with non-academic problems related to this ASEI-PDSI approach. (M=2.74, SD=2.24).

The respondents however indicated that it was not true that they were concerned about the conflict between their interests and their responsibilities when using ASEI-PDSI approach (M=2.44, SD=2.21), completely occupied with other things I have no room to implement ASEI-PDSI approach (M=2.28, SD=2.21), have a limited knowledge about the ASEI-PDSI Paradigm (M=1.82, SD=1.73), not concerned about this ASEI-PDSI approach (M=1.56, SD= 1.97), and that they did not even know what the ASEI-PDSI paradigm entails (M=1.21, SD=1.16).

This implies that the respondents were concerned about evaluating their impact on students using ASEI-PDSI classroom practices, not having enough time to organize themselves each day using ASEI-PDSI approach, the conflict between their interests and their responsibilities when using ASEI-PDSI approach, how the ASEI-PDSI approach affects students liked to excite their students about their part in the ASEI-PDSI approach, about their inability to manage all the ASEI-PDSI classroom practices required, Coordination of tasks and students is taking too much

of their time, their attitude towards the ASEI-PDSI classroom practices and the time spent working with non-academic problems related to this ASEI-PDSI approach.

It also implies that respondents were keen to know the effect of the SMASSE training on their professional status, to know how their teaching or administration is supposed to change with the use of ASEI-PDSI approach, know how this ASEI-PDSI approach is better than what they had heard earlier, discuss the possibility of using the ASEI-PDSI approach more and help other departments in their use of the ASEI-PDSI classroom practices approach

The study however shows that the respondents were not concerned about the conflict between their interests and their responsibilities when using ASEI-PDSI approach and that they were not completely occupied with other things that they had no room to implement ASEI-PDSI approach had sufficient knowledge about the ASEI-PDSI Paradigm, were concerned about the ASEI-PDSI approach and that they knew what the ASEI-PDSI paradigm entailed.

4.5 Attitude towards ASEI – PDSI Classroom Practices

Table 4.8 Attitude towards ASEI- PDSI classroom practices

Item	N	Mean	Standard deviation
ASEI-PDSI approach saves time and effort for both teachers and students.	58	2.94	1.25
ASEI-PDSI approach increases access to knowledge and training.	58	4.25	.78
ASEI-PDSI approach enables collaborative learning	58	4.12	.80

ASEI-PDSI approach can engage learners more than other forms of learning	58	4.30	.83
5. ASEI-PDSI approach increases the quality of teaching and learning because it integrates all form of media; print, audio, video, and animation.	58	4.30	.86
6.ASEI-PDSI approach increases the flexibility of teaching and learning	58	3.84	1.08
7. ASEI-PDSI approach improves communication between students and teachers.	58	4.05	.94
8.ASEI-PDSI approach enhances the pedagogic value of my subject	58	4.02	.81
9. ASEI-PDSI approach is a clear enough process of learning	58	3.92	.94
10.Teacher training should adopt ASEI-PDSI approach for their trainees	58	4.23	.77
11.ASEI-PDSI practices improve students' performance in my subject	58	3.71	.95
12.ASEI-PDSI practices require less materials because of improvisation	58	3.56	1.16
13.ASEIPDSI practice saves on teaching time	58	3.00	1.33
14. ASEI-PDSI approach is not effective for students learning.	58	1.97	1.13
15. I feel I have lost control using the ASEI-PDSI learning	58	2.00	1.02

for my classes			
16ASEI-PDSI approach makes me uncomfortable because I do not understand it.	58	1.79	1.08
17.It is not possible to cover the syllabus if ASEI-PDSI practices are implemented	58	2.89	1.48

Table 4.8 shows that the respondents agreed that ASEI-PDSI approach can engage learners more than other forms of learning (M=4.30, SD=0.83), ASEI-PDSI approach increases the quality of teaching and learning because it integrates all form of media; print, audio, video, and animation, (M=4.30, SD=0.86) ASEI-PDSI approach increases access to knowledge and training, (M=4.25, SD=0.78) Teacher training should adopt ASEI-PDSI approach for their trainees, (M=4.23, SD=0.77) ASEI-PDSI approach enables collaborative learning, (M=4.12, SD=0.80) ASEI-PDSI approach improves communication between students and teachers, (M=4.05, SD=0.94) ASEI-PDSI approach enhances the pedagogic value of their subject (M= 4.02, SD=0.81), ASEI-PDSI approach is a clear enough process of learning, (M=3.92, SD=0.94) ASEI-PDSI approach increases the flexibility of teaching and learning, (M=3.84, SD=1.08) ASEI-PDSI practices improve students' performance in their subject (M=3.71, SD=0.95), ASEI-PDSI practices require less materials because of improvisation (M=3.56, SD= 1.16).

