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교육학석사학위논문

Factors Affecting the Sustainability of
Japan's 『Strengthening Mathematics and Science Education』 Project
for Teacher Training in Kenya

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교원연수 사업의 지속가능성 요인 분석

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Japan's 『Strengthening Mathematics and Science Education』 Project
for Teacher Training in Kenya**

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ABSTRACT

Factors Affecting the Sustainability of Japan's 『Strengthening Mathematics and Science Education』 Project for Teacher Training in Kenya

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The SMASE (Strengthening Mathematics and Science Education) project was initiated and implemented in the global context in which the old model of technical cooperation (TC) was criticized because of its short-term engagement and donor-driven nature. The SMASE project tried to address these limitations of TC and aimed at establishing a sustainable in-service training (INSET) system on technical, institutional and financial bases. These bases were jointly formed by Kenya and Japan, but slight more emphasis was on Kenya's initiatives and self-help efforts. However, the SMASE INSET system has shown several challenges in terms of sustainability. This study analyzes the factors that affected the sustainability of the SMASE INSET system in Kenya. More specifically, it examines the technical, financial and institutional measures which were taken to establish SMASE as a sustainable INSET system, and also the

ownership and localization of knowledge initiatives and limitations which affected the sustainability of the SMASE INSET system.

The study indicates that the contents, human resources, institutional and financial measures have been taken to improve sustainability of the SMASE INSET system. The SMASE INSET curriculum and contents were developed by the efforts of Kenyan trainers and teachers on the basis of teachers' needs and Kenyan educational context. CEMASTE (Center for Mathematics, Science and Technology Education in Africa) was established to serve as a center for teacher capacity development in mathematics and science education. Human resources for the project such as INSET trainers and administrative personnel have been trained regularly at the center. Under the leadership of the CEMASTE, the project was implemented using existing management structures and the personnel from national to district level. The institutional frameworks which are cascade model from national to cluster and the enforcement of training to all secondary mathematics and science teachers have contributed to the fast, broad diffusion and establishment of the INSET system. Cost sharing between Kenya and Japan, and a sustainable fund raising mechanism, *SMASE Fund*, contributed to enhancing the sustainability of the INSET system.

However, there were also limitations which hindered the sustainability of the project. First, what teachers learned during the INSET (ASEI-PDSI approach) were not actively utilized by teachers in the classroom. Second, the lack of capacity of trainers and administrative personnel at the district and cluster level has hampered sustainability of the SMASE INSET system. Third, top-down approach and compulsoriness which failed to bring out teachers' support and nurture their responsibility have threatened the sustainability of the project. Fourth, there was a discrepancy in the collection rate of the SMASE Fund between schools, and no district succeeded in collecting 100% of the Fund. In addition, the management of SMASE fund has become an issue.

These findings were interpreted from the perspective of ownership and localization of knowledge using analytical frameworks designed by the researcher based on literature review. The result shows that ownership was ensured at the high level (national government), but it was not promoted at the lower level (end-beneficiaries) in the SMASE project. Ownership of the Kenyan Government (GOK) was enhanced by joint project formulation, cost sharing strategy, GOK's political support, integration of the project into existing structure and system of the GOK, and South-South cooperation with SMASE-WECSA (Western Eastern Central and Southern Africa) member countries. In terms of nurturing ownership of the most important beneficiaries, the teachers, their participation, empowerment, and consensus were quite limited under the condition of cascade model (top-down model). Also, the enforcement of participation by the Government made teachers de-motivated. Unless teachers consider their role as the agent of change and take ownership of the project, the project cannot be sustained successfully.

The direction of training was introduced and induced by the foreign knowledge from Japan and the knowledge gained through South-South cooperation with the Philippines. However, in the identification of local needs and the development of training contents heavily depended upon local knowledge of Kenya counterparts (C/Ps). Localization of foreign knowledge and utilization of local knowledge contributed to improving the training contents to be more compatible with the condition of the partner country, thereby, contributing to the project being more sustainable and friendly to the local people. In spite of such efforts, however, SMASE-trained teachers still face difficulties to apply the knowledge acquired through the project to the classroom practices. Teachers are still struggling with surrounding circumstances that hinders actual practice of knowledge. This challenge derived from two reasons. First, teachers were recommended to practice advanced teaching methods which was inadequate

considering the actual environment where basic needs were not satisfied. Second, the training contents are not compatible with the existing knowledge of other stakeholder institutions due to lack of cooperative institutional network. Such low level of application of training contents resulted the effect of project to be less tangible, simultaneously, has impeded sustainability of the project.

The project shows how ownership and localization of knowledge discourses are practically applied to the development cooperation projects and how these efforts can lead to sustainability of the project. It was found that the ownership of the Government of Kenya was powerful as the project was initiated and led by the government. The INSET contents were developed by Kenyans based on Kenyan teachers' needs and curricula. However, the project showed limitations in considering the importance of the role of teachers as the main agent of change as the result indicated that their ownership was not reinforced. Another missing piece is that the project was too much focused on the lesson improvement assuming that other basic challenges can be overcome solely by teachers' attitude. Only by training teachers, it is difficult to engender teachers' capacity development and lesson improvement since the surrounding circumstances were insufficient for the teachers to be innovative and proactive. There needs to be a comprehensive approach to make teachers more motivated to change their teaching attitudes and methods.

.....

keywords: Japan's Official Development Assistance (ODA), Strengthening Mathematics and Science Education (SMASE) Project in Kenya, in-service teacher training (INSET), sustainability, ownership, localization of knowledge

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CHAPTER 1. INTRODUCTION

The purpose of the study is to critically analyze the factors which positively and negatively affected sustainability of SMASE (Strengthening Mathematics and Science Education) INSET (In-service teacher training) system and practice in Kenya. More specifically, this study will examine technical, financial and institutional bases of establishing a sustainable INSET system. It will also explore ownership and localization of knowledge initiatives and limitations affecting sustainability of the SMASE INSET system.

The Government of Kenya (GOK) recognized that quality mathematics and science education is important to become an industrialized country and it depends on well trained, educated and highly motivated teachers. In this regard, the SMASE (Strengthening Mathematics and Science Education)¹ project, a technical cooperation project between the Government of Kenya (GOK) and the Government of Japan (GOJ), was launched in Kenya in 1998.

The project is aiming at the improvement of mathematics and science education through in-service training (INSET) for teachers. The project focuses on lesson improvement relying on student-centered approach as its key concept using the slogan “ASEI-PDSI (ASEI: Activity, Student-centered, Experiment, Improvisation, PDSI: Plan, Do, See, Improve)”.

¹ The project was initiated in 1998 with the name “Strengthening of Mathematics and Science in Secondary Education (SMASSE) Project” because the project only targeted secondary education in the 1st (1998-2003) and 2nd (2003-2008) phase. The name changed into SMASE (Strengthening Mathematics and Science Education) after the project started including primary sector in the 3rd phase (2008-2013).

The project has introduced an INSET system in Kenya using cascade approach² at the national, district/regional and cluster levels. After the launch of the 2nd phase of the project (2003-2008), the GOK established the CEMASTEIA (Center for Mathematics, Science and Technology Education in Africa) and the project was expanded both domestically to the entire Kenyan territory, and intra-regionally to 34 Sub-Saharan African countries³ (JICA, 2007a).

This project was initiated and implemented in the global context that old model of technical cooperation (TC) was criticized because of its short-term engagement and donor-driven nature such as lack of alignment with partner country's needs, distorting priorities, fragmenting management, ignorance of local knowledge and context, knowledge transfer from North to South based on "filling knowledge gap" approach (UNDP, 2002a; Jha, et al., 2004).

So, the SMASE project tried to address these limitations of TC and aimed at establishing a sustainable INSET system on technical (content and human resources), institutional and financial bases jointly formed by Kenya and Japan but more emphasis on Kenya's initiatives and self-help efforts. However, the SMASE INSET system has shown some problems in terms of sustainability. There are several contributing and impeding factors affecting the sustainability of the SMASE INSET system. Among various factors, this study will focus on the ownership and localization of knowledge

² The SMASE project has been implemented through three levels of cascade which are national, district/regional, and cluster levels. In the cascade model, national trainers (CEMASTEIA Staff) train district or regional trainers (selected teachers or Teacher Training College tutors) who consequently train cluster trainers (selected teachers). At the lowest level of cascade, cluster trainers train teachers.

³ For the intraregional activities, SMASE-WECSA (Western Eastern Central and Southern Africa) Association was established in 2003.

initiatives and limitations.

1.1 Background and Statement of the Problem

- Background of the Problem

Since technical cooperation (TC) first appeared in the 1940s, its concept and focus have continuously changed. In the early period of TC, many TC projects at that time focused on one-way transfers of knowledge such as short-term training and workshops based on good practices of developed countries. However, during the 1990s, TC was frequently criticized for undermining local capacity, lack of local control management, lack of alignment with partner country's needs, distorting priorities, choosing high-profile activities, fragmenting management, using expensive methods and fixating on targets (UNDP, 2002a). For this reason, donors' thinking shifted from a traditional focus on skill transfer supply to a more strategic and demand-driven concept of "capacity development". Since the middle of the 2000s, deliberate effort to shift control and decision making to local systems and actors during the process of TC was underlined (i.e. Ownership) and the significance of local institution, culture, and structure is emphasized (Localization). Most of all, longer term engagement and implementing TC in a sustainable manner is considered important (Sustainability).

In this global context, in the middle of the 1990s, Japan started to conduct formulation studies of the SMASE project and tried to overcome criticisms on the old model of TC "filling knowledge gap approach" when planning and implementing the

project. From the pilot stage (phase 1) of the project, the significant consideration was given to sustainable nation-wide INSET system building, ensuring ownership and localization of knowledge starting from the partner country by engaging local people into joint formulation and making them take initiatives of developing and operating INSET by themselves (JICA, 2007a).

On the other hand, in Kenya in the late 1990s and 2000s when the SMASE project was formulated and implemented, there were two main emphases in education sector: 1) strengthening mathematics and science education for achieving higher economic levels in the country⁴, 2) improving quality of education through an effective professional development program for teachers.

Kenya's vision is to transform into a rapidly industrializing, middle-income nation by 2030. According to the First Medium Term Plan 2008-2012 (FMTP) of Kenya Vision 2030, the integration of science, technology, and innovation (STI) in the national productive process is recognized as central to the attainment of the Vision 2030. To this effect the GOK has committed to 'raising the quality of teaching of mathematics, science and technology in schools, polytechnics, and universities'. This is because the capability of students in mathematics and science was low given the performance in national examinations. The FMTP further notes that there have been fewer secondary school students enrolling for science-based courses in post-secondary institutions than the economy and industry demand. To meet the demand of skilled workforce in STI

⁴ Various national development policy documents of the Government of Kenya (GOK) such as *National Development Plan (Kenya Vision 2030)*, *Master Plan on Education and Training: 1997-2010*, *Poverty Reduction Strategy Paper (PRSP)*, *Economic Recovery Strategy for Employment and Wealth Creation*, *Sessional Paper No. 1 of 2005 on "Policy Framework on Education and Training"*, *Kenya Education Sector Support Program (KESSP)* etc. emphasize the importance of Mathematics and Science Education in order to achieve higher economic levels in the country.

fields, it is urgently needed to improve mathematics and science education and to spur interest in these subjects among youths. The GOK was accordingly prepared to invest into strengthening of mathematics and science education in the 1990s.

The GOK introduced Free Primary Education (FPE) in 2003 and Free Day Secondary Education (FDSE) in 2008, which have rapidly expanded access to education in Kenya. With the effort of policy implementation by the GOK, the primary school enrollment raised from 68.8% (1999) to 91.4% (2010) and the secondary enrolment raised from 13.7% (1999) to 32.6% (2010) (MOE, 2010). However, the FPE and FDSE have led to many challenges in quality of education regarding inadequacy or unavailability of teaching and learning facilities/materials, deficit of teachers in some areas of curriculum, inappropriate teaching by under-qualified teachers, poor administration of facilities, curriculum instruction, student and staff development and financial management (JICA, 2008).

Kenyan Ministry of Education (MOE) acknowledges that the achievement of quality Education for All (EFA) will largely depend on having a well trained, well educated and highly motivated teaching force. Kenya Education Sector Support Program (KESSP)⁵ thus points out that in order to realize continuous and sustainable improvement of quality of education, establishment of an effective professional development program for teachers is essential (CEMASTE, 2009). MOEST⁶ (2003) stated that development and operation of in-service programs is one of the indicators of

⁵ KESSP, developed by Ministry of Education, is a comprehensive framework for program implementation. This program was developed to operationalize the budget for prioritized education programs, to ensure that the goals and objectives spelt out in policy document are attained. In the KESSP covering the period of 2005-2010, 23 investment programs are addressed.

⁶ Ministry of Education Science and Technology

the quality of education.

In this vein, the GOK has been running different models of in-service training with various development partners. Many Initiatives have targeted improvement of both school administration and classroom practices mostly at primary education level. For example, PRISM (Primary School Management Project) and SPRED (Strengthening Primary Education) / School-based Teacher Development (SbTD) were implemented jointly by the GOK and the UK Department for International Development (DfID) during the period of 1996-2000 and 1991-2005 respectively. KENSIP (Kenya School Improvement Project) by CIDA and Aga Khan, starting in 1997/98, also included a component of teacher mentoring and support. There are two things to point out. First, before SMASE, the secondary education sector had very few initiatives. Second, these in-service training programs were implemented without effective coordination at the national level. It was therefore indicated that a harmonized national INSET program has to be systemized and institutionalized by the Ministry of Education (MOE).

Under the circumstances of a new trend of technical cooperation and Kenya's emerging needs of strengthening mathematics and science education and quality of education through teachers' professional development, the SMASE project was launched and expanded.

- Statement of the Problem

From the early stage of the project, establishing a sustainable INSET system and its independent operation by the Kenyan Government was intended. While the project has contributed to attaining this goal, several issues have remained unsolved.

