SMASSE PROJECT

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SMASSE

Baseline Studies and Intervention Strategies

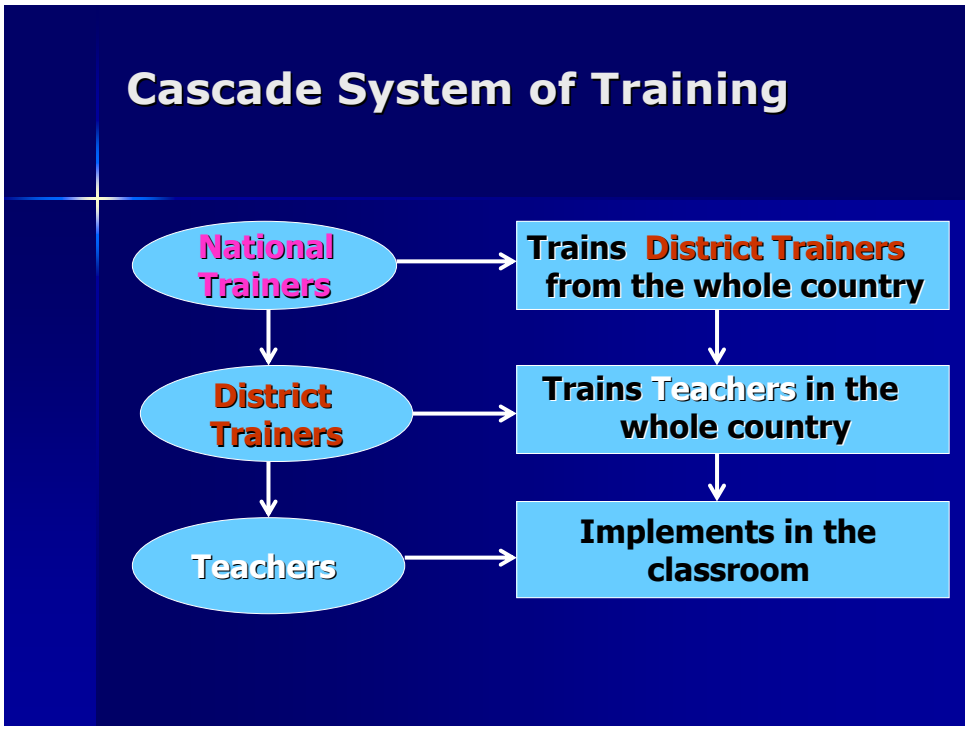
1.0 What is SMASSE Project?

SMASSE is an acronym for Strengthening of Mathematics and Science in Secondary Education.

SMASSE Project is a joined venture between the Kenya government through MoEST, and Government of Japan through JICA initially on pilot basis.

SMASSE Project is mainly involved in In-Service Training (INSET) of Serving Teachers in Mathematics and Science in Secondary Schools in Kenya.

The System of operation is through the Cascade System.



1.1 Why SMASSE?

SMASSE 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 Science and Technology (MoEST) and other stakeholders felt there had to be an intervention, hence the Strengthening of Mathematics And Science in Secondary Education (SMASSE) Project.

The SMASSE team conducted a baseline survey in the nine pilot districts (Kajiado, Gucha, Kakamega, Lugari, Butere-Mumias, Kisii, Murang'a, Maragua and Makueni) to determine the areas that needed intervention and come up with a strategic plan of operation. Interviews were conducted for Head teachers, teachers, students, parents and laboratory assistants. More data was collected by administering questionnaires to teachers and students, lesson observation and video recording of lessons for further observation.

From the results of the survey, it was evident that there were numerous problems in mathematics and science education. Among these were those problems within the scope of SMASSE Operations and others beyond the scope of the project.

Problems within the scope of SMASSE include:

1. Attitude Towards Science and Mathematics

   a. Students' Attitude:

   Attitude was generally neutral/negative. This was attributed to low marks at admission, belief that the subjects are difficult, peer influence, lack of facilities, harsh teachers, teacher absenteeism and theoretical approach to teaching.

   b. Teachers' Attitude:

   Attitude was generally neutral. They were reluctant to perform experiments, especially in Chemistry which were deemed dangerous. In some cases experiments failed. Most practical sessions were merely teacher demonstrations.

   c. Head Teachers' Attitude

   The Head teachers' neutral/negative attitude was reflected in their development project priorities. Text books, laboratories and laboratory equipment rarely were ranked high.

   d. Parents' Attitude

   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. PTAs were eager to construct prestigious structures to be seen to be development conscious, at the expense of basic teaching / learning resources.