The respondents were however neutral on whether ASEI-PDSI practice saves on teaching time, (M=3.00,SD= 1.33) ASEI-PDSI approach saves time and effort for both teachers and students, (M=2.94, SD=1.25) It is not possible to cover the syllabus if ASEI-PDSI practices are implemented (M=2.89, SD=1.48).The respondents also however disagreed that they felt I had lost control using the ASEI-PDSI learning for their classes, (M=2.00, SD=1.02) ASEI-PDSI

approach is not effective for students learning, (M=1.97, SD=1.13), ASEI-PDSI approach makes me uncomfortable because I do not understand it (M=1.79, SD=1.08).

This implies that ASEI-PDSI approach can engage learners more than other forms of learning, ASEI-PDSI approach increases the quality of teaching and learning because it integrates all form of media; print, audio, video, and animation, ASEI-PDSI approach increases access to knowledge and training, Teacher training should adopt ASEI-PDSI approach for their trainees, ASEI-PDSI approach enables collaborative learning, ASEI-PDSI approach improves communication between students and teachers, ASEI-PDSI approach enhances the pedagogic value of their subject, ASEI-PDSI approach is a clear enough process of learning, ASEI-PDSI approach increases the flexibility of teaching and learning, ASEI-PDSI practices improve students' performance in their subject, and that ASEI-PDSI practices require less materials because of improvisation

It also implies that teachers don't lose control using the ASEI-PDSI learning for their classes, ASEI-PDSI approach is effective for students learning, and that teachers understand ASEI-PDSI therefore the approach does not make them uncomfortable. The study could not however determine from the descriptive analysis of the questionnaire items, whether ASEI - PDSI practice saves on teaching time, ASEI-PDSI approach saves time and effort for both teachers and students and whether It is not possible to cover the syllabus if ASEI-PDSI practices are implemented .

4.6 Other Factors Affecting ASEI – PDSI Application

Table 4.9 shows that the respondents indicated that the other factors that affected the outcome of the ASEI – PDSI included Insufficient time for preparation, heavy workload, inadequate

resources, poor planning for lessons, poor attitude towards ASEI PDSI, large classes, wide syllabus, other responsibilities and learner intelligence levels.

Table 4.9 Other factors affecting ASEI – PDSI application

Item	Frequency	Percentile
Insufficient time for preparation	23	39.7
Inadequate resources	16	27.6
Poor Planning for the lessons	7	12.1
Poor attitude towards ASEI	12	20.7
Heavy workload	36	62.1
Large class	7	12.1
Other responsibilities	8	13.8
Wide syllabus	4	6.9
Learners abilities	2	3.4

4.7 Extent of application ASEI – PDSI classroom practices

Table 4.10 indicates that ASEI – PDSI was partially implemented in Mathematics (M=2.05, SD=0.23), Physics (M=2.00, SD=0.66), Biology (M=2.09, SD=0.30) and Chemistry (M=2.08, SD=0.28). This implies that ASEI PDSI was only partially implemented in all the science subjects.

Table 4.10 Extent of application of ASEI – PDSI classroom practices

Item	N	Mean	Standard deviation
mathematics	31	2.05	.23
physics	19	2.00	.66
biology	26	2.09	.30
chemistry	24	2.08	.28
Aggregate extent of application		2.05	.37

4.8 Factor Analysis

Factor analysis was used in this study as it is an exploratory study which needed to identify the factors that influence the training outcome of the ASEI – PDSI. Factor analysis works at two levels. The first stage was to generate for the questionnaire item responses the various common factors that most of the respondents addressed and list them according to the magnitude of their influence on the dependent variable as shown in table 4.11 below. The second stage was the determination of the factors that have the highest effect on the variable as shown in table 4.12 below. The study set a qualification level at 0.4 which is considered by most scholars as the boundary of weak and strong correlation. This was then followed by identification of the factors based on the common items they were correlated to as shown in table 4.13 below