The SMASE INSET was spread to all districts in the country using cascade model of three-level INSETs which are national, district/regional, cluster INSETs⁷. Through the cascade approach and enforcement of training to teachers⁸, the 3-level INSET system has been settled down and a large number of teachers were trained⁹. The training contents have been developed on the basis of Kenyan knowledge and context by Kenyan C/Ps (national INSET trainers) since the initial stage. The SMASE INSET training contents consisted of four cycles were established and they were modified and renewed according to the context of each district and schools. This contents basis also helped to build sustainable INSET system. The INSET system at each level has been operated by Kenyan personnel using existing human resources. To utilize the existing personnel in MOE or District Education Offices, sensitization workshop was also conducted using the cascade model from national to cluster. Above all, the budget of the project was covered by both Kenya and Japan sides (cost sharing) and the financial independence rate has become higher. The financial contribution ratio of Kenya among the total budget was 89% in 2011 (Mid-term evaluation of Phase 3). At the district level, a funding mechanism called “SMASE Fund” was established to raise funds for operating district level INSETs. The SMASE Fund contributed to establishing sustainable fund raising mechanism at the district level. For this achievement, political support and

⁷ SMASE-secondary and primary has different cascade structures. Secondary has two levels of INSETs which are national and district INSETs. Primary has three levels of INSETs which include national, regional and cluster INSETs.

⁸ The participation was enforced to every mathematics and science teacher in secondary schools and three M&S teachers at class 6-8 in each primary school based on the agreement specified in the Minutes of the Stakeholders’ Meeting in 2002.

⁹ As of 2012, 1,139 district trainers, 14,581 M&S teachers were trained at the secondary level, and 271 regional trainers, 4,164 cluster trainers and 55,393 teachers were trained at the primary level.

ownership of the Government of Kenya contributed a lot.

However, the turnover rate of cluster trainers was remarkably high and the participation rate of teachers at the bottom level training has decreased. For example, the number of district trainees decreased from 16,362 (2004) to 14,581 (2007) during the period of Phase 2. As this number shows, the discontent of participants has increased and become more apparent. During the interviews with participant teachers, it was very obvious that their motivation toward the SMASE INSET was low and many of them were unsatisfied with and some were even resistant against the project (more details are given in *5.1. Ownership in SMASE 2) Ownership of Beneficiaries b. Limited participation: De-motivated teachers*). Teachers did not consider themselves as the main agent of change but as passive recipient or the oppressed by the government force.

Another concern is that what teachers learned in the INSET was not being applied to the classroom activities. The core value of the SMASE INSET is student-centered approach which could be attained through lesson study. In the INSET, teachers have been trained to plan, implement, observe and improve student-centered mathematics and science lessons. However, according to the survey conducted in 2011, only 28% of the lessons conducted by SMASE trained teachers could be classified as tending towards learner-centered approach (CEMASTE, 2011). Many interviewed teachers said that there are many impeding factors to practice ASEI-PDSI approach in schools. The problem may reside in the SMASE training contents itself or in surrounding environment of teachers.

There have been efforts to establish sustainable INSET system in the SMASE project and it was considered to attain this goal to some extent. But several problems

were captured which hinders sustainability of the SMASE INSET system. Therefore, this study will examine the measures taken to establish sustainable INSET system in the project. It will clarify the contributing and impeding factors affecting the sustainability of the SMASE INSET system in relation with ownership and localization of knowledge.

Sustainability, ownership, and localization issues are repeatedly emphasized in the development cooperation field. But it was mostly high-level discourse or political statement detached from the real aid practices on the ground. This study will contribute to narrowing the gap between the high-level discourse and the field practices of sustainability, ownership, and localization.

Most of previous studies on the SMASE project focus on its impact on students' attitude and academic achievement or teachers' teaching practices. There are some literatures which analyze the SMASE project from the perspective of capacity development, but there is no research which analyzes focusing on sustainability and its contributing and impeding factors in terms of ownership and localization of knowledge. Therefore, this study will also help understanding the project from a new perspective.

1.2 Purpose of the Study and Research Questions

The main purpose of the study is to critically analyze the factors which positively and negatively affected the sustainability of the SMASE INSET system in Kenya. In this study, the researcher will examine technical, financial, and institutional bases of establishing a sustainable INSET system, and ownership and localization of knowledge initiatives and limitations affecting the sustainability of the SMASE INSET

system.

To fill this purpose, the main and sub questions were set as follows:

The Main Research Question: What are the factors that affected sustainability of the SMASE INSET system in Kenya?

1. What technical, financial and institutional measures were taken to establish a sustainable INSET system in the SMASE project?

a. What are content, human resources, institutional and financial bases of the SMASE INSET?

b. How were the content, human resources, institutional and financial bases of the SMASE INSET developed?

c. What was the achievement and limitation of the content, human resources, institutional and financial bases of the SMASE INSET in relation with sustainability of the INSET system?

2. What were the ownership and localization of knowledge initiatives and limitations to establish a sustainable INSET system in the SMASE project?

2.1 Ownership

a. What kinds of strategies and activities were introduced to nurture ownership of the partner country?

b. To what extent was ownership in the SMASE project ensured at the national, district and school level?

c. What were the ownership related factors which made difficulties in

establishing the SMASE INSET system?

2.2 Localization of Knowledge

- a. What kinds of strategies and activities were introduced to enhance localization of SMASE INSET knowledge (training contents)?
- b. What is the perception of compatibility or practicability of the SMASE INSET knowledge in Kenyan context?
- c. What were the reasons for low utilization of the SMASE INSET knowledge in Kenyan classrooms?

1.3 Significance of the Study

The significance of the study can be understood in various ways. First, this study will enhance the understanding of sustainability mechanism in aid projects and its relation with ownership and localization of knowledge. It investigates various contributing and deteriorating factors of the sustainability of ODA projects and specifically proves the significance of ownership and localization of knowledge for establishing sustainable system in the partner county with detailed examples of the SMASE project. So, this research will be an addition to understanding and promoting the significance of these three issues.

Second, this study will help overcoming the ambiguous and theoretical features of sustainability, ownership, and localization discourses by providing concrete examples from the project. Until now, sustainability, ownership and localization issues have been

repeatedly raised as a motto or principle of aid policies or strategies, but they were hardly reflected or realized in the implementation of the aid project. The reason is that most discourses on sustainability, ownership and localization were based on theoretical argument or political statement rather than vivid reflection of the reality on the ground. Usually, it was very hard to understand how to apply these high-level discourses into the process of the real aid projects. So, there has been a big gap between the policies and the realities in the field of development cooperation. This study tries to contribute to addressing the gap between high level policy and local ground implementation.

Third, this study will deepen the understanding on the various levels of ownership. In most cases, in particular, in top-down model projects, the ownership is restricted to the level of government and the ownership of the bottom-level beneficiaries is ignored. Of course, it is important to secure political support and leadership by enhancing the ownership of the recipient government and high-level key personnel. However, for sustainability of the project, it is also significant to encourage participation, empowerment, and responsibility of end-beneficiaries. They need to be recognized as the main agent of the project rather than passive recipient of the benefits given by the recipient government or donor organizations. If their ownership is guaranteed, end-beneficiaries will pave the way to make the project or system sustainable with their own self-help efforts.

Finally, this study will give an answer to the unsolved question, why the “try-to-be-localized” knowledge in the technical cooperation project is not utilized in the context of the partner country. In the SMASE project, there were various efforts to use local knowledge basis and localize foreign knowledge. But the locally developed

training contents were not actively used in the classroom practices. It was because the surrounding environment does not encourage teachers to utilize what they learned in the SMASE INSET. It was compared to the situation that people struggling with basic needs were recommended to eat “meat” in the situation where even “bread” does not exist. In this case, there needs to be more holistic and comprehensive approach to deal with the overall difficulties in education environment, system and policies (“bread” and “meat” together in harmony approach). Therefore, this study finds lesson that in order to make the knowledge more applicable and sustainable, there needs to be more than localization of knowledge.

1.4 Limitations and Delimitations

There are some limitations of the study in terms of its research design and methods. First, though the SMASE project has been implemented in all districts of the country, the researcher was based in Nairobi during the field study and could not have a chance to visit various districts to investigate the overall situation of the project. It is evident that the situation in rural area is quite different from that of Nairobi. In particular, from the document analysis and interview, it was recognized that the Arid and Semi-Arid Land (ASAL) area¹⁰ have faced many challenges to implement the SMASE project. However, the researcher could not specifically identify the challenges of the project in rural areas. Instead, the researcher tried to interview regional trainers coming

¹⁰ Nomadic culture is preserved in ASAL area, and it is the socioeconomically poorest area in Kenya.

from various parts of the country to attend a national INSET at the CEMASTEIA and reflect their opinion on the findings of the study as much as possible.

Second, though there are three levels of INSET (national, regional/district, cluster INSET) in the SMASE project, the researcher could only observe national INSET. It is because the period of the stay in Kenya allowed the researcher to observe only a national INSET. In the cascade system, it is often criticized that the quality of INSET is degraded when cascading down to lower levels. If it had been possible to observe all levels of INSET, it would have helped to understand the advantages and disadvantages of the cascade model more in depth. So, the researcher tried to identify the regional INSET with the interview with regional trainers and to examine the district and cluster INSET with the interview with participant teachers in sampled schools.

Third, since this study adopts qualitative approach targeting small number of samples, it may be difficult to generalize the findings to explain large size of the population. Other stakeholders or participants of the SMASE project who were not sampled in this study may have different understanding and opinions. To address this problem, the researcher tried to include various data sources and did data triangulation to confirm and increase their validity.

This study consists of six chapters. Chapter 1 provides the reader with a basic understanding and broad overview of the study, including the background and statement of the problem, the purpose and importance of the study, the limitations and delimitations of the study. The purpose of Chapter 2 is to review the literature on changing concept of technical cooperation, ownership and localization of knowledge in

technical cooperation and previous studies on SMASE. This chapter aims at understanding the study's theoretical background and the main perspective of the study and at examining what kind of research has been conducted on the project and make sure which part this study can make contribution upon the previous works. Chapter 3 focuses on the methodology of the study, which describes the research methods, the sample and population of the study, and overall data collection and analysis process. Chapter 4 presents the reader with the study's findings on the first research question about the content, human resources, institutional and financial bases of sustainability of the SMASE INSET system. The purpose of the Chapter 5 is to analyze and interpret the findings in relation to ownership and localization factors following the analytical frameworks designed by the researcher. And finally, Chapter 6 summarizes the study and presents concluding remarks on the implications of the study.

CHAPTER 2. LITERATURE REVIEW

This study tries to look into the question of how the sustainability of the SMASE INSET system was positively or negatively affected by ownership and localization of knowledge related factors in the project process. To analyze the project from this point of view, it is necessary to review literatures on ownership and localization of knowledge. These issues emerged in the changing paradigm of ODA and, in particular, technical cooperation. So, this paradigm shift will be reviewed beforehand and ownership and localization of knowledge issues in technical cooperation will be examined next. For the better understanding of the SMASE project and to find out which contribution this study can make, previous studies on SMASE will be examined.

2.1 Changing Concept of Technical Cooperation

Technical cooperation (TC, sometimes used interchangeably with the term “technical assistance”) is a traditional aid instrument. TC is generally acknowledged by donors to include activities like dispatching experts, training, providing equipment and research. The primary goal of TC is to help countries create, strengthen, utilize and retain capacity.

When TC first appeared in the 1940s, the international society paid attention to it as a new aid modality with financial support. In particular, as bilateral and multilateral donors recognized the necessity of stepping forward from infrastructure-centered

development assistance to transfer of advanced knowledge and technology, TC packaged in the form of short term donor projects was considered reasonable initial responses to the challenges of overall development in the partner country (Berg, 1993).

Likewise, TC's role in development began with the notion that that there were certain gaps in the skills and abilities of "developing" countries that prevented them from becoming "developed" and that an outsider could fill that gap. Thus, many TC projects at that time focused on one-way transfers of knowledge such as short-term training and workshops based on good practices of developed countries. Theoretically, once the gap was filled, people would become self-reliant ("gap-filling approach") (OECD/DAC, 2011). According to Morgan (2009), this period is classified as the first generation of TC.

However, during the 1990s, as aid fatigue became apparent and a series of reports were published which were highly critical about the effects of aid in general, and TC in particular (OECD, 1992; UNDP, 1993; World Bank, 1998). TC was frequently criticized for undermining local capacity, lack of local control management, lack of alignment with partner country's needs, distorting priorities, choosing high-profile activities, fragmenting management, using expensive methods and fixating on targets (UNDP, 2002a). It was widely recognized that TC had performed least favorably in institutional capacity building of developing countries. Such criticism have mainly been directed towards an old type of TC which tends to depend upon the dispatch of foreign experts who took over the positions of local experts, the formulation of Project Implementation Units (PIUs) independent from existing organization, and transfer of knowledge which is not aligned with partner countries needs and context (Kanda and

Kuwajima, 2005).

One written milestone for the criticism of TC was the well known Berg Report “Rethinking Cooperation: Reform for Capacity Building for Africa” commissioned by the UNDP in 1993. In this paper, he pointed out four major problems of TC as follows: 1) Donors could not provide appropriate and flexible TC based on the various needs of the partner country 2) TC’s objectives were not aligned with development goal of the partner country’s government or related organizations 3) Since TC was mainly managed by dispatched foreign experts, using local human resources was restricted 4) TC was planned and implemented independently from other aid modalities, hence failed to contribute to mid- and long-term systematic reform and capacity development (Berg, 1993, ReDI, 2012).

As donors thinking shifted from a traditional focus on skills transfer supply to a more strategic and demand driven concept of “capacity development”, an impetus for change in technical cooperation practice slowly built momentum. By the time of the Paris Declaration (2005) donors and partner countries alike identified capacity development as one of their short list priorities. With Paris Declaration, ownership, alignment and harmonization were more emphasized. Technical cooperation is now regarded as a means to achieve the ultimate goal, capacity development (Technical Cooperation for Capacity Development) at individual, organizational and societal/institutional level. Morgan (2009) named this period from 1990s to 2000s as the 2nd generation of TC and mentioned that most countries are now evolving through this approach.