2. Inappropriate teaching methodology
3. Content Mastery

4. Inadequate Assignments
5. Few or no interactive fora for teachers
6. Infrequent professional guidance by subject quality assurance and standards officers
7. Missing link between primary and secondary school levels
8. Lack of information about schools (the community)

1.2 SMASSE Intervention

SMASSE Project, through In-Service Education and Training of serving teachers of Mathematics and Sciences, addresses the problems within its scope.

The INSET Curriculum was thus developed to upgrade / strengthen teacher competence by addressing, through carefully selected topics, such areas of concern as:

- Attitude
- Pedagogy /Teaching Methodology
- Mastery of Content
- Developing teaching / learning materials
- Administration and Management

a. Attitude:

SMASSE targeted teachers first because of the time they spend with students. The attitude of the teacher, (teacher centred ness, inability to carry out experiments and demonstrations successfully, low frequency of experiments, chalk and talk, being content driven and knowledge based) impacts negatively on students. Negative attitude among students is manifested in untidy/incomplete homework, frequent absenteeism/feigned illness, lack of attention in class, poor performance and low enrolment in optional science subjects, especially physics.

b. Pedagogy:

Teacher training curricular do not adequately address issues pertinent to secondary school teaching. The theories in the curricula are often outdated and not applicable in the classroom.

c. Methodology:

Most teachers are content/syllabus driven; thinking that covering the syllabus is the same as effective teaching. Lecture becomes the method of choice even in science subjects because it allows coverage of ground in terms of content, although very little, if anything is achieved in terms of learning.

d. Mastery of content

In our classrooms we have the following categories of teachers;

1) Teachers who have good content mastery. The following is portrayed in their teaching;
    - take time to plan,
    - think about the delivery process with their students in mind
    - are sequential in their teaching and
    - Most often student focused /centred.

2) Teachers who 'lack' the time and their teaching portrays that they ;
    - do not take time to plan
    - do not think about the delivery process
    - are not sequential in their teaching
    - are out of touch with the syllabus
    - aren't student focused/centred and in many cases confuse students

3) The third category is of those who lack content mastery. They ;
    - cannot explain concepts satisfactorily
    - often misleading students unknowingly

SMASSE has all these factors in mind while preparing for INSETS.