4.8.1 Total variance

Table 4.11 Total Variance

Total Variance Explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	11.226	32.075	32.075	11.226	32.075	32.075
2	3.568	10.193	42.269	3.568	10.193	42.269
3	2.779	7.940	50.209	2.779	7.940	50.209
4	2.564	7.326	57.535	2.564	7.326	57.535
5	1.928	5.508	63.043	1.928	5.508	63.043
6	1.831	5.232	68.275	1.831	5.232	68.275
7	1.489	4.253	72.528	1.489	4.253	72.528
8	1.357	3.878	76.406	1.357	3.878	76.406
9	1.212	3.464	79.870	1.212	3.464	79.870
10	.976	2.789	82.659			
11	.909	2.598	85.257			
12	.756	2.159	87.417			
13	.652	1.863	89.279			
14	.628	1.796	91.075			
15	.545	1.558	92.633			
16	.448	1.280	93.914			
17	.399	1.141	95.054			
18	.324	.925	95.979			

19	.288	.823	96.802			
20	.258	.738	97.540			
21	.216	.617	98.157			
22	.157	.448	98.605			
23	.139	.397	99.002			
24	.106	.304	99.306			
25	.081	.230	99.536			
26	.064	.183	99.719			
27	.038	.107	99.826			
28	.036	.103	99.929			
29	.016	.047	99.976			
30	.008	.024	100.000			
31	1.230E-16	3.515E-16	100.000			
32	-3.836E-17	-1.096E-16	100.000			
33	-2.113E-16	-6.038E-16	100.000			
34	-2.759E-16	-7.883E-16	100.000			
35	-3.691E-16	-1.055E-15	100.000			
Extraction Method: Principal Component Analysis.						

The table 4.11 shows that the analysis identified a total of 35 factors that influence training outcome of ASEI-PDSI training. These factors were then listed in order of the magnitude to which they influence the outcome. However, the system eliminated factors whose influence was

below 1 eigenvalue as this is seen as a weak correlation. This thus left 9 factors with strong influence on the outcome of the training as given in the table below. Factor 1 has the strongest influence with a 32.0755 eigenvalue. Followed by factor two up to factor 35 in that order.

4.8.2 Component matrix

Table 4.12 Component matrix

	Component								
	1	2	3	4	5	6	7	8	9
B1					.47				-.45
B2					-.46				
B3		.50			.61				
B4	.54			.49					
B5			.55	-.48		-.42			
B6		.43	.44	.56					
B7		.60							
B8		.60							
B9	-.57								
B10	.68	.42							
B11		.71							
B12	.58								

B13	.62								
B14		.67							
B15	.71								
B16				.68					
B17		.43				.46		.46	
B18			-.58						
C1	.45			.60					
C2	.90								
C3	.78								
C4	.84								
C5	.87								
C6	.66						-.43	.40	
C7	.72								
C8	.83								
C9	.70						-.42		
C10	.91								
C11	.70								
C12					-.62				
C13	.46		.58	.44					
C14	-.78								

C15	-.74		.41						
C16			.77						
C17						-.60			

Extraction Method: Principal Component Analysis.

The table 4.12 shows the nine components extracted that have a high influence on the outcome of ASEI- PDSI training and classroom practice. These factors have also been listed with the questionnaire items that they correspond to. The top shows factors 1 to 9 while the rows shows the questionnaire items coded form B1 to C 17 in respect to the questionnaire section and item number in the section for instance, B6 is the item 6 in section B of the questionnaire thus the item 'I would like to know the effect of the SMASSE training on their professional status' This is then the factor used to identify the variables by identifying the commonalities in the test items they correspond to.

4.8.3 Component Identification

Table 4.13 Component Identification

Component	Component name
1	Involvement of students and teachers in other departments through collaborations
2	Conflict of Interests
3	Knowledge on ASEI – PDSI
4	Time needed for / saved by ASEI PDSI

5	Availability of the resources
6	Work load
7	Anticipated Impact of ASEI –PDSI on learning
8	Coordination of tasks
9	Attitude of teachers and students

The table 4.13 shows that Involvement of students and other teachers in the implementation of ASEI – ADSI has the strongest influence on the outcome of the practice with 11.226 eigenvalues accounting for 32.075% effect on the outcome of the practice. It is closely followed by conflict of interest at3.568 eigenvalues accounting for 10.193% effect in that order up to attitude of teachers and students at 1.212 eigenvalues accounting for 3.464% effect

4.9 Discussion

The desired outcome of training is the achievement of a skill, knowledge and positive attitudes towards work (Kenneth, 2001). Training is an important element for employees' success through creating and acquiring skills and knowledge. Modification of employee behavior therefore, reflects new knowledge and insights in the Education industry. Formal processes are used to impart knowledge and help personnel acquire the necessary skills to perform their jobs satisfactorily.