Since the middle of the 2000s, technical cooperation has been discussed more

comprehensively considering the complexities of development. The features of the 3rd generation of TC can be summarized as follow. First, deliberate effort to shift control and decision making to local systems and actors during the process of TC was underlined (Ownership). It is also emphasized that TC needs to support self-reliant efforts and endogenous capacity development of the partner country. The concept of TC has been affected a lot in terms of ownership, alignment and harmonization by Paris Declaration (2005) and Accra Agenda for Action (2008). Second, the significance of local institution, culture, and structure is emphasized (Localization). It is recommended to use local context as starting point and to sees indigenous institutions, culture and structures as key determinants. The necessity of understanding partner country, region and institutes through systematic and professional research (searching) rather than starting with planning is addressed (searching than planning). Third, longer term engagement and implementing TC in a sustainable manner is considered important (Sustainability). System building in a sense of human resources, financial and institutional resources can lead to sustainability. And Sector Wide Approach (SWAp) or Program-Based Approach (PBA) was also emphasized to make TC included in the existing structure of the partner country and make it more sustainable. Previously mentioned two features (ownership and localization) are necessary conditions for achieving sustainability. In this study, ownership and localization factors of the SMASE project will be analyzed as factors affecting the sustainability of the INSET system built through the project.

Since TC first appeared in 1940s, its concept and focus has continuously changed. Morgan (2009) has offered a helpful historical generalization of its evolution

over three “generations”: a) first generation (prevalent in 1960s - early 1980s), b) second generation (turn of century forward), c) third generation (emerging). The main features of each generation are listed in table 2-1. Today’s world of technical co-operation, depending on the aid agency, is largely transitioning from the second to third generations of this characterization, although considerable first generation activity remains.

Table 2-1 Three Broad “Generations” of Technical Cooperation (TC)

Period	Features
<p>First Generation <i>(prevalent in 1960s - early 1980s)</i></p>	<ul style="list-style-type: none"> • Supply (and donor) driven • Framed in 2-5 year projects • Focused on gap filling at the level of individuals • Tasks and the transfer of knowledge and techniques • Use of industrialized world good practice • Extensive focus on training • Tend to bypass country systems and to make use of substitution TC
<p>Second Generation <i>(turn of century forward)</i></p>	<p>(Most donors now evolving towards this approach)</p> <ul style="list-style-type: none"> • Emphasis on country commitment and ownership • Uses “linear” performance management • Seeks to move TC towards capacity development • Favors strategies of planned change • Focuses on good practice models • Delegates most aspects of TC management to outside management contractors • Sees donor role as processing, contracting, monitoring • Responds to demands from domestic groups for control, clarity, efficiency, results and accountability
<p>Third Generation <i>(emerging)</i></p>	<ul style="list-style-type: none"> • Based on new needs of SWaps • Paris Declaration and better understanding of complexities of development • Uses local context as starting point; sees indigenous institutions, culture and structures as key determinants • Uses searching rather than planning • Integrated with governance and political economy issues • Aware of dynamics of change including informal level • Deliberate effort to shift control and decision making to

	local systems and actors <ul style="list-style-type: none"> • Build on strengths rather than weakness • Need for longer term engagements
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Source: Morgan (2009) p5

2.2 Ownership and Localization in Technical Cooperation

As the old model of technical cooperation (TC) was seriously criticized and trends of rethinking and reforming TC as a means of capacity development (CD) became prevalent, many researchers¹¹ examined today's challenges in TC in terms of CD and how TC can best contribute to the lasting an indigenous CD. The findings from the studies emphasize that recipient ownership in TC activities as the cornerstone for indigenous, sustainable capacity development.

UNDP report titled "Capacity for Development: New Solutions to Old Problems" (2002) examines the basic assumptions underlying the old model of TC, many of which have remained unchanged to this day. The report tackles three major issues for more effective TC for developing capacity in developing countries: 1)

¹¹ Development Policy Journal-Special Issue on Technical Cooperation, UNDP, 2002; Developing Capacity through Technical Cooperation: Country Experiences, UNDP, 2002; Ownership, Leadership and Transformation: Can We Do Better for Capacity Development?, UNDP, 2003; Capacity for Development: New Solutions to Old Problems, UNDP, 2002; Reforming Technical Cooperation and Project Implementation Units for External Aid provided by the European Commission, European Commission. 2008; Developing Capacity? An evaluation of DFID funded Technical Cooperation for economic management in Sub Saharan Africa. Technical Cooperation for economic Development, DFID, 2006; Joint Evaluation Study on Promising Approaches to TA, European Centre for Development Policy Management (ECDPM), 2007; A Study of the Effectiveness and Problems of JICA's Technical Cooperation from a Capacity Development Perspective, JICA, 2006; Reforming Technical Cooperation for Capacity Development, UNDP; DAC Perspective Notes on TC for CD, OECD/DAC, 2011

Ownership, 2) (Localization of) Knowledge and 3) Multi-layered Capacity Development. Among the issues, there is already a case study on SMASE analyzing the project from a multi-layered capacity development perspective (JICA, 2007a). So, this research will focus on the other two issues, ownership and localization of knowledge. This section will provide a theoretical basis for analyzing the factors affecting the sustainability of the SMASE project from the perspective of ownership and localization of knowledge. Based on the literature review on ownership and localization of knowledge in TC, the analytical framework for this study will be designed.

2.2.1 Ownership in Technical Cooperation

The idea of ownership is hardly new in development cooperation. It is a product of several decades of learning within the development community that reaches from dependency theory over concepts of self-help and participation to the current debate on aid effectiveness (Muller, 2003). Ownership is usually defined as the idea that the recipients assume the responsibilities for their own development. However, there is no unanimously agreed-upon definition of the term, which has led to many different interpretations.

Brautigam (2000) quotes Johnson and Wasty (1993), who defines “ownership” based on four measurable dimensions: 1) locus of initiative, 2) level of intellectual conviction among key policymakers, 3) actions and speeches in support of the reforms by top leadership, and 4) visible efforts toward consensus-building among various constituencies. This definition is more focused on top-level leadership and the recipient

governments' ownership. On the other hand, Singh (2002) insisted that ownership is the acceptance of responsibility through the three processes: 1) stakeholder participation, 2) empowerment and 3) consensus. The author assumes that the desired end of technical cooperation is an appropriate level and type of ownership by all stakeholders (Intended direct beneficiaries, intended indirect beneficiaries, unintended beneficiaries, intended direct losers, unintended direct losers, and unintended indirect losers).

According to Rebeiro (2002), ownership depends heavily on two variables. One is the access to power, to being able to control one's own environment and to avoid being the object of outsiders' will or of the imperatives of structural, faceless, expansionist forces. The other is the access to knowledge and information that enables actors to understand what is happening and, more importantly, what will happen to them. Resistance or participation is the results of the ways these variables are combined. Self-confidence and ownership can thrive only where actors feel they have power over their environment.

Since the mid-1990's "local ownership" have taken on particular prominence in the policies of bilateral and multilateral development agencies (Saxby, 2003). "Shaping the 21st Century" (OECD/DAC, 1996) asserts that sustainable development "must be locally owned", and that development cooperation has to be shifted to a partnership model, where donors' programs and activities operate within locally-owned development strategies. Donors should respect and encourage strong local commitment, participation, capacity development and ownership. In a landmark proposal to the World Bank, Wolfensohn, President of the Bank, set forth his case for a Comprehensive Development Framework (1999). He emphasized that developing countries "must be in

the driver's seat and set the course," owning and implementing their development strategies. Like the OECD/DAC, he saw donors in a support role, working with governments, business and civil society of developing countries.

In the Paris Declaration (2005), ownership was emphasized as its first principle and its importance was more recognized by international development communities. However, PD was criticized because it oversimplified the complex conditions for development cooperation. For example, "existence of operational development strategies" was set as the indicator to measure the degree of ownership (Indicator 1: Countries put in place national development strategies with clear strategic priorities). But ownership is more than the existence or absence of national development strategies. It is not always the comprehensive plans that imply strong ownership. Such plans may even reduce ownership by being too demanding for the available capacities of the partner country (Beier, 2003).

To overcome this limitation, recently in the 4th High Level Forum (HLF-4), a broader concept of ownership was proposed and agreed by development communities. Among one of four Busan Shared Principles, there is "Ownership of development priorities by developing countries". It means that partnerships for development can only succeed if they are led by developing countries, implementing approaches that are tailored to country-specific situations and needs.

These initiatives reflect the centrality of local ownership in the new development assistance model. However, the policy references are more metaphorical than analytical. The literature directly addressing local ownership is modest in size; a much more extensive literature approaches the idea indirectly by analyzing related

themes such as partnership, participation, and aid conditionality. The origins, conceptual assumptions, operational components and practical implications of the ownership agenda remain largely unmapped (Saxby, 2003).

Considering these concepts and initiatives of ownership, one of the major criticisms against technical cooperation (TC) in the form of project aid is that it tends to be donor driven, which undermines local ownership and commitment (International Development Center of Japan, 2003). Though TC in the past was based on an assumption of equal partnership between donor and recipient, the relationships have tended to be more asymmetric, discontinuous and distorted (UNDP, 2002a). Development agencies operate as bureaucracies of different size and complexity. As Max Weber (1977) has pointed out, bureaucracies are a form of domination, of exerting power. The larger the development initiatives, the larger the bureaucracies related to them and the stronger their capacity to exert power, especially over institutions and actors operating at lower levels (in the partner country). With their hierarchies, rules and reproductive needs, bureaucracies are the machines of indifference (Herzfeld, 1992).

This asymmetric relationship based on bureaucracies has led to a donor-driven nature of TC. Donors conceived, designed and implemented projects with too little input from recipients. As a consequence, recipients perceived little or no ownership in the projects. TC comes from donors who have their own agendas and have a strong desire for measurable outputs within a limited time period. Since weak recipient management structures impede progress towards proximate project goals, donors often search, as a result, for ways to circumvent existing recipient management structures (e.g.,

establishment of Project Management Unit), which can serve to undermine the institutional capacity. If TC is donor-driven and bypasses existing government system, it could have negative impact on the level of endogenous efforts and commitment of recipients, and thus on the sustainability of the projects (International Development Center of Japan, 2003).

Another concern is that since TC is typically 100% financed by donors, recipients generally view it as a free good. This may have negative effects on the level of commitment and cost consciousness of the recipient government about TC projects. Furthermore, as a result of the perception of zero opportunity costs on the part of recipients, priority setting by recipients becomes pointless, which often leads to enormous resource misallocations (International Development Center of Japan, 2003).

Moreover, as it is difficult to establish mutual respect between donor and partner country, the management control of TC is not usually given to the partner country. In order to attain their common objectives, it is essential to foster a feeling of mutual respect and commonness of purposes between them. However, there usually exists a psychological gap between them. A tendency of resentment toward foreign expatriates by local counterparts and disdain of expatriates towards counterparts creates a social and psychological environment in which mutual exchange of ideas and learning is made extremely difficult (Mkandawire, 2002).

To overcome these limitations of the old model of TC, a new model was proposed by several researchers. UNDP (2002a) claims that one way to tackle the asymmetric donor-recipient relationship is the establishment of innovative funding

channels. According to UNDP, the most direct solution to the asymmetry problem in technical cooperation would be that the donors simply support the national budgets of the recipients. Budgetary support would allow governments to exercise ownership over those funds and determine what inputs, advice, training, etc. is suitable to national capacity-development needs. It would also contribute to aligning incentives and allow an improvement of overall civil service conditions. Donors can adopt a more targeted version of this in order to retain a degree of control by channeling resources through specific technical cooperation funds with a clear general purpose. As an extension of this, a group of donors could come together and pool funds that could be used in a similar way. It also claims that “the pooling of resources, ideally as budget transfers, would dramatically simplify the aid relationship and would help resolve many other issues, including the obstacles created by vested interests.” UNDP (2002a)’s approach denies the old model of project-type TC and suggests budget support.

On the other hand, International Development Center of Japan (2003c) provides more moderate approaches to enhance ownership in TC than those of UNDP above. It states that local ownership is not always diminished and sometimes can be enhanced even in the project-type TC depending on the nature of outside intervention as well as domestic factors on the side of the recipients. The report suggests how local ownership can be enhanced in project-type TC through case studies as follows: 1) Supporting self-help efforts of partner countries, 2) Making decisions fit local needs, 3) Integrating TC projects into existing public and local institutions, 4) Establishing partnership based on mutual respect, 5) Establishing phase-out mechanisms, and 6) Promoting regional cooperation through support for South-South cooperation.

According to Singh (2002), ownership in TC modalities could be enhanced through stakeholder’s inclination and commitment to moving towards wider ownership¹² and a fruitful balance of owners. To move towards more ownership-friendly TC, some of the modalities that need to be established are listed in table 2-2. For the balance of ownership, it is important to hear and involve all the various categories of stakeholders. In many cases of TC, ownership is restricted to a formal endorsement by the national government which does not always speak for all their people.

The author also mentioned that if TC’s benefits are immediate and focused and if the costs are long-term and dispersed, ownership potential grows. Similarly, if a TC is culturally and socially appropriate and if it is easy to understand and accept, it is ownership-friendly. Finally, where the process of stakeholder empowerment has started from the beginning and the design and implementation of the TC are a consensus of views and opinions of the various stakeholders, much greater potential for widely-based ownership develops.

Table 2-2 Ownership-Friendly Modalities in TC

Ownership Factors	Modalities
For Stakeholder Participation and Involvement	a) Identifying Stakeholders b) Disseminating Appropriate Information c) Invoking Stakeholder Participation d) For Facilitating Stakeholder Participation
For Stakeholder Empowerment	a) Decentralized Decision-Making b) Transparency c) Answerability d) Monitoring and Evaluation
For Building Stakeholder Consensus	a) Setting Broad Goals and Objectives b) Prioritizing Among Objectives

¹² 1) participation & involvement, 2) empowerment, 3) building consensus, 4) Responsibility

	<ul style="list-style-type: none"> c) Deciding on the Scope d) Selecting Strategies
For Ensuring Stakeholder Responsibility	<ul style="list-style-type: none"> a) Fighting Donor Dependence b) Addressing Felt Needs and Priorities c) Ensuring Real Benefits d) Ensuring Cultural, Social and Economic Viability and Optimality e) Pacing for Assimilation f) Designing for Sustainability <ul style="list-style-type: none"> i. Appropriate Institutional Structures, Staffing and Funding ii. Appropriate levels of Funding iii. Addressing Root Causes

Source: Singh (2002)

Ribeiro (2002) emphasized that only by changing the characteristics of the power distribution within development field will TC really change. The author said participatory bottom-up approach creates active subjects and is more ownership-friendly than authoritative top-down approach. The top-down approach tends to reinforce existing political elites and have no preoccupation with local models and cultures. On the other hand, the bottom-up approach tends to introduce new leadership, thereby creating new tensions within the pre-existing power and political systems. And this approach is more sensitive to local cultures and models, including indigenous models of management.