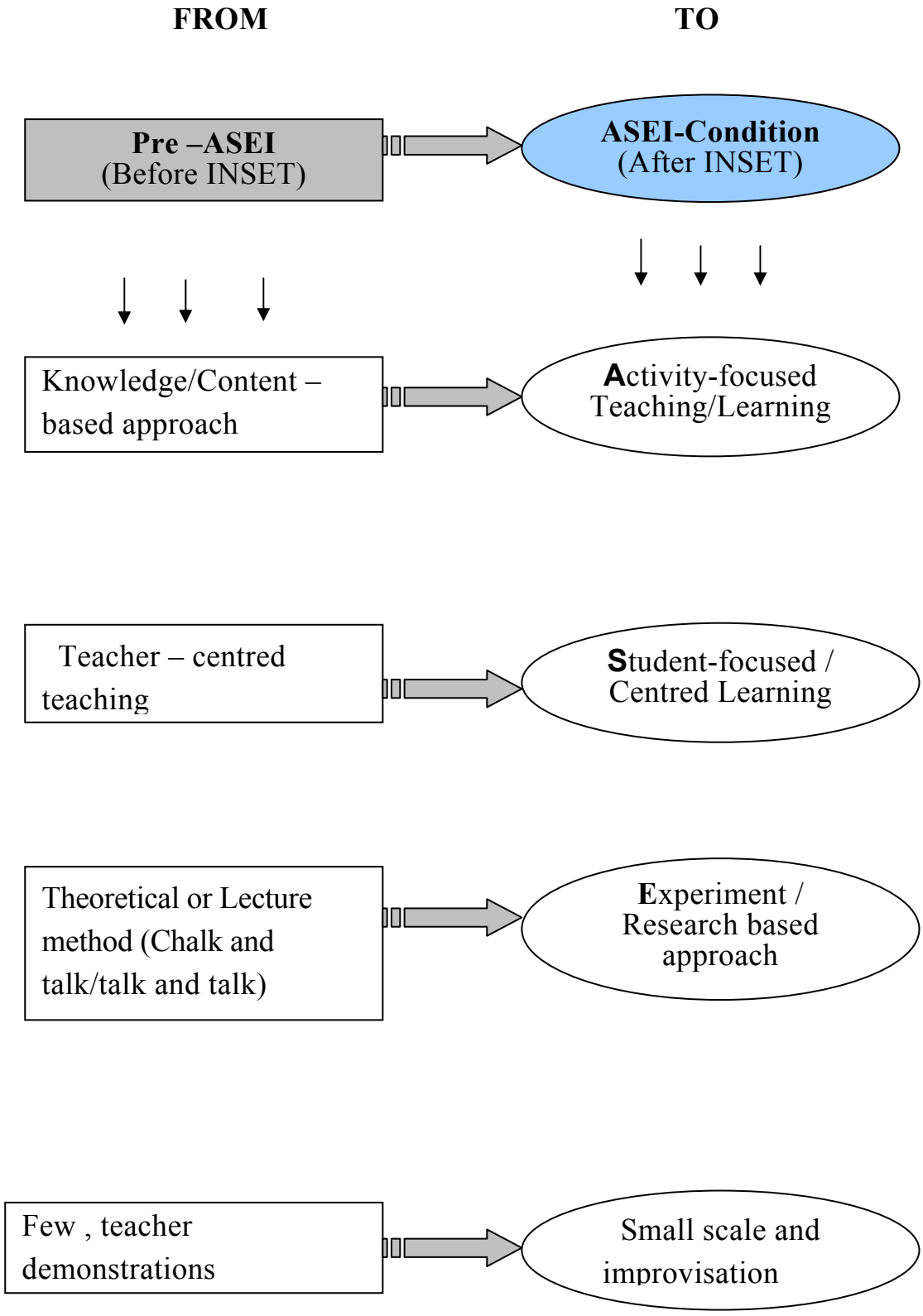
During INSET teachers are equipped with the necessary skills to develop teaching/learning (training) materials, use limited resources efficiently and effectively and utilise materials in their environment, Work planning e.t.c for effective teaching and learning of Mathematics and Sciences.

1.3 Good Practices for Effective Classroom Practices

1. ASEI /PDSI Paradigm Shift

The SMASSE Team came up with the **A**ctivity, **S**tudent, **E**xperiment, and **I**mprovisation (**ASEI**) movement to upgrade the various aspects of teaching and learning. There are four basic principles inherent in this, which guide SMASSE INSET activities aimed at a shift as follows:

A shift


FROM
TO
Pre –ASEI
(Before INSET)
ASEI-Condition
(After INSET)
Knowledge/Content – based approach
Activity-focused Teaching/Learning
Teacher – centred teaching
Student-focused / Centred Learning
Theoretical or Lecture method (Chalk and talk/talk and talk)
Experiment / Research based approach
Few , teacher demonstrations
Small scale and improvisation

PDSI Approach:

To achieve the ASEI condition, SMASSE came up with the **P**lan, **D**o, **S**ee and **I**mprove (PDSI) approach to teaching and learning.

- **P**lan

Apart from schemes of work and lesson plans, the teacher carefully plans and tries out the Teaching / Learning activities, materials and examples before the lesson.

Emphasis is on how instructional activities will enable learners to:

- Understand individual concepts and connections among them
- Get the rationale/value for the lesson
- Retain the learning and apply it in real life situations
- Get rid of learning difficulties and misconceptions
- Have more interest in the lessons

- **D**o

The teacher carries out the planned lesson / activity as planned

Teachers are encouraged to;

- Be innovative in lesson presentation.
- Present lessons in varied interesting ways to arouse learners' interest e.g. through role play, story telling
- Ensure active learner participation
- Be a facilitate the teaching/learning
- deal with students' questions and misconceptions
- Reinforce learning at each step

During INSETS, Teachers carry out peer teaching on the ASEI lessons and later actualize in schools.

- **S**ee **(Lesson study)**

The teacher evaluates the teaching and learning process during and after lesson, using various techniques and feed back from students. Teachers also allow their colleagues to observe their lessons and offer feed back.