The theory of planned behavior in combination with other learning theories including; constructivism theory of learning and experiential learning theories were adopted in this research. The systematic process incorporated with desire to change people's behavior, enhance cognitive learning and personal construction through experience and increase social interaction

was the rationale that justified the combination of these theories. In reference to studies used to guide the study, Ndirangu, (2013) did a study on the factors influencing teachers' level of implementing of SMASSE in Nyeri County, based on her findings the level of implementation of the ASEI-PDSI classroom practices was partial and the most significant variable influencing the implementation was the attitude of teachers.

The study has also shown that the was ASEI-PDSI was partially implemented in Mathematics (Mean 2.0556, Standard deviation 0.23570), Physics (Mean 2.000, Standard deviation 0.666667), Biology (Mean 2.0909, Standard deviation 0.30151) and Chemistry (Mean 2.0833, Standard deviation 0.28868). This implies that ASEI PDSI was only partially implemented in all the science subjects. Poor attitude towards the ASEI-PDSI approach is also a variable towards the implementation of the approach therefore this findings have a strong relationship with the finding of Ndirangu, (2013) in Nyeri county.

In the literature review factors that affect training outcomes were discussed at length and there is a variety of theoretical and empirical approaches that examine the issue of training transfer (Baldwin & Ford, 1988; Geilen, 1996; Huczynski & Lewis, 1980; Kontoghiorghes, 2004). These studies distinguish three categories of factors affecting training transfer at work. These factors include, factors concerning the trainee, factors concerning the training and the planning of the training program; and organizational factors affecting the transfer as well as the training and the trainee. The study established a number of factors that influence the implementation of the SMASSE inset which can also be grouped in the three categories. This include, Insufficient time for preparation, Inadequate resources, Poor planning for the lessons, Heavy workload, large class, other responsibilities, wide syllabus and learners ability.

CHAPTER FIVE

SUMMARY, CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

The chapter deals with a summary of the findings as given in chapter two followed by a discussion of the findings in relation to the literature review as depicted in chapter two followed by recommendations both for theory and practice and future studies then finally a conclusion

5.2 Summary

The findings show that the respondents were evenly distributed among the genders thus the outcome of the study would not be compromised by gender bias, had sufficient education to respond adequately to the questionnaire, evenly distributed among newly recruited teachers to seasoned teachers thus covering many different categories of teachers, had taught long enough to respond adequately to the research items, were from all levels of responsibilities thus had sufficient knowledge to enable them respond adequately to the research items, were of greater knowledge of both the subject content and curriculum requirements as well as the aspects of SMASSE relevant to the study and had sufficient knowledge of the concerns of study. It therefore means that the respondents were appropriate for the study and that the findings of the study would therefore be reliable and valid.

The study also showed that were concerned about evaluating their impact on students using ASEI-PDSI classroom practices, not having enough time to organize themselves each day using ASEI-PDSI approach, the conflict between their interests and their responsibilities when using ASEI-PDSI approach, how the ASEI-PDSI approach affects students liked to excite their

students about their part in the ASEI-PDSI approach, about their inability to manage all the ASEI-PDSI classroom practices required, Coordination of tasks and students is taking too much of their time, their attitude towards the ASEI-PDSI classroom practices and the time spent working with non-academic problems related to this ASEI-PDSI approach.

It also implies that respondents were keen to know the effect of the SMASSE training on their professional status, to know how their teaching or administration is supposed to change with the use of ASEI-PDSI approach, know how this ASEI-PDSI approach is better than what they had heard earlier, discuss the possibility of using the ASEI-PDSI approach more and help other departments in their use of the ASEI-PDSI classroom practices approach

The study however shows that the respondents were not concerned about the conflict between their interests and their responsibilities when using ASEI-PDSI approach and that they were not completely occupied with other things that they had no room to implement ASEI-PDSI approach had sufficient knowledge about the ASEI-PDSI Paradigm, were concerned about the ASEI-PDSI approach and that they knew what the ASEI-PDSI paradigm entailed. The study also found out that ASEI-PDSI approach can engage learners more than other forms of learning, ASEI-PDSI approach increases the quality of teaching and learning because it integrates all form of media; print, audio, video, and animation, ASEI-PDSI approach increases access to knowledge and training.