In this section, literatures on the definition of ownership, criticism on TC in terms of ownership, and the way to improve ownership in TC were reviewed. They are summarized in the table below.

Table 2-3 Summary of the Literature Review on Ownership

Research / Initiative	Ownership
Johnson and Wasty (1993)	<ol style="list-style-type: none"> 1) Locus of initiative 2) Level of intellectual conviction among key policymakers 3) Actions and speeches in support of the reforms by top leadership 4) Visible efforts toward consensus-building among various constituencies
Singh (2002)	<p>Widely-based ownership including various stakeholders</p> <ol style="list-style-type: none"> 1) Stakeholder participation 2) Stakeholder empowerment 3) Stakeholder consensus 4) Stakeholder responsibility
Rebeiro (2002)	<ol style="list-style-type: none"> 1) Access to power 2) Access to knowledge and information <p>Participatory bottom-up approach is more ownership-friendly than authoritative top-down approach</p>
OECD/DAC High Level Forum (HLF)	<p>Paris Declaration (2005) Ownership Indicator: Countries put in place national development strategies with clear strategic priorities</p> <p>Busan Partnership (2011) Ownership of development priorities by developing countries</p> <ol style="list-style-type: none"> 1) Partnerships led by developing countries 2) Implementing approaches tailored to country-specific situations and needs
World Bank	<p>Comprehensive Development Framework (1999)</p> <ol style="list-style-type: none"> 1) Owning and implementing their development strategies 2) Donors in a support role
UNDP (2002a)	<p>UNDP's Proposal for a New Model of Technical Cooperation</p> <ol style="list-style-type: none"> 1) Formation of southern forums on development cooperation 2) Budgetary support: Donors simply support the national budgets of the recipients

Source: The researcher reconstructed the literature review.

Table 2-4 Limitations of TC related to Ownership

Research	Limitations related to Ownership
UNDP (2002a)	<ul style="list-style-type: none"> • Lack of local control management • Lack of alignment with partner country's needs • Distorting priorities • Asymmetric, discontinuous and distorted relationship between donors and recipients

	<ul style="list-style-type: none"> • Bureaucracies (Donor agency exerting power) • Reproductive needs
Kanda and Kuwajima (2005)	<ul style="list-style-type: none"> • Performed least favorably in institutional capacity building • Dispatch of foreign experts who took over the positions of local experts • Formulation of Project Implementation Units (PIUs) independent from existing organization
Berg (1993)	<ul style="list-style-type: none"> • Donors could not provide appropriate and flexible TC based on the various needs of the partner country • TC's objectives were not aligned with development goal of the partner country's government or related organizations • Since TC was mainly managed by dispatched foreign experts, using local human resources was restricted • TC was planned and implemented independently from other aid modalities, hence failed to contribute to mid- and long-term systematic reform and capacity development
International Development Center of Japan, 2003	<ul style="list-style-type: none"> • Donor-driven nature of TC • Conditionality • TC as a free good • Bypassing existing government system • Difficulty to establish mutual respect

Source: The researcher reconstructed the literature review.

2.2.2 Localization of Knowledge in Technical Cooperation

Since time immemorial, knowledge has played an important role in human progress, but there has been a “rediscovery of the power of knowledge” with knowledge revolution or knowledge explosion in the twenty-first century (Tilak, 2002). And this rediscovery also stimulated development community to reexamine the critical relevance of knowledge in development.

Knowledge initiative in the field of development cooperation was launched by a monumental declaration by the World Bank President Wolfenshon in 1996 that the bank would become a knowledge bank. The lead set by the World Bank has been

followed by most bilateral and multilateral aid agencies. In the late 1990s, aid donors started to involve knowledge as a special area of focus (King & Mcgrath, 2002).

The World Development Report (1998), titled “Knowledge for Development” emphasizes the importance of knowledge in development arguing that poor countries differ from rich ones not only because they have less capital but because they have less knowledge. The report specifically examines how knowledge promotes economic development in developing countries, paying attention to reducing the “knowledge gap” between advanced industrialized and developing unindustrialized countries.

In the concept of knowledge gap, however, there is an assumption that every country goes through the same process of development. It proposes that developing countries should imitate the rich and follow roughly the same development path towards a similar destination. It is assumed that the developing countries would be able to catch up to the developed by following the best practices of the developed and filling the knowledge gap. Indeed, it was believed that the developing countries would be able to do this even more rapidly with the help of international assistance in the form of technical cooperation (International Development Institute of Japan, 2003).

Knowledge initiative led by the World Bank was basically an extension of the general concept of TC in the 1990s (focusing on Southern deficit and the need for Northern transfer of knowledge), but more emphasis was put on “knowledge” as a critical means of development. This maintained the performance of implementing aid agencies in the way that they do not face the local conditions and bring development solutions regardless of local needs.

However, in the late 1990s and the early 2000s, knowledge transfer in TC has

been severely criticized due to several reasons. First, TC was criticized due to its traditional “filling knowledge gap” approach. UNDP (2002a) criticizes that this approach assumes that developing countries lack important knowledge, and that outsiders can fill these gaps with quick injections of know-how. That means “partner countries can simply adopt a knowledge template refined over time in the richer countries and the template can be accepted without reinventing the wheel”. It is considered possible to simply ignore existing capabilities in developing countries and replace them with knowledge and systems produced elsewhere - a form of development as displacement, rather than development as transformation of existing capabilities (UNDP, 2002a).

Second reason for the criticism is that the focus of TC is delivering North-made development answers. Ellerman (2004) argues that the development agency has “development knowledge” in the form of answers encapsulated in standard core courses that need to be taught, transmitted, and transferred to the target population of trainees. The focus is simply on how to deliver knowledge, how to scale up the knowledge transmission belt into the partner country, and how to measure and evaluate the impact of these dissemination efforts. This standard view of knowledge transfer is based on the pedagogy that sees the learners as essentially passive containers into which knowledge is poured. It is compatible with the theory that Paulo Freire calls the “banking” theory since teaching was seen as depositing knowledge into a bank account. Therefore, TC can easily end up transferring “best practices” chosen by the donors without any or with little consideration of local knowledge or context, which might be seen effective on the short-term basis but makes neither real institutional change nor sustainable capacity for

development. It will undermine the partner country's incentives to develop their own capacities and weaken their confidence in using their own local knowledge (Ellerman, 2004).

Third reason why TC has been criticized is that TC knowledge has not been appropriate for local conditions. Even knowledge or technology which contributed to socioeconomic development in developed countries in the past cannot bring the same results to developing countries. It is because each country passes through different development process in its specific local context. In many cases, state-of-the-art technology and knowledge impede and deteriorate local capacity and knowledge which has been developed and used for a long time. So, it is better to identify and develop knowledge embedded inside rather than to bring knowledge from outside (Seo, 2012).

Fourth, it usually happens in TC that external experts who do not understand local knowledge and context are dispatched and try to transfer "advanced knowledge" from their country. It needs to be asked if 'experts' from outside who are involved in such international projects can really understand how local culture and values are entwined with the local educational systems they support. Misunderstandings about the link between local cultural values and institutions can cause problems for donors, especially when aid agencies assist in institutional reforms in very different contexts.

Lastly, TC has been heavily criticized for the absence of feedback loops between the donors and partner countries (Hovland, 2003; Jha, et al., 2004). Knowledge sharing platforms are failing to enable partner countries to share their own local knowledge with donors, since these platforms have been filtered through a Northern lens. Furthermore, South-based knowledge development platforms have reduced. Lack of

feedback loops and knowledge sharing platforms have made relevance of the content to local conditions even more difficult.

The ways to address these issues suggested in literature can be broadly divided into three categories. Firstly, localization of global/foreign knowledge to be compatible with social, cultural, and economic condition of the partner countries is emphasized. Such ideas are reflected in Stiglitz's keynote address to the First Global Development Network Conference: "Scan globally, reinvent locally" (Stiglitz, 1999). It means that all knowledge has to be gathered and then analyzed, modified, disassembled and recombined to fit local needs.

The most representative example of localizing development knowledge may be "appropriate technology". The concept of appropriate technology was introduced in the middle of 1960s for the first time by Schumacher and other researchers. They tried to find technology which can be aligned with local contexts as development solutions. Schumacher defined appropriate technology as technology which is based on local environment, affordable and available to make with local materials with respectively simple technology. It means that what developing countries need is not state-of-the-art technology from developed countries itself, but localized technology which can be compatible with social, cultural, and economic condition of the partner countries, and which is sustainable and friendly to local people. The language of appropriate technology awakened people to recognize

And this approach can be applied to education sector. Education is also closely linked with social and cultural activities. Even if issues faced in education are similar

across countries and societies, the resolution of these issues could differ depending on different countries' values and traditions (Sawamura, 2002). Cheng (2000) says that frameworks developed elsewhere can be borrowed to identify or solve problems in a particular society. There are norms, values and assumptions that could be totally different in different societies. There are therefore different perspectives that identify problems differently, present different criteria for solutions, and design different solutions for the problems. Localization of global knowledge means not only the necessity to adapt the level of knowledge according to the local conditions, but also to raise the cultural sensitivity to care about local values and institutions.

Secondly, utilizing local knowledge is considered the first step to approach knowledge in TC. Schumacher (1997) argues that the very start of appropriate technology is not from outside but from local ground. In order to be rooted in the local soil, development projects should not be initiated by donors but embryonic projects by the local initiative should be found. He emphasizes that the first task is to study what people are already doing and to help them do it better. Then the second task is to investigate what people need and the possibility of helping them to cover more of their needs out of their own productive efforts and knowledge.

Thirdly, developing local capacity to develop their own knowledge is considered important. To be based on local knowledge and to develop knowledge which is appropriate for local context, it is needed to go back to ownership issues of emphasizing the role of the South. According to the UNDP (2009), people are best empowered to realize their full potential when the means of development (such as knowledge) are sustainable – home-grown, long-term, and generated and managed

collectively by those who stand to benefit. Therefore, it is necessary for developing countries to build capacity to localize external knowledge appropriately for their context and develop their home-grown knowledge.

In this sense, Stiglitz (1999) underlined that intellectual confidence and self-reliance is necessary to avoid becoming a knowledge recipient. And eventually each country has to become an 'autonomous knowledge society'. For sustainable capacity development and self-help, developing countries have to play the principal role of generating knowledge based on their local knowledge and localizing global knowledge for their own use, while aid agencies take a role of collaborative creator of knowledge rather than exporter of competitive expertise.

UNDP (2002a) and International Development Center of Japan (2003b) suggested more comprehensive approaches to localization of knowledge in a new paradigm of TC. In a new paradigm suggested by UNDP (2002a), it is considered that knowledge cannot be simply transferred from donor to recipient countries, but that this knowledge should be willingly acquired by the recipients. It is also requested that donor programs should have a deeper understanding of local knowledge and practice, because the most useful knowledge for the development would exist locally, possibly in a tacit form. The report stated the traditional "expert-counterpart model" of TC can be replaced by new forms of knowledge acquisition using information and communication technology (ICT). Through the networks, the developing countries can obtain various types of useful knowledge for their development. Moreover, if TC is in a form of budget support, the developing countries could purchase a variety of knowledge which is

suitable to the local needs in the market, using financial resources in the pooled TC funds.

International Development Center of Japan (IDCP) (2003b) also suggests the way of dealing with knowledge issues in TC for capacity development. It has many aspects in common with the new model proposed by UNDP (2002a). IDCP states that foreign knowledge should be applied based on local ones in order to internalize them to the society of the recipient countries. Therefore JICA's approach recognizes the importance of the local values and knowledge, and thus is not based on an assumption that it is possible to replace existing capabilities in partner countries with knowledge and systems produced in Japan. In this sense, IDCP suggests a new mode of acquiring knowledge in TC as follows: 1) Identification of the types of knowledge by the partner countries, 2) Identification and utilization of local knowledge, 3) Acquisition and internalization of foreign knowledge and 4) Mobilization of donors' own knowledge (development experience).

On the other hand, unlike UNDP, Japanese are not so optimistic about knowledge acquisition through the internet connection. The knowledge acquisition could be a rather difficult and time-consuming process, and tacit knowledge in particular cannot be possibly acquired from the internet. The acquisition of tacit knowledge requires direct contact. Therefore, the acquisition of such kinds of knowledge can be facilitated by external support that emphasizes the process of acquiring new knowledge. JICA's technical cooperation focuses on this process. The difference between the UNDP's new model and the Japanese TC approach is found in their views on the way knowledge is effectively acquired (see Table 2-5).

Table 2-5 Difference between UNDP’s New Model and JICA’s Process Oriented Approach

	UNDP’s New Model	JICA’s Process Oriented Approach
Sources of knowledge	Local and foreign, sometimes in tacit forms	Local and foreign, sometimes in tacit forms
Effective methods of the acquisition	Local initiatives using networks and pooled TC fund	Local initiatives support by expatriate experts, etc.
Views on the acquisition	Possible to be acquired on the web or in the market	Difficult to acquire all knowledge on the web or in the market

Source: International Development Center of Japan (2003b), p5

Table 2-6 Summary of the Literature Review on Localization of Knowledge

Research / Initiative	Localization of Knowledge
World Development Report (1998)	Reduction of “knowledge gap” between advanced industrialized and developing countries Developing countries would be able to catch up to the developed by following the best practices of the developed and filling the knowledge gap.
UNDP (2002a)	Underlying premise of “filling knowledge gap” paradigm Outsiders can fill these gaps with quick injections of know-how. Partner countries can simply adopt a template that has been refined over time in the richer countries. No need to reinvent the wheel. A form of development as displacement, rather than development as transformation of existing capabilities
Ellerman (2004)	Criticism on knowledge transfer The standard, default, or naïve theory-in-use that the development agency has “development knowledge” in the form of answers encapsulated The focus is simply on how to deliver knowledge, how to scale up the knowledge transmission belt into the partner country, and how to measure and evaluate the impact of these dissemination efforts. Transferring “best practices” chosen by the donors with little consideration of local knowledge or context will makes neither real institutional change nor sustainable capacity development.