- Enables teachers to;
  - ✓ see the good practices in the lesson and strengthen them
  - ✓ see mistakes made in earlier lesson

- ✓ Avoid earlier mistakes in future lessons

- In the process teachers become more open to evaluation by;
  - ➢ fellow teachers
  - ➢ school administrators
  - ➢ Quality and standards assurance officers
  - ➢ Students
- **I**mprove

Reflect on the performance, evaluation report and effectiveness in achieving the lesson objectives.

These Enables the teacher to;

- ✓ see the good practices in the lesson and strengthen them
- ✓ see mistakes made in earlier lesson
- ✓ Avoid earlier mistakes in future lessons

The teacher makes use of such information in planning the next lesson to enhance performance and student learning.

2. Climbing learning approach

Other than ASEI and PDSI approach SMASSE has borrowed other important practices in the classroom like the **Climbing Learning Approach**

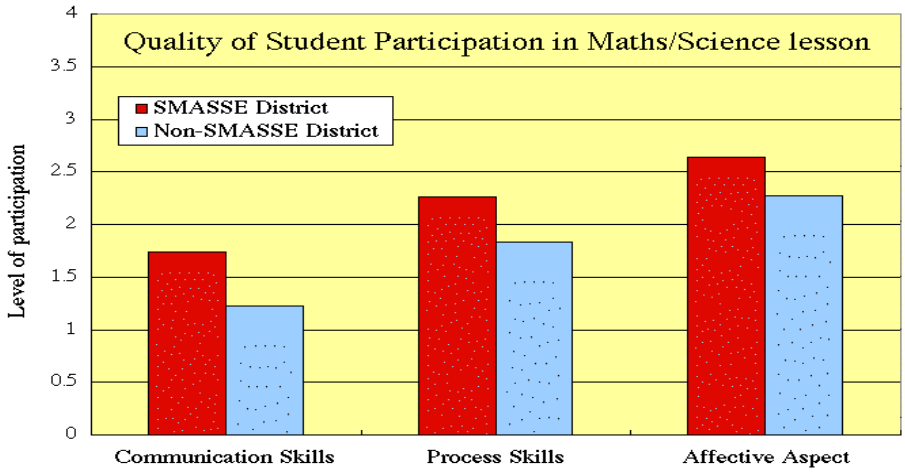
Climbing Learning approach was developed by Professor Noboru Saito of Naruto University of Education, Japan, Mathematics department. This method utilizes a *concept map, table of the reason for arrow lines* and *the research card* during the lesson instruction. Students are supposed to fill in the space of the concept-map the explanation of the learning elements, the formula, the examples and self made problems and answers. In the process the teacher makes the students understand the content and meaning of each learning element tightly. Thereby having the student extend the existing knowledge and reconstruct it. The other teaching learning tools in this method is the *Table of the reason for arrow lines,* where the students write the reason for arrows in the concept map. This activity is to enhance the students' understanding of interrelation of learning elements

The 3rd tool is *the research card* where the students write any questionable issues. These are *how, why* and *what* issues.