Teacher training should adopt ASEI-PDSI approach for their trainees, ASEI-PDSI approach enables collaborative learning, ASEI-PDSI approach improves communication between students and teachers, ASEI-PDSI approach enhances the pedagogic value of their subject, ASEI-PDSI approach is a clear enough process of learning, ASEI-PDSI approach increases the flexibility of

teaching and learning, ASEI-PDSI practices improve students' performance in their subject, and that ASEI-PDSI practices require less materials because of improvisation

Besides, it also found out that teachers don't lose control using the ASEI-PDSI learning for their classes, ASEI-PDSI approach is effective for students learning, and that teachers understand ASEI-PDSI therefore the approach does not make them uncomfortable. The study could not however determine from the descriptive analysis of the questionnaire items, whether ASEI - PDSI practice saves on teaching time, ASEI-PDSI approach saves time and effort for both teachers and students and whether It is not possible to cover the syllabus if ASEI-PDSI practices are implemented The study also determined that other factors that affected the outcome of the ASEI – PDSI included Insufficient time for preparation, heavy workload, inadequate resources, poor planning for lessons, poor attitude towards ASEI PDSI, large classes, wide syllabus, other responsibilities and learner intelligence levels.

Analysis of the extent of application of the ASEI – PDSI classroom practices indicated that ASEI PDSI was only partially implemented in all the science subjects. The study also identified 35 factors that influenced the independent variable. However, since the study was based on correlation, factors that had below 0.4 correlation coefficients were not considered as they have very weak correlations. This thus ensured that the study came up with 9 factors that had strong influence on the dependent variable. These factors were then identified based on the questionnaire items they strongly correlated to. The study thus found out that the outcomes of science and mathematics teachers of SMASSE INSET is highly influenced by involvement of students and teachers in other departments through collaborations, conflict of interests, knowledge on ASEI- PDSI, time needed for and saved by ASEI- PDSI, availability of the

required resources, workload, Anticipated impact of ASEI- PDSI on learning, coordination of tasks and attitude of teachers and students.

5.3 Conclusion

Based on the findings, the level of implementation of the ASEI-PDSI classroom practices in the public secondary schools in Mombasa County is partial and the conclusion is that the implementation of this innovation has not been successful. The study concluded that the most significant variable influencing the level of implementation of the ASEI-PDSI classroom practices was the attitude of the teachers. However, there was a dissonance between majority of the science teacher's positive attitude towards the ASEI-PDSI classroom practices and their level of implementation which was mainly partial.

The study further concluded that teachers had self-concerns. The majority of the teachers' second highest intense concern was management, therefore task concerns. The study concluded that little indication of teachers moving through the stages in a linear fashion even after five to ten years of completing the SMASSE INSET cycles. This leads to the conclusion that with appropriate support and assistance from change facilitators the teachers' concerns can shift to the next level taking advantage of the positive aspect of concerns not being fixed. Lastly, the study concluded that there was a significant relationship between the students' scores and the level of implementation; however, this can only be realized if a critical mass of the science teachers are implementing the ASEI-PDSI classroom practices fully in all the schools.

5.4 Recommendations for Theory and Practice

Based on the findings, the study the made the following recommendations, that he level of implementation of ASEI-PDSI classroom practices was found to be related to the teachers' attitude, although majority of the teachers had a positive attitude, there was per cent of teachers who still have a negative attitude towards the innovation. The national SMASSE INSET trainers should have strategies to bring them on board because the success of implementation of ASEI-PDSI is deemed effective when the majority or all the implementers are using it fully. Findings of this study showed that teachers had self and task concerns over the implementation of the ASEI-PDSI classroom practices. The management of SMASSE INSETs at the national level and the Quality Assurance and Standard Officers should address the root cause of these concerns. Most of the concerns were traced to the INSET, there is need to assess the training strategies of the trainers or even consider training a new crop of district trainers.