Hovland (2003) & Jha, et al., (2004)	<p>Criticism on knowledge transfer Failing to pay attention to the importance of local knowledge and for the absence of feedback loops between the donors and partner countries South-based knowledge development platforms have reduced.</p>
Seo (2012)	<p>Knowledge should be adopted and adapted considering the local needs and local context. State-of-the-art technology and knowledge impede and deteriorate local capacity and knowledge. It is better to identify and develop knowledge embedded inside rather than to bring knowledge from outside</p>
Schumacher (1997)	<p>Appropriate technology Localized technology which can be compatible with social, cultural, and economic condition of the partner countries, and which is sustainable and friendly to local people The first task is to study what people are already doing and to help them do it better. The second task is to investigate what people need and the possibility of helping them to cover more of their needs out of their own productive efforts and knowledge.</p>
UNDP (2009)	<p>People are best empowered to realize their full potential when the means of development (such as knowledge) are sustainable – home-grown, long-term, and generated and managed collectively by those who stand to benefit</p>
Stiglitz (1999)	<p>“Scan globally, reinvent locally”: All knowledge has to be gathered and then analyzed, modified, disassembled and recombined to fit local needs. Intellectual confidence and self-reliance is necessary to avoid becoming a knowledge recipient.</p>
UNDP (2002a)	<p>New paradigm for Knowledge Acquisition Donor programs should have a deeper understanding of local knowledge and practice, because the most useful knowledge for the development would exist locally, possibly in a tacit form. The report stated the traditional “expert-counterpart model” of TC can be replaced by new forms of knowledge acquisition using information and communication technology (ICT). Developing countries could purchase a variety of knowledge which is suitable to the local needs in the market, using financial resources in the pooled TC funds.</p>
International Development Center of Japan (2003b)	<p>Foreign knowledge should be applied based on local ones in order to internalize them to the society of the recipient countries. New mode of acquiring knowledge in TC 1) Identification of the types of knowledge by the partner countries 2) Identification and utilization of local knowledge 3) Acquisition and internalization of foreign knowledge 4) Mobilization of donors’ own knowledge</p>

Source: The researcher reconstructed the literature review.

2.3 Previous Studies on SMASE

Previous studies on SMASE can be divided into two categories, a) analyzing previous cooperation activities in the SMASE project from capacity development perspective, and b) impact on teachers' and students' attitude (teaching and learning process) and students' academic achievement scores for investigating whether SMASE achieved its goals or not, and what factors are correlated and influence the results. However, there has been little research focusing on the sustainability of the INSET system in relation to ownership and localization of knowledge so far. So, this study will contribute to understanding the project from this new perspective.

2.3.1 Capacity Development Perspective

There is a case study on the SMASE project which analyzes the project from the perspective of capacity development. JICA (2006) defines "capacity development (CD)" as "the ongoing process of enhancing the problem-solving abilities of developing countries by taking into account all the factors at the individual, organizational, and societal levels". In the case study report on the SMASE project conducted by the JICA (2007), capacity outcomes at the level of nation, district and school are analyzed from the perspective of CD.

According to the research, five project features considered to have played a crucial part in enhancing capacity development of partner countries: 1) identifying the needs of a variety of stakeholders, 2) securing sustainability, 3) fostering ownership, 4) tangible outcomes (incentives) served to attract further support, 5) “waiting” stance of Japanese experts. The establishment of sustainable system, the identification of the multi-level needs, and indirect assistance stimulating developing country-driven efforts are recommended as lessons of this case study.

The idea of CD is also compatible with the researcher’s idea on “ownership, localization of knowledge” which are underlying contributing factors of building a sustainable national INSET system. However, this research focuses on analyzing the project in the framework of multilayered capacity development (CD at the level of individuals, organizations, and institution). And it does not provide in-depth analysis focusing on ownership and localization of knowledge components of the SMASE project.

2.3.2 Impact of SMASE on Teachers and Students’ Attitude and Performance

Most of previous studies on the SMASE project are impact researches that examine what change this project brought to teachers’ teaching practices (practice of ASEI-PDSI), students’ attitude (participation in lessons), and their academic achievement scores (KCSE/KCPE or SPIAS scores) in mathematics and science (M&S) subjects. The sustainability of the project depends on its tangible outcomes to ensure

donors and partner country to continue investing money and resources into the project. This is why many studies were conducted on the impact of the project.

Previous studies showed that the change in teachers' practice and students' participation was relatively improving. One impact study compares the data from 2003/4 and 2007 (before and after INSET) in three sampled district. There is a significant difference between lessons in 2003/4 and 2007. These findings are indicators that SMASE INSET has had impact on the quality of teaching and learning (CEMASTE, 2007). However, this study was conducted by CEMASTE, the implementation body of this project. So there is a possibility that the impact was generously evaluated or districts with relatively good performance were sampled for the study.

On the other hand, the improvement in academic achievement scores, in particular, KCSE or KCPE scores was not significant. The project's impact on students' academic achievement is analyzed using two kinds of instrument: 1) SPIAS¹³ (SMASE Project Impact Assessment Survey) achievement test scores and 2) KCPE (Kenya Certificate of Primary Education) scores. According to Ogwel et al. (2008), there was a significant impact of SMASE INSET on students' SPIAS test scores during the period of 2004-2008. On the other hand, Langat's study (2009) finds out that SMASE INSET failed to improve students' KCSE scores in mathematics.

Some studies show why the impact of the project did not appear in the KCSE scores. Langat (2009) says there are three reasons for this result. First, full SMASE

¹³ SPIAS achievement tests in the four subjects (math, biology, chemistry, and physics) were constructed based on five cognitive domain levels of 1) Preconception; 2) Information; 3) Understanding; 4) Application and 5) Higher Order. The levels were equally weighted at 8 marks per cognitive level.

The tests were developed by SMASE M&E Task Force to measure students' achievement in mathematics and science before and after the SMASE INSET.

implementation is very demanding on the side of the teachers. Teachers have a minimum of 27 lessons per week and have to teach the large number of students. In this situation, SMASE's ASEI/PDSI cannot be implemented in a real sense. Second, though superficial features of teaching practices appear to be changed, the fundamental nature of the instruction is not changed. Third, if the national examination (KCSE) tests only narrow field of students' capacity such as memory rather than analysis, creativity or real understanding, even higher quality of lessons from a student-centered approach cannot be effective to raise test scores.

Matachi (2012) also argued that the biggest challenge of SMASE is that ASEI/PDSI approach is not implemented in everyday classroom situation. This is because implementing the ASEI approach requires teachers to spend longer time for preparation until they get used to it. And this approach needs more time to complete curricula than conventional lecture method. Above all, the nature of examination matters. Since exams mainly assess whether students have factual knowledge, teachers tend to impart to learners as much knowledge as possible rather than using ASEI approach.

Most of literatures on the impact of SMASE recommended two things in common. One thing is that not only INSET system but also other related education system such as pre-service teacher education, curriculum, textbook and material, national examination (KCPE and KCSE), school inspector system has to be reformed and aligned with the change of INSET to make better impact and create a synergy effect. And the other thing is that teachers have to become the agents of reform rather than the targets. If teachers believe that lesson improvement is their innovation, not one that an outsider has imposed on them, they will persevere with an innovation.

CHAPTER 3. METHOD

This study will critically analyze the SMASE project focusing on its sustainability. The purpose of the study is to find out factors which positively or negatively affected the sustainability of the SMASE INSET system in Kenya. More specifically, two questions will be examined as follows: 1) What technical, financial and institutional measures were taken to establish SMASE as a sustainable INSET system in Kenya? and 2) How did the ownership and localization of knowledge initiatives and limitations affect the sustainability of the SMASE INSET system in Kenya? To conduct this study, the researcher adopted the qualitative research approach.

3.1 Qualitative Research Approach

Qualitative approach is most appropriate for this study because the study focuses on the complex process of establishing the SMASE INSET system in Kenya which cannot be captured by quantitative approach. Patton (2002) suggested that qualitative inquiry is highly appropriate for studying processes because depicting processes requires detailed descriptions of how people engage with each other, and experiences with processes typically vary for different people. Therefore, their experiences need to be captured in their own words. Moreover, processes are fluid and dynamic, so they cannot be fairly summarized on a single rating scale at one point in time. Here, participants' perceptions are the key process considerations. Process studies

aim at elucidating and understanding the internal dynamics of how a program, organization, or relationship operates.

The study used four kinds of data collection: 1) interviews, 2) participant observation, 3) document analysis and 4) questionnaire. It follows Patton (2002)'s description that qualitative findings grow out of three kinds of data collection: in-depth and open-ended interviews, direct observation, and written documents. Interviews yield direct quotations from people about their experiences, opinions, feelings and knowledge. The data from observation consists of detailed descriptions of people's activities, behaviors, actions, and the full range of interpersonal interaction and organizational processes. Document analysis includes excerpts, quotations from organizational records, official publications, and reports. The researcher added one more component of data collection, a small-scale questionnaire based on Patton (2002)'s data collection methods. It was taken as a complementary means to interviews which could only deal with a very limited number of people. The data from questionnaire is about people's simplified perception and ideas.

Argyris quoted in Patton (2002) introduced what has become a classic distinction between "espoused theories" and "theories-in-use." The espoused theory is what people say they do; it is the official version of how the project or organization operates. The theory-in-use is what really happens. In this study, interviewing project staff or administrators and analyzing official documents, reveals the espoused theory. Interviewing or doing questionnaire to participants and front-line people, and directly observing the project, reveals the theory-in-use (Patton, 2002).

3.2 Sample and Population

3.2.1 Population

The study aims to find out factors which positively and negatively affected the sustainability of the SMASE INSET system in Kenya. So, theoretical population of the study is all the stakeholders related to the SMASE project including both Japanese and Kenyan sides. The Japanese side includes those personnel in charge of the project in JICA Headquarter and Kenya Overseas Office. The Kenyan side includes those personnel in charge of the projects in the national, district and school level institutions. The Specific institutions and personnel in each level are listed in the table 3-1. Since the SMASE project is a nation-wide project which has been implemented targeting 20,000 secondary and 60,000 primary mathematics and science teachers in all districts, the study theoretically covers huge population. Moreover, since the study examines the whole process of the project from the very initial stage up to 2013, the population of the study includes not only currently involved personnel but also those who were formerly engaged in the project after the formulation in 1995. Among them, the researcher could get access to the personnel in the institutions located in Nairobi or participants of the INSET held in Nairobi (at CEMASTE A).

3.2.2 Sampling

- Quota, Snowballing, Convenience and Purposive sampling

The study adopted quota sampling, snowballing sampling, convenience sampling and purposive sampling methods. Since the project has been implemented in a cascade model, the implementation process can be divided into three levels: 1) national, 2) district and 3) schools. In each of these three levels, there are several institutions related to the SMASE project. For example, at the national level, there are the Ministry of Education and the CEMASTEAs. At the district level, there are District Education Offices, District INSET Centers, and PTTCs (Regional INSET Centers). At the school level, there are public primary and secondary schools. These are sub-groups of the whole population.

From each sub-group, the researcher selected samples using convenience sampling and snowballing sampling. For example, when the researcher visited JICA Kenya Office, she could get a contact of a CEMASTEAs supervisor. So, the researcher visited the supervisor and with his help she got permission to do participant observation on the national INSET held in CEMASTEAs from the Director of the CEMASTEAs. He also introduced another CEMASTEAs staff who belongs to the Department of Research and Development. The R&D staff introduced the researcher to do interview with several CEMASTEAs staffs who were available during the period of participant observation and who were appropriate for interviews in terms of relatively long working period at the CEMASTEAs. In this case, the researcher used snowballing sampling by which existing study subjects were used to recruit more subjects into the sample.

While conducting participant observation, the researcher could form rapport with regional trainers who were trained at CEMASTE. Sharing ideas and opinions, the researcher decided to interview some regional trainers who would be appropriate for the study. Appropriate interviewee means those who has completed four cycles of the SMASE INSET, and who have certain (whether it is positive or negative) opinions on the SMASE INSET. So, these samples were chosen purposively (purposive sampling). But the questionnaires were given to all available respondents among regional trainers randomly.

In case of selecting samples from primary and secondary school teachers, convenience sampling was adopted. Two primary and two secondary schools were selected considering the distance from the base of the field study. Among SMASE-trained teachers in each school, those who were available and willing to participate in the interview were selected as samples. The questionnaires were distributed to all SMASE-trained teachers in these four schools.

Through these sampling methods, the samples of the study were completed with due representation. The total size of the sample is around 70, including the target of participant observation it is 120. The detailed lists of the sample are shown in Table 3-1.

Table 3-1 Population and Sample of the Study

Nation	Level	Institution	Personnel	Role	Population	Sample
Japan	HQ	JICA Headquarter	Person in Charge	Admin		0
	Overseas Office	JICA Kenya Office	Person in Charge	Admin		1
Kenya	National	Kenya MOE	Person in	Admin		1

			Charge			
	National	CEMASTE A	National Trainers	Admin & Training	49	5
			Japanese experts	Advisor	4	2
	District	District Education Office	DEOs	Admin	150	0
			QASOs	Admin	1,618	0
			TAC Tutors	Admin	1,100	0
		PTTC (Regional INSET Center)	PTTC principals, Deans of Curriculum	Admin	57	0
			Regional trainers	Training	320	30
		District INSET Center (DIC)	DIC Principal	Admin	360	0
	District trainers		Training	1,500	0	
	Cluster/School	Primary schools	Headteachers	Admin	20,000	2
			Cluster trainers	Training	5,600	0
			Cluster trainees	Training	60,000	6
			Students		Students in 20,000 primary schools	0
		Secondary schools	Principals	Admin	6,125	2
			District trainees	Training	20,000	20
			Students		Students in 6,485 secondary schools	0

3.3 Data Collection

The researcher stayed in Kenya for two months and conducted field surveys. She visited the CEMATEA and sampled schools several times to perform participant observation, interviews, and questionnaire and to collect documents as well. In data collection procedures, usually the first issue was how to get access to the data. The researcher formally sent them an official letter explaining the purpose of the study, the reason why the researcher chose them, what the researcher wants to find out, and asking their support for the study at the site. This field was greatly helpful in looking into the real situation of SMASE and listening to vivid local voices. The study used four kinds of data collection: 1) interview, 2) participant observation, 3) document analysis and 4) questionnaire.