3. Open-ended approach

1.4 Why they are good practices

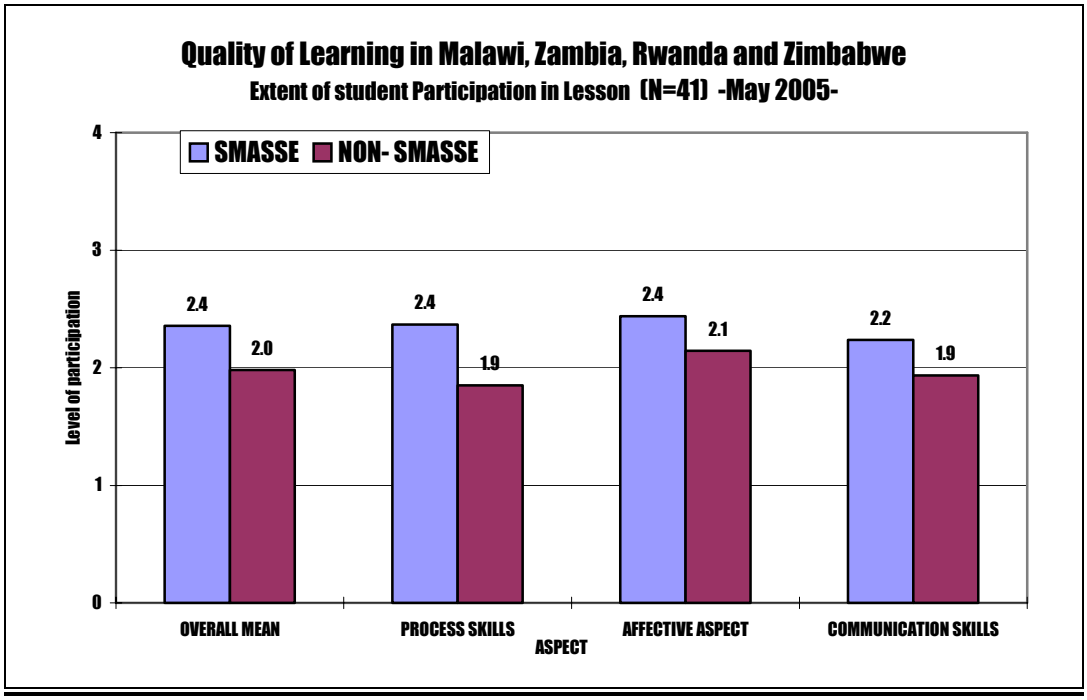
Through these approaches, SMASSE Project has had a positive impact on skills, knowledge and attitudes in the teaching and learning of mathematics and science. There has been significant improvement in performance in these subjects, in the districts where SMASSE has been in operation during the project period. The graph below shows some of those results in Kenya;



Other than focusing on Kenya, SMASSE focuses on the African region through SMASSE-Western, Eastern, Central and Southern Africa (WECSA) as a regional association of mathematics and science educators. It was started in 2001 for the purpose of strengthening the quality of teaching and learning of mathematics and science in member countries. Member countries have adopted SMASSE's ASEI movement and PDSI approach as a way of improving classroom practice.

As a follow-up, SMASSE Kenya personnel conducted Monitoring and Evaluation of application and impact of the principles of ASEI movement and PDSI approach, in the classroom in Malawi, Zambia, Rwanda and Zimbabwe

They also administered lesson Quality of Participation questionnaire to the students in the classes they observed lessons to assess the quality of learning by SMASSE trained and non-SMASSE trained teachers. The results were as follows:



SMASSE Project Impact Assessment Survey Results

September 2004, SMASSE Project undertook a nationwide survey to assess the impact of INSET. The aim was to find out how SMASSE activities are practiced in the classroom and how they translate in achievement. It was conducted in form two classes of selected schools, teachers taking the classes in mathematics and science subjects, and Principals of the schools.

The students had two sets of questionnaires; one dealing with their learning of mathematics in general, their attitudes toward the subjects and their participation in class during learning.

The following were observations on the teachers and the learners after being exposed to the INSET

Net impact on Teachers;

- Plan better and more consistently
- Attend students' needs more
- Teachers are more open to team work
- More confident to carry out practical activities and experiments previously thought to be difficult or dangerous
- Try out new methods
- Face the challenge arising from lack of resources better
- Face the challenge of large classes better

Net impact on Students;

- ❑ Are actively involved
- ❑ Show great interest and responsiveness
- ❑ Attend lessons more punctually and regularly
- ❑ Do their assignments more neatly and promptly
- ❑ Carry discussions beyond class time
- ❑ Ask questions in and out of class
- ❑ Students' interest and curiosity is aroused and sustained as they relate mathematics to their real life experiences
- ❑ Encourages teamwork but allow individual participation for the students.
- ❑ Provide students with opportunities to develop key competencies such as problem-solving, analysis, synthesis and application of relevant information
- ❑ Demystify math because by relating it to students' real life experiences
- ❑ Their attitude gradually becomes positive

Reforms expected;

The kind of reforms expected out these practices are like some of the positive impacts already mentioned as noted in the teachers and learners. We also expect that;

- Attitude will be positive for teachers and students
- Teachers will practice more effective Teaching Methodologies
- Teachers will have a better Mastery of Content
- Teachers will Develop effective teaching / learning materials
- There will be better Administration and Management in schools

In essence, the students should become active in the learning process while the teacher carefully guides the process and there will be more meaningful learning activities in the Mathematics classrooms.

References:

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Noboru Saito,Boo Yoon Kim, (1998)Comparison of Japan-Korean Mathematical Achievement Using the Climbing-Learning Method *Proceedings of ICMI-EARCOME 1 Vol.3*