It was also revealed that majority of the science teachers had heavy teaching loads and other responsibilities. The majority of the teachers were also handling large classes. The teachers therefore indicated they had little time left to prepare the ASEI-PDSI lesson plans. The government should employ more teachers to create balance between the teachers student ratio and to reduce the teaching load. This will give the teachers ample time to prepare for ASEI lessons and also manageable groups to apply the learner-centered approaches the innovation recommends. It is recommended that the government with the help of the Board of Governors review the science infrastructure in the secondary schools. As they consider modernizing it, there is urgent need to increase the number of laboratories according to the number of streams a school has so that all the double lessons in science can be time tabled in the a laboratory. This will

encourage the teachers to carry out practical lessons recommended by the innovation instead of teacher demonstrations, which limit the learners 'hands-on' activities.

It is recommended as technology embraces e-learning the Kenya Institute of Education considers preparing common science lesson plans using the ASEI-PDSI paradigm for all levels of the secondary science curriculum to accompany the syllabus they prepare for schools. These could be posted on the internet for teachers to down load for their teaching.

5.5 Recommendations for Further Studies

The researcher recommends the following areas need further research. Given that this study was conducted in the Mombasa County secondary schools, it would be prudent for a comparable study to be developed to ascertain the level of implementation of the ASEI-PDSI innovation in other counties in Kenya. A comparative study on the implementation of ASEI-PDSI classroom should be conducted in the other countries in Africa as well, because they are receiving similar SMASSE INSET as that of Kenya, which has its regional center in CEMASTEA, Kenya. The study was based in the secondary school level. There should be a comparable study to find out the implementation of ASEI-PDSI classroom practices at the primary school. This would help the science teachers in secondary school to build continuity from the primary school level to benefit the students' emphasis on "hands on" learning. This study only established that the implementers had a negative attitude towards the implementation of the ASEI-PDSI classroom innovation. An in depth qualitative study should therefore be carried out to find out the factors that are contributing to the negative attitude towards this innovation.

5.6 Limitations of the Study

Even though the study makes reference to SMASSE, it is delimited to the teaching of Physics, Chemistry and Biology only. Therefore, the findings may not be generalized to other subjects' areas. The study was delimited to the public secondary schools and not to the private secondary schools Mombasa County. Generalizations to other parts of the country and to the private schools should therefore be applied with caution because the factors affecting the implementation of ASEI-PDSI classroom practices may vary from one place to another and to the category of school. The researcher also had no control over the attitudes of the respondents. The researcher was limited by time and resources and therefore only reached purposely selected schools in the County.

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APPENDICES

Appendix I: Teachers Questionnaire

This questionnaire is for the purpose of research only **N.B. DO NOT WRITE YOUR NAME ANYWHERE; THE RESPONDENTS IDENTITY SHALL BE ABSOLUTELY CONFIDENTIAL**. Please tick (√) in the appropriate bracket or fill in the information of your response to all the following questions.

PART A: BACKGROUND INFORMATION

1. What is your gender?
   a. Male ( )
   b. Female ( )

2. What are your professional qualifications?

   a. M.Ed. ( )
   b. M.Sc. ( )
   c. B.Ed. ( )
   d. B.Sc. + PGDE ( )
   e. Diploma ( )
   f. Others, please specify.....

4. What is your teaching subject?

   a.....

   b.....

5. How long have you taught your main subject.....?

6. What was the KCSE mean score in your teaching subjects in the year 2009?

Subject	Mean score
Biology	

Chemistry	
Physics	
Mathematics	

7. How many lessons do you have in a week? .....

8. (A) what are your responsibility in the school?

a. Principal ( )
b .Deputy Principal ( )
c. Head of Department ( )
d. Subject Head ( )
e. Class Teacher ( )
f. Subject Teacher ( )
g. Others please specify.....

(B) What are your responsibilities outside school?

a. Examiner ( )
b. Science congress official ( )
c. Subject panel member ( )
d. SMASSE trainer ( )
e. Others please specify.....

9. (A) Have you attended the SMASSE INSET?

a. Yes ( )
b. No ( )

(B) If yes, please specify the subject(s).....

10. Have you attended the following cycles of the SMASSE INSET in your teaching subject(s)

I. Cycle 1 Yes ( ) No ( )
II. Cycle 2 Yes ( ) No ( )
III. Cycle 3 Yes ( ) No ( )
IV. Cycle 4 Yes ( ) No ( )

PART B: ASEI-PDSI classroom practices.