3.3.1 Interview

Under the consent of the participants, interviews were addressed to stakeholders and participants of the project at national, district, and school levels. The research conducted one-on-one or group interviews with JICA Kenya Office In-house consultants, Japanese experts, CEMASTEAs (national trainers), PTTC tutors (regional trainers), and SMASE-trained mathematics and science teachers in sampled schools. The interviews were conducted for 1-2 hours, one or two times, per each participant. Interviews were recorded under participants' consent. They were transcribed

and quoted in this study to vividly show the local voices.

The interview protocol is designed to find out this study's research questions. The semi-structured interview, designed as open-ended questions, aimed to answer the research questions. The researcher brought interview guideline but let the interview went on under the control of the interviewees as much as possible. The semi-structured interview was helpful to elicit participants' perspective, opinions, attitudes, and experiences. These interviews were major source of this study to understand the participants' ideas on the sustainability of the SMASE INSET system in Kenya focusing on ownership and localization of knowledge initiatives and limitations.

3.3.2 Questionnaire

Questionnaire survey was conducted to complement the interview, because interviews could be only administered to limited number of people. It was also done in order to get more general and simplified perception of the participants. Under the consent of personnel in charge of each institution, simplified questionnaires were distributed to regional trainers (PTTC tutors) and mathematics and science teaches in sampled schools. The answers to these questionnaires provided general understanding of participants' perception and attitude toward the sustainability of the SMASE INSET system in Kenya, more specifically, the degree of localization of knowledge (ASEI-PDSI approach) in SMASE.

3.3.3 Participant observation

The researcher did a participant observation of the national INSET for regional trainers (Primary Teacher Training College tutors) held from January 28 to February 8, 2013 at the CEMASTEА. It was the whole period of the 2-week national INSET course. The observation was done under the consent of the director and the academic coordinator of the CEMASTEА. Participant observation was conducted to examine what really happened, what knowledge was shared, how trainees accepted the training contents and the project during the INSET. During the participant observation, the relationship and interaction among Japanese experts, national trainers and regional trainers, their roles and perception regard to ownership and localization of knowledge in the SMASE project were also examined. Participant observation allowed the gap between the espoused theory (official version of the project) and theory-in-use (what really happens) reduced. It also helped to forming rapport with national trainers and regional trainers which made a basis of doing in-depth interviews.

3.3.4 Document Analysis

There are several project reports including project formulation study reports, needs survey reports, plan of operation reports, Record of Discussions (R/Ds), Minutes of Meetings (M/Ms), monitoring and evaluation reports, mid-term evaluation reports, and final evaluation reports which were published during the phase 1, 2, and 3. These reports were comprehensively reviewed to get useful qualitative information and

statistical data related to research questions.

3.4 Data Analysis

The purpose of data analysis is to bring together data and find common patterns, themes, and interrelationships within the data collected. To establish the validity of the data analysis, triangulation of data was used. Triangulation of data means that several data sources are used for indicating common perception or understanding of the situation and phenomena and answering the research questions. Table 3-2 shows how data sources are linked to indicate four bases and two initiatives (with many sub-categories) for sustainability of the SMASE INSET system.

Table 3-2 Triangulation of Data

	Interview	Questionnaire	Participant Observation	Document Analysis
Four Bases of Sustainability				
Content	√	√	√	√
Human Resource	√	√	√	√
Institution	√	√		√
Finance	√			√
Two Initiatives for Sustainability				
Ownership	√	√	√	√
Localization of Knowledge	√	√	√	√

First of all, the data from interviews, questionnaires, participant observation, and document analysis was analyzed under the four categories of bases which contributed or hindered the sustainability of the SMASE INSET system (content, human resources, institutional and financial basis). These findings were interpreted from the perspective of ownership and localization of knowledge in relation with sustainability of technical cooperation projects using analytical frameworks designed by the researcher based on literature review.

A conceptual framework made from UNDP (2002a), International Development Center of Japan (2003c), Singh (2002), Rebeiro (2002), and Berg (1993) was used to analyze the data in relation with ownership. Another conceptual framework was constructed from UNDP (2002a), World Bank (1999b), International Development Center of Japan (2003b), Jha, et al. (2004), Ellerman (2004), Hovland (2003), and Schumacher (1997). This framework was applied to analyze the data in relation with localization of knowledge. These analytical frameworks are given in table 3-3.

Table 3-3 Analytical Frameworks of Ownership and Localization of Knowledge

Ownership	1) Ownership of the Government	a. Joint project formulation
		b. Cost sharing
		c. GOK's political support
		d. Integrating the project into existing structure and system of the GOK
		e. Enhancement of ownership through SS cooperation
	2) Ownership of Beneficiaries	a. Reflecting local needs through participatory approach
		b. Limited participation (De-motivated teachers)
	3) Japan's ODA Strategy	Enhancing self-help efforts and indirect assistance

Localization of Knowledge	1) Localization of Foreign Knowledge	a. Localization of knowledge from Japan
		b. Localization of Knowledge through SS Cooperation
	2) Local Knowledge Initiative	a. Identification of local needs by the partner country
		b. Utilizing Local Knowledge
	3) Difficulties of using localized knowledge	a. Practical reasons
		b. Fundamental reasons
	4) Japan's ODA Strategy	Use of Japanese experience but with culturally careful approach

CHAPTER 4. FINDINGS:

The Process of Establishing the SMASE INSET System

This study found that there has been an effort to build a sustainable INSET system through the SMASE project. From the formulation stage of the project, technical, institutional and financial bases have been intended to be built considering sustainable INSET system building. In this part, the content, human resource, financial and institutional bases and measures for the sustainability of the SMASE INSET system will be examined. To be more specific, this part will examine what these bases are, how these bases were developed in the project and what the achievement and limitation of these bases are considering the sustainability of the project.

4.1 Content Aspect

- SMASE In-Service Teacher Training Curriculum and Contents

For the sustainability of an in-service teacher training program, it is very important to develop sustainable training contents. Sustainable training contents mean that they are home-grown, local-friendly, generated and managed collectively by those who stand to benefit (UNDP, 2009). The SMASE project could be established as a

national INSET system because the training contents are developed by the effort of Kenyan trainers and teachers on the basis of teachers' needs and Kenyan education context. However, the training contents are not actively utilized by teachers in the classroom. That means there are barriers to utilize the contents due to the problems of contents themselves or surrounding circumstances. First of all, how the SMASE training contents were developed and what these contents are will be examined. Then the achievement and limitation of the contents will be reviewed.

For the development of training contents, 8 Kenyan counterparts (C/Ps: national trainers) were recruited and sent to Japan to take a training course for 3 months from August 1998. The national trainers were given training together with teachers from other countries and observed what Japan was doing for lesson improvement and lessons study.

Due to lack of prior knowledge of in-service, the Japanese took us to Japan for training and there we had the opportunity to interact with other teachers from different schools like Egypt, Philippines, and Nigeria. (...) At every stage the Japanese brought a counterpart to refine our thinking on the ground. They enlightened us on what was to be done. (Source: Interview with one of 8 Kenyan C/Ps M¹⁴, Feb 22, 2013)

¹⁴ In this study, for the privacy of interviewees, their real names are not given. But if the researcher quotes some parts of the interviews conducted in other research, the interviewee's name is given.

Kenyan C/Ps (national trainers) were given the guide and source of developing INSET contents through training in Japan and draw up training curriculum including the selection of priority teaching items and preparation of annual teaching plans (i.e. determination of hours for each module and education method for each lesson).

We developed the SMASE INSET program. But after going to Japan to see how they do it. So it was they who educated that. Then we came up made it together with them. It was because there was no INSET program in the country. So there was nothing here to give us any experience, so they took us there and all of us about three months each, and then we went to see what they do, we looked at it and saw what could work here and what couldn't. So when we were putting together the program, we had all these, what we had learnt and what is possible. (Source: Interview with one of 8 Kenyan C/Ps M, Jan 18, 2013).

The source of INSET contents derived from Japan, but the Kenyan C/Ps (national trainers) screened 'what could work' and 'what couldn't' in Kenya and elaborated the concept or ideas they got during the training in Japan into the training curriculum and materials which were appropriate in Kenyan context.

For the development of training contents, Kenyan C/Ps (national trainers) also conducted a needs survey together with Japanese experts from September to November 1998. The survey was conducted through questionnaires, interviews, and lesson observations. During the survey, it was observed that mostly chalk and talk methods and

theoretical way of teaching was being used in mathematics and science lessons.

Teachers would just enter a classroom and talk and talk without involving the learners and after that they would leave and assume the children have understood. So the lesson was not interesting and the learners ended up not liking the lesson. Because of the theoretical way of teaching, the learners could not perform well. (Interview with a national trainer C, Feb 7, 2013)

Therefore, two kinds of needs were gathered during the survey; 1) changing negative attitude of teachers and students on mathematics and science, 2) changing teacher-centered pedagogy into student-centered one.

Researcher: So what kind of needs were gathered during the needs survey?

National trainer S: They were mainly in two areas; one is attitude factors of teachers and students that is some form of negative attitude on mathematics and science, the other area is on pedagogical needs. Teachers had challenges teaching math and science effectively. (Interview with a national trainer S, Feb 7, 2013)

The findings of the survey suggested that teachers need training which would help enabling them to construct the student-centered learning methods. Based on the results of needs survey, the national trainers and Japanese experts had brainstormed the way of creating student-centered lessons and concluded the solution of ASEI-PDSI

approach.

The acronym ASEI expresses the elements of student-centered lessons. ASEI stands for Activity-based teaching (creation of lessons in which knowledge is gained through activities), Student-centered (shift from teacher-centered to student-centered lessons), doing Experiment (introduction of experiments and practices rather than just lecturing) and Improvisation (introduction of simple experiments using locally available teaching materials) to enhance curiosity and to promote participation of students in the lessons (JICA, 2007).

Adding to the ASEI, the daily improvement cycle PDSI which is a general process of lesson study was developed as a way of changing the teaching methods. The PDSI stands for Plan (planning lesson activities and flow based on learners' needs and abilities), Do (implement the lesson activities systematically), See (observe learner's growth in knowledge, skills and attitudes at all stages of lessons) and Improve (feedback process based on evaluation results).

The principles of ASEI-PDSI approach serve as a foundation upon which teachers can build a substantive and sustainable change in classroom practices with the ultimate aim of enhancing the quality of teaching/learning of mathematics and science (CEMASTEVA, 2007b). The ASEI - PDSI approach was chosen as an intervention to the problem in the Kenyan classroom. ASEI aimed at changing from chalk and talk teaching methods to activity & experiment-integrated student-centered ones. Improvisation was added because teachers usually complain that they cannot integrate activities or experiments due to lack of materials. "Improvisation" says teachers can do activities even without materials using locally available ones. PDSI was suggested in

order to change teachers from reading textbooks without any lesson plan towards preparing, implementing, checking and improving their ASEI lessons.

ASEI-PDSI was based on the needs identified in 1998. ASEI was tailored for the teachers so that they change from chalk and talk to activities that are centered on the students. (...) And the teachers always used textbooks only and that meant that there was no thinking injected in the preparation of the lesson. The teachers only read from the textbook. So, PDSI was tailored to enable the teacher to plan an ASEI lesson, do it and improve it. (Interview with a national trainer S, Feb 7, 2013)

In the process of developing the training curriculum, a pedagogical paradigm of ASEI movement by application of PDSI approach, was constructed. The training program is comprised of understanding the principle ASEI-PDSI, how to apply this principle to teaching certain topics of mathematics and science, and preparing and actualizing the real ASEI-based lessons in the PDSI cycle.

Certain topics of mathematics and science were also decided based on the results of the needs survey. During the survey, teachers were asked which topics teachers and students feel difficult to teach and learn. Topics such as scale drawing or proportion in mathematics and circulatory system or adaptation of plants in science were selected as difficult topics.

Based on the difficult topics chosen in the survey, national trainers and teachers together with Japanese experts analyzed the challenges that teachers and pupils face in

the teaching and learning of the topics and suggest how those challenges can be overcome. They collectively designed hands-on activities which would be used to enhance the understanding of the topics. While considering the challenges and hands-on activities, they developed the training contents and curriculum. These contents were developed based on Kenyan textbooks and syllabus and Kenyan classroom practices.

The other things that we cover when we go for needs survey are some topics of concern that we are given by both the learners and teachers. So we tackle them and the (national) trainers together with the teachers try to come up with some activities which can be given to the learners and which can help understanding that topic. (...) What we (the national trainers and teachers) do is to prepare the write-up (manual) and in that we usually have some activities that can help enhance the understanding of such topics. (Interview with a national trainer C, Feb 7, 2013)

This collective work among national trainers, Kenyan teachers and Japanese experts increased the relevance of the training contents to the needs of Kenyan teachers and to the local situation in Kenyan classroom. CEMASTEIA conducted the first needs survey in 1998 and has done it continuously in every 5 years so that training contents are redeveloped based on updated needs of teachers and students.

Eventually, the SMASE INSET curriculum was designed to be a 10-day intensive course per year for 4 years (a total of 40 days). There are four intensive training courses (four cycles) which are delivered for four consecutive years as follows:

1) Changes in the attitudes of teachers and stakeholders, 2) Hands-on activities and ASEI lessons, 3) Implementation of the ASEI-PDSI in the classroom at schools, 4) Enhancing and sustaining ASEI-PDSI and transfer of impact to the students (JICA, 2002). This is cascaded from national to cluster level with appropriate modifications. The detailed outline of the training is provided in the table 4-1. The INSET includes ASEI-PDSI approach, theme-specific discussion, ASEI lesson preparation, Actualization of ASEI lesson¹⁵, SMASE INSET management, and Facilitation skills (including ICT skills).

As of 2013, most districts finished four cycles of the training, both at the secondary and primary level. In case of secondary, the four cycles were already covered during Phase 2, and the renewal of contents became an assignment of district trainers at the district level INSET. However, district trainers repeated the same contents and the participants expressed dissatisfaction and fatigue about this repetition. It is now urgently needed to develop follow-up contents of the four cycles to make the project more sustainable.

¹⁵ Actualization of ASEI lessons were practiced in real primary or secondary school classrooms. One of three themes dealt during the INSET was allocated to a group of two-three trainees. A group should cooperate together to prepare 2 consecutive lessons including ASEI lesson plans and teaching materials.

Table 4-1 Outline of the SMASE National INSET¹⁶

Day	Session	Schedule	
Day 1(Mon)	Common INSET Plenary Sessions	<ul style="list-style-type: none"> • Leveling of expectations, INSET objectives, guidelines • Pre-INSET evaluation • Opening ceremony • Feedback on the implementation of SMASE 2012 Regional & Cluster INSET • Feedback on the practice of ASEI-PDSI in classroom 	
Day 2(Tue)	Common INSET Plenary Sessions	<ul style="list-style-type: none"> • ASEI-PDSI Approach 4 (Part 1) – Improvisation of ASEI and See and Improve of PDSI • ASEI-PDSI Approach 4 (Part 2) – See and Improvement of pupil’s learning 	
Day 3(Wed)	Subject Based Sessions	Mathematics	Science
		Theme 1: Ration and Proportion <ul style="list-style-type: none"> • Exposition • Discussion (Reflection on the topic concepts) • Activity (Hands-on and Minds-on) • Lesson preparation • Peer teaching discussion 	Theme 1: Circulatory System <ul style="list-style-type: none"> • Exposition • Discussion (Reflection on the topic concepts) • Activity (Hands-on and Minds-on) • Lesson preparation • Peer teaching discussion
Day 4(Thu)	Subject Based Sessions	Theme 2: Money and Postal Charges <ul style="list-style-type: none"> • Exposition • Discussion (Reflection on the topic concepts) • Activity (Hands-on and Minds-on) • Lesson preparation • Peer teaching discussion 	Theme 2: Light <ul style="list-style-type: none"> • Exposition • Discussion (Reflection on the topic concepts) • Activity (Hands-on and Minds-on) • Lesson preparation • Peer teaching discussion
Day 5(Fri)	Subject Based Sessions	Theme 3: Scale Drawing <ul style="list-style-type: none"> • Exposition • Discussion (Reflection on the topic concepts) • Activity (Hands-on and Minds-on) • Lesson preparation • Preparation for 	Theme 3: Adaptation of Plants and Crop Diseases <ul style="list-style-type: none"> • Exposition • Discussion (Reflection on the topic concepts) • Activity (Hands-on and Minds-on) • Lesson preparation

¹⁶ The timetable of the 2013 SMASE National INSET (Primary) held in January 28 – February 8, 2013 at CEMASTE A. The researcher conducted participant observation on this INSET.

		Actualization	Preparation for Actualization
Day 6(Mon)	Actualization in School	<ul style="list-style-type: none"> • Actualization Lesson 1 • Actualization Lesson 2 • Feedback on the actualization / preparation for actualization at Regional & Cluster level / Exposition on preparation for facilitation skills 	<ul style="list-style-type: none"> • Actualization Lesson 1 • Actualization Lesson 2 • Feedback on the actualization / preparation for actualization at Regional & Cluster level / Exposition on preparation for facilitation skills
Day 7(Tue)	Common INSET Plenary Sessions	<ul style="list-style-type: none"> • INSET Management • Action Plan 	
Day 8(Wed)	Subject Based Sessions	<ul style="list-style-type: none"> • ICT Skills for INSET Provision • Facilitation Skills 3 (Preparation) 	
Day 9(Thu)	Subject Based Sessions	<ul style="list-style-type: none"> • Facilitation skills 3 Peer presentation by Groups 	
Day 10(Fri)	Common INSET Plenary Sessions	<ul style="list-style-type: none"> • Strategies to sustain ASEI-PDSI Practice • Post-INSET evaluation • Feedback/open Forum • Closing ceremony 	

Source: Distributed at the 2013 SMASE National INSET (Jan 28 – Feb 8, 2013, CEMASTE A)

In order to control the quality of training contents and management and understand the impact of the training, an internal Monitoring and Evaluation (M&E) Task Force was established within the project. These M&E Task Force consisted of Kenyan C/Ps (national trainers) to encourage them to find improvement from tangible outcomes or to face challenges and look for solutions by themselves as the owner of the project. The Task Force attended INSETs at different levels and mathematics and science lessons by SMASE-trained teachers regularly to monitor the quality of INSET and to evaluate the impact of INSET on classroom practices. The monitoring and evaluation has been carried out every April and August.

The quality and impact of the SMASE INSET has been monitored and

evaluated using various instruments. They can be divided into 3 categories: 1) Instruments for monitoring and evaluating the quality of SMASE INSET, 2) Instruments for monitoring and evaluating the observed lessons conducted by SMASE-trained teacher, 3) Instruments for gather information on overall M&S lessons, and 4) Instruments for monitoring student achievement in schools who were taught by SMASE-trained teachers. The list of instruments under the 3 categories is given in Table 4-2.

Table 4-2 List of SMASE M&E Instruments

M&E Target	Name of M&E Tools
INSET	<ul style="list-style-type: none"> • Pre-INSET evaluation questionnaire • Post-INSET evaluation questionnaire • Session evaluation instrument • Quality of INSET instrument (Capacity index of trainers)
Observed Lessons	<ul style="list-style-type: none"> • ASEI-PDSI checklist / Lesson observation instrument • Questionnaire for extent of student participation in lesson
Overall M&S Lessons	<ul style="list-style-type: none"> • Teachers' questionnaire • Students' questionnaire
Student Achievement	<ul style="list-style-type: none"> • SPIAS (SMASE Project Impact Assessment Survey) achievement tests (Students)

Source: Reconstructed of the information from JICA (2007b)

Monitoring and Evaluation Tools developed by SMASE M&D Task Force

1. ASEI-PDSI Checklist / Lesson Observation Instrument

These two instruments were currently made into one instrument. This Instrument was developed to evaluate the extent of practice of ASEI principles and

PDSI approach in the observed lessons. ASEI-PDSI factors are measured with 5 rating scale by the observers to rate extent of practice of ASEI-PDSI.

2. Questionnaire for Extent of Student Participation in Lesson

This instrument was developed to evaluate the quality of students' participation in lessons. The participation is categorized into three categories: 1) process skills, 2) affective aspect and 3) communication skills. This questionnaire is used by the students to rate the extent of their participation in lessons.

3. Teachers' Questionnaire & Students' Questionnaire

These instruments were developed to identify overall M&S lessons in school and to gather information on status of M&S subject in terms of challenging areas, available teaching and learning resources, perception of pupils and teachers, subject content mastery and teaching and learning methods.

- Difficulty of using ASEI-PDSI in the classroom

Though the SMASE INSET has been conducted more than 10 years, the ASEI-PDSI approach is not implemented in everyday classroom situation (Matachi, 2011). According to the survey conducted in 2011, most of SMASE-trained teachers (72%) were still using teacher-centered teaching methods and only 28% of the lessons were classified as tending towards learner-centered approach¹⁷ (CEMASTE, 2013).

¹⁷ It was determined by examining how teachers employed participatory approach to engage pupils in lesson activities and the duration of pupil-centered activities out of total lesson time.

During the interview, SMASE-trained teachers said that if they use ASEI approach, students find lessons more exciting and the lessons become more enjoyable both to students and teachers. But they said there are challenges to practice ASEI-PDSI on the ground. Impeding factors to practice this approach were raised as follows: 1) large class, 2) lack of resources, 3) broad syllabus (pressure of covering all in syllabus), 4) emphasis on exam results, 5) lack of time to prepare and conduct ASEI lessons, 6) students' low level of understanding, and 7) teachers' low motivation.

To be more specific, there are so many students in one class to apply learner-centered approach such as activities or experiments. It is also because of the lack of facilities like equipped laboratory. Another reason is that there is a pressure for teachers to cover all contents listed in syllabus before exams and to raise exam scores. In this situation, teachers think the ASEI approach is time-consuming to prepare activities and integrate them in lessons which are already busy with finishing syllabus. To be a student-centered lesson, teachers let students to discover the rules through hands-on activities instead of telling them, which takes a lot of time especially for students with low level of understanding. This perception of teachers on the limitations of ASEI-PDSI was revealed evidently in the interview as shown in the box below.

Teachers' Perception on the Limitations of Practicing ASEI-PDSI

(Quotation from Interviews with Teachers)

1. Large class

Well we have challenges also, like when you talk of public schools, it's a lot of challenges and you have a class of sixty or eighty. You just give them material, and check if they did or not. But they also have many challenges. (Interview with M&S teachers in R Secondary School, Feb 13, 2013)

2. Lack of facilities and equipment

I found it (practicing ASEI-PDSI) challenging because of lack of the facilities in many schools in Kenya so the facilities that you can use to teach science in simplicity. (Interview with M&S teachers in B Secondary School, Feb 15, 2013)

3. Pressure of covering all in syllabus

When we go back to school, students are going to have an examination next term. We must have completed covering the syllabus. Then am I going to spend time doing the practical activities or am I going to rush them through using lecture method? As much as I would like to implement the ASEI approach, the time is limited. We may put in some elements of ASEI-PDSI, but we cannot fully implement. (Interview with a regional trainer W & K, Feb 4, 2013)

4. Emphasis on exam results

I think now striking a balance between using the methods and completing the syllabus in good time is an issue. It is because at the end of the day and at the end of the year, you want that grade to go up, but not stagnate or even go down. We are answerable to the school. So which ever methods you use, we need to think whether it adds value to the

school by improving the grade of the student. So even if you use those methods (ASEI-PDSI) and the grades are still low, it doesn't considered an important matter. We can use something helpful in the future. But I didn't perform the approach because their grade went down. (Interview with M&S teachers in R Secondary School, Feb 13, 2013)

5. Lack of time to prepare and conduct ASEI lessons

A: Students like the hands-on activities. But, it is so time-involving, because teachers need to prepare the activities then the students carry out the activities. The time required is too much baring in mind that you have other classes to attend. So preparing such activities for all the classes, it will be so time-involving.

B: When I'm teaching with hands-on activities, students find lessons more exciting. But time here is the factor. When time is there, it (ASEI-PDSI) is workable because it involves a lot of time. If time is there, it is enjoyable even to the students even to me as the teacher.

(Interview with M&S teachers in R Secondary School, Feb 13, 2013)

6. Students with low level of understanding

A: It is hard to do ASEI in lesson, because our students are not very bright. For those who are teaching very bright students, ASEI may work conveniently. They may not have problem with time. But for students who are slow learners, it takes time. Hands-on activities may take time, so you will cover very little.

B: It also depends on the level of understanding of students. They just have to discover (the rules) by themselves. But they cannot come up with the conclusions by themselves.

(Interview with M&S teachers in R Secondary School, Feb 13, 2013)

According to the results of the questionnaire survey conducted by the researcher targeting 29 regional trainers, it was also evident that most of them think these reasons make teachers hard to implement ASEI-PDSI. Among various reasons, broad syllabus was most agreed and lack of resources were least agreed.

Table 4-3 Impeding Factors of ASEI-PDSI in Classroom

Impeding Factors of ASEI-PDSI	Strongly Agree	Agree	Disagree	Strongly Disagree	Don't know
Large classes	15	10	2	2	0
Lack of resources	8	10	9	1	1
Broad syllabus	14	14	1	0	0
Emphasis on exam results	13	12	1	1	2
Teachers' low motivation	12	12	4	1	0
Teachers' lack of time to prepare lessons	12	9	8	0	0

Source: Results of a questionnaire survey conducted by the researcher to regional trainers

4.2 Human Resource Aspect

- Human Resource Management and Development for INSET

Implementation

In terms of human resources, there are three main factors which have contributed to the sustainability of the SMASE INSET system. First, there are CEMASTEAs (Center for Mathematics, Science and Technology Education in Africa) serving as a center for teacher capacity development in mathematics and science education. Second, there are relatively well-functioning management structures from national to district level. Third, there are trained human resources such as INSET trainers and administrative personnel working for the project. In particular, utilizing Kenyan personnel within existing administrative structure helped smooth implementation of the project.

Before the CEMASTEAs were established in 2003, KSTC (Kenya Science Teachers College) was working as the counterpart (C/P) institute. So, KSTC could be called a parent institution of the CEMASTEAs. KSTC was chosen as the C/P institute during the formulation study of the project in 1997. Japan originally planned to build a new in-service teacher training center, but it changed its mind to support KSTC to function as the center. The reason why KSTC was chosen is that it has relatively well-functioning infrastructures and was the only teachers' college specialized in mathematics and science education in Kenya. Moreover, the college was emphasizing teaching methods as a result of Swedish technical assistance in the past. So, it had

willingness to make lesson improvements by changing practical teaching methods through in-service training. Above all, KSTC had lecturers who have sufficient capacity to work as content developers and project operators of the SMASE project (JICA, 2007 a).

So, JICA requested KSTC to recruit 8 full-time C/P academic and administrative personnel as a condition for the launch of the project. Designation of Kenyan C/Ps was the first step to make Kenyan side take initiative of the project. 8 national trainers (2 trainers for each subject: Mathematics, Biology, Chemistry, Physics) were recruited in February 1998. One trainer was in charge of the operation of the training and the other trainer was in charge of creating the contents of the training. Since these national trainers were already teaching pre and in-service teachers in KSTC, they knew well about how teachers are trained and what they learn during PRESET and INSET courses. Most of them worked as secondary school teachers before they started working in KSTC, so they understood the classroom situation in Kenya. Utilizing Kenyan C/Ps to develop contents and manage trainings contributed to enhance the degree of localization of the project. They were the right ones who could develop locally adaptable training contents and operation system in Kenya.

As the project was expanded to all districts in Kenya and SMASE-WECSA (Western, Eastern, Central, and Southern Africa) member countries in Phase 2 (2003-2008), the necessity of establishing a center for SMASE project independently from KSTC was raised. So, CEMASTEAs was established under the auspices of Ministry of Education in 2004 and started functioning as the center of excellence for capacity development of mathematics and science teachers in Kenya and Africa from January

2005. As the scale of the project expanded, the number of Kenyan C/Ps (national trainers) working for CEMASTEIA also increased to 49 in 2011 (CEMASTEIA, 2011c).