Please use the following rating scale to indicate your current concerns and needs towards implementation of ASEI-PDSI classroom practices and tick the appropriate box

NB: ***Please respond to the items of your present concerns, or how you feel about your involvement or potential involvement with ASEI-PDSI classroom practices. For completely irrelevant items please tick '0' on the scale. Other items will represent those concerns you do have in varying degrees of intensity, see the scale below.***

Irrelevant	Not true of me now		Somewhat true of me	Very true of me
0	1,2		3,4,5	6,7

	0	1	2	3	4	5	6	7
1. I am concerned about my attitude towards the ASEI-PDSI classroom practices								
2. I do not even know what the ASEI-PDSI paradigm entails								
3. I am concerned about not having enough time to organize myself each day using ASEI-PDSI approach.								
4.I would like to help other departments in their use of the ASEI-PDSI classroom practices approach								
5.I have a limited knowledge about the ASEI-PDSI paradigm								

6. I would like to know the effect of the SMASSE training on my professional status.								
7.I am concerned about the conflict between my interests and my responsibilities when using ASEI-PDSI approach								
8. I am concerned about how the ASEI-PDSI approach affects students.								
9. I am not concerned about this ASEI-PDSI approach.								
10. I would like to discuss the possibility of using the ASEI-PDSI approach more.								
11. I am concerned about my inability to manage all the ASEI-PDSI classroom practices required.								
12 would like to know how my teaching or administration is supposed to change with the use of ASEI-PDSI approach.								
13. I am concerned about evaluating my impact on students using ASEI-PDSI classroom practices.								
14. I am completely occupied with other things I have no room to implement ASEI-PDSI approach.								
15. I would like to excite my students about their part in the ASEI-PDSI approach.								

16. I am concerned about the time spent working with non-academic problems related to this ASEI-PDSI approach.								
17. Coordination of tasks and students is taking too much of my time.								
18. I would like to know how this ASEI-PDSI approach is better than what we have heard earlier.								

Source: Adapted from SEDL, 2006.

PART C: Attitude towards ASEI-PDSI classroom practices.

Please use the following rating scale to indicate your current attitude towards implementation of ASEI-PDSI classroom practices and tick the appropriate box.

STRONGLY DISAGREE (SD)	DISAGREE (D)	UNDECIDED (UD)	AGREE (A)	STRONGLY AGREE (SA)
1	2	3	4	5

	1	2	3	4	5
1. ASEI-PDSI approach saves time and effort for both teachers and students.					
2. ASEI-PDSI approach increases access to knowledge and training.					

3.ASEI-PDSI approach enables collaborative learning					
4.ASEI-PDSI approach can engage learners more than other forms of learning					
5. ASEI-PDSI approach increases the quality of teaching and learning because it integrates all form of media; print, audio, video, and animation.					
6.ASEI-PDSI approach increases the flexibility of teaching and learning					
7. ASEI-PDSI approach improves communication between students and teachers.					
8.ASEI-PDSI approach enhances the pedagogic value of my subject					
9. ASEI-PDSI approach is a clear enough process of learning					
10.Teacher training should adopt ASEI-PDSI approach for their trainees					
11.ASEI-PDSI practices improve students' performance in my subject					
12.ASEI-PDSI practices require less materials because of improvisation					
13.ASEIPDSI practice saves on teaching time					
14. ASEI-PDSI approach is not effective for students learning.					
15. I feel I have lost control using the ASEI-PDSI learning for my classes					
16ASEI-PDSI approach makes me uncomfortable because I do not understand it.					
17.It is not possible to cover the syllabus if ASEI-PDSI practices are implemented					

PART E: Others

a. As a science/mathematics teacher do you implement the ASEI-PDSI classroom practices fully, partially or not at all? Please tick against the appropriate subject.

	Subject/ Implementation	Fully	Partially	Not at All
1	Mathematics			
2	Physics			
3	Chemistry			
4	biology			

b. In your own opinion, what factors do you think hinder the implementation of ASE-PDSI classroom practices?

i)……
ii)……..
iii)……

c. In your opinion how can the implementation of ASEI-PDSI classroom practices be improved?

i).....
.....
ii).....
.....

THANK YOU FOR THE THOUHGTS, TIME AND EFFORT YOU

HAVE PUT INTO COMPLETING THIS QUESTIONNAIRE