At the national level, CEMASTEIA and its staff (national trainers) performed various activities in the SMASE project as follows: 1) Developing training programs to upgrade pedagogical skills and mastery of subject content for M&S teachers, 2) Developing and implementing specialized professional training programs in M&S education, 3) Carrying out empirical research and lesson study for innovative teaching and learning in M&S, 4) Developing effective monitoring and evaluation tools for quality assurance and impact assessment of CEMASTEIA programs, 5) Organizing conferences, seminars and workshops for stakeholders, and 6) Offering consultancy services in M&S for SMASE-WECSA countries (CEMASTEIA, 2008).

At the district level, PTTC (Primary Teacher Training College) lecturers and selected teachers are working as regional (or district) trainers. They played the role as the advanced base spreading the training to the whole country. They participated in renovating training contents tailored to the needs of each district and managing the training at the district level. They are from the local ground and understand the education situation and needs which is specific to each district.

The sustainability of the SMASE INSET system was enhanced with relatively well-functioning management structures utilizing the existing education administrative structures and personnel. The SMASE project has been implemented by Kenyan Ministry of Education through the CEMASTEIA with technical assistance from JICA using the 3 level management structures. They are Joint Coordinating Committee (JCC), National Planning Committee (NPC), and District Planning Committee (DPC). JCC,

chaired by Permanent Secretary of MOE, was established to approve annual plan of operation, to review the overall progress of the project and to make decisions on major issues of the project. NPC, chaired by Director of CEMASTEAs, runs the project on a daily basis. Its functions include making annual action plan on the basis of the plan of operation, managing INSETs and Workshops, and taking daily administrative responsibilities. DPC's main responsibility is to make District Annual Work Plan and to manage SMASE district, regional and cluster INSET activities. The members of each committee are listed in figure 4-1.

Figure 4-1 SMASE Management Structure

<u>Joint Coordinating Committee</u>	
(Japan) Chief Representative, JICA Kenya Office Chief Advisor	(Kenya) Permanent Secretary, MOE (Chair) Education Secretary Director of Education, MOE Chief Finance Officer, MOE Director, Ext. Resource Dept., MOF Secretary, TSC Representative, PDE Chairman, BOG, CEMASTEAs Director, CEMASTEAs (Secretary)
<u>National Planning Committee</u>	<u>Ministry of Education</u>
(Japan) Chief Advisor Coordinator	(Kenya) Director, CEMASTEAs Deputy Director Deans of Studies Education Secretary Director, Basic Education Director, Secondary Education Director, QASO Head of INSET Unit SMASE Desk Officer
<u>District Planning Committee</u>	
District Planning Committee (Chair) District SMASE Coordinator (Secondary D-QASO) District SMASE Coordinator (Primary D-QASO) Principal of District INSET Center Representative, TSC (Staffing officer)	
[Primary]	[Secondary]

Principal of PTTC	Chairperson of District
Representative, Regional Trainers	Representative, District Trainer
Chairperson of District	
Representative, Z-QASO	
Representative, TAC Tutor	
Representative, Cluster Trainer	
Representative, Cluster School Headteacher	

Source: Government of Kenya (2008)

As shown in the figure 4-1, DPC is composed of District Quality Assurance Standard Officers (D-QASOs), Teacher Advisory Center (TAC) Tutors, and principals of schools designated as District INSET Centers etc. Instead of creating extra project implementation units (PIUs) and new employment, the existing administrative structures and personnel were utilized for the administrative management of INSET.

The project put emphasis on not only the capacity development of teachers but also that of organization and institution which directly affects teacher practices. It is because without support of headteachers or education officers, it is difficult for teachers to make change in their teaching. Therefore, DEOs, QASOs, TAC tutors and headteachers were also invited to the sensitization workshop. Stakeholder workshops are aimed at sensitizing the importance of SMASE INSET and ASEI-PDSI practices, and enhancing INSET management and supervision capacity of stakeholders. The workshop helped these local education administration agencies and human resources to function as an executive body of the SMASE project. The workshop also made it possible to secure political and administrative support from the Ministry of Education and District Education Officers. As a result, it helped SMASE project to be absorbed into the Kenyan education system and institutionalized in Kenyan education policy and budget system.

The workshops were also implemented in the cascade model like SMASE INSET from national to district and cluster level as shown in the table 4-4 and 4-5 below. Two approaches, which are 1) INSET for trainers and teachers and 2) workshop for stakeholders, interact with each other and contribute to more smooth implementation and development of the SMASE project.

Table 4-4 Delivery system of SMASE Workshop - Secondary

Level	Objective	Participants	Trainers	Venue	Duration	Management
National	To promote ASEI-PDSI classroom practices at	360 selected principals 150 DEOs 360 selected QASOs	CEMASTE A	CEMASTE A	1 week	CEMASTE A
District	secondary school classrooms through sensitization for all principals	Other principals (6,125)	360 selected principals	108 INSET Centers	1 week	DPC

Source: Government of Kenya (2008)

Table 4-5 Delivery system of SMASE Workshop - Primary

Level	Objectives	Participants	Trainers	Venue	Duration	Management
National	Sensitization on SMASE INSET & ASEI-PDSI,	PTTC Principals (19) Deans of Curriculum / HOD (38)	CEMASTE Academic staff	CEMASTE EA	5 days	CEMASTE A

Distric t	INSET managem ent, supervision of ASEI- PDSI practices	TAC Tutors (1,100) QASO / Deputy (1258)	320 RT	19 PTTCs	5 days	DPC & CEMASTE A
Cluster		Headteach ers / Deputy (20,000)	TAC Tutors QASO / Deputy	108 INSET centers and other venues	1 day	DPC

Source: Government of Kenya (2008)

- Lack of Capacity at the District Level

The lack of capacity of trainers and administrative personnel at the district and cluster level has hampered the sustainability of the SMASE INSET system. During the Phase 1 and 2 when the INSET contents for the four cycles were all developed by the CEMASTE A, it was not a huge task for district trainers to revise some parts of the contents to make them acceptable to their local contexts. However, in the Phase 3, the districts which had completed the four cycles of SMASE INSET courses were expected to develop their own individual activities. The training at the district level was supposed to be planned and implemented independently by district trainers and DPCs with CEMASTE A monitoring. It was based on the belief that training should be and can be planned and implemented at the district level according to the needs of the districts after the four year training program finished. In this way, it was intended to make the district INSET system more decentralized that it can be operationalized independently and sustainably (JICA, 2007a). However, this strategy should have been based on high capacity and strong responsibility of district trainers.

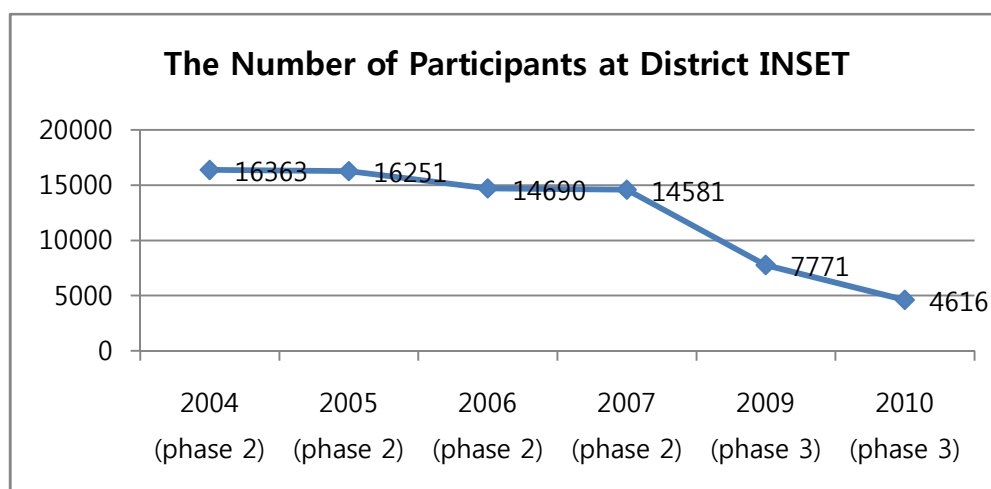
However, the lack of capacity of trainers and administrative personnel at the

district and cluster level were repeatedly raised in the monitoring and evaluation reports. In case of district trainer, the problem is that they are not full-time INSET trainers like national trainers at CEMASTEPA. They are originally PTTC lecturers or school teachers and play the role as a SMASE trainer as a part time job during vacation. So, they had difficulty to have time for the SMASE project during semesters. Due to lack of time to prepare INSET plans and materials, the quality of district, regional and cluster INSET has been sacrificed. Moreover, since they were not professionally trained as a trainer of teachers, they faced several challenges related to developing INSET contents and preparing for the INSETs. In case of administrative personnel at DPC, they are not full-time administrative work force for the SMASE project, neither. Though they are trained what they have to do for INSET management, in most cases their SMASE-related duties are not on their priority list. During the interview with regional trainers, it was found that the capacity of District-QASOs is limited in terms of monitoring and quality assurance in ASEI-PDSI regularly with a certain quality without National Trainers' accompany. Moreover, DPCs sometimes neglect their duties of monitoring and evaluation of the SMASE-trained teachers' lessons and they often delay reimbursing meals and transport fee for participant teachers.

Of course, some districts were proactively planning and implementing the district-level INSET. In Muragua District, the DPC carried out monitoring and evaluation of the four cycles of training courses and conducted a needs survey for post-4 cycle INSET at the district level. District Trainers gradually independently proceeded creating new teaching materials for the training course. However, most district trainers failed to prepare training contents for District INSET by themselves. In Matuga District,

District Trainers were unable to develop new INSET content and therefore recycled previous INSET contents. The support from the DPC to the District Trainer to conduct District INSET was minimal (Mid-term Evaluation Report, 2011). As a result, the quality of district INSETs was threatened during the Phase 3 and the number of participants at the district level decreased compared to those in Phase 2.

Figure 4-2 The Number of Participants at District INSET



Source: CEMASTE A (2011c)

4.3 Institutional Aspect

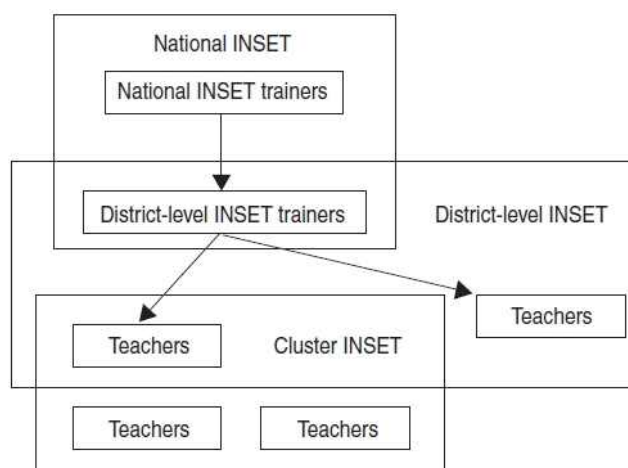
For the SMASE project to reach all secondary mathematics and science teachers in all districts in the country there were two institutional frameworks: 1) cascade model from national to district and cluster, 2) compulsoriness of the training to

all secondary mathematics and science teachers. These institutional frameworks have contributed to the fast, broad diffusion and establishment of the INSET system. However, top-down approach and compulsoriness which failed to bring out teachers' support and nurture their responsibility have threatened the sustainability of the project.

- Cascade INSET Model

The SMASE Project established a nation-wide INSET system using cascade model. The cascading model allowed the diffusion of training effects to water down from national to the district, cluster (cluster: gathering several schools) level (Figure 4-3). The basic study in 1997 concluded that the cascade approach was the most appropriate for the training system considering the highly centralized character of Kenya. So, the cascade model was adopted in the SMASE project.

Figure 4-3 Cascade Model of SMASE



SMASE INSETs from national to cluster levels are standardized with training materials made in the National INSET Center and SMASE INSET Implementation Guidelines. But, the contents and the way of implementation can be modified according to the local context.

SMASE-Secondary and SMASE-Primary have different cascade structures. SMASE-secondary has two levels of training, national and district INSET, while SMASE-primary has three levels, national, regional and cluster INSET. So, the cascade system and its output will be reviewed separately.

In case of secondary, national trainers (CEMASTEA academic staffs) train district trainers (selected mathematics and science teachers) at the CEMASTEAs and district trainers train mathematics and science teachers in their respective districts at SMASE District INSET Centers (designated public secondary schools in those districts). So far, there are 108 District INSET Centers. In the original plan of Phase 1, there was a cluster level INSET and it was actually held up to the 2nd training cycle in 2001. However, the cluster training courses were stopped in order to avoid a heavy burden put on the district for the preparation and logistics for the cluster INSET as well as to avoid lowering the quality of the cluster training. Instead, the targeting number of District INSET became larger.

Table 4-6 Delivery system of SMASE INSET - Secondary

Level	Objectives	Participants	Trainers	Venue	Duration	Management
National	To promote ASEI-PDSI classroom practices at secondary school classrooms by strengthening of existing INSET system and curriculum	1,500 selected teachers (as District Trainers)	CEMAST EA Academic staff	CEMAST EA	2 weeks	CEMASTE A
District		20,000 M/S teachers	1,500 DTs	108 INSET Centers	2 weeks	DPC

Source: Government of Kenya (2008)

During the period of Phase 1 (1998-2003) and Phase 2 (2003-2008), a system of training district trainers was established at the CEMASTE A. 1,381 district trainers were trained in the national INSET, and 14,581 (2,350 for Phase 1 and 12,231 for Phase 2) teachers were trained in district INSETs (CEMASTE A, 2007c). For effective INSET management, 196 District Education Officers (DEOs), 472 Quality Assurance Standard Officers (QASOs) and 686 secondary school principals were also trained in SMASE stakeholder Workshops.

Since there have been demands to expand the SMASE project to primary level, SMASE-primary was initiated from phase 3 (2008-2013). At the primary level, national trainers train regional trainers (Primary Teacher Training College lecturers) at CEMASTE A and regional trainers train cluster trainers (selected mathematics and

science teachers) in their PTTCs. Cluster trainers train all mathematics and science teachers in Class 6, 7 and 8 at Cluster INSET Centers (designated public primary schools in those regions).

As of February 2013, four cycles of training materials and programs for the national INSET were developed and 271 regional trainers were trained. A system of regional INSET was also established at the PTTCs and 4,164 cluster trainers were trained. Existing system of cluster INSET has been strengthened and 55,393 teachers were trained. However, the number of cluster trainees is less than the targeted number. The shortfall could be attributed to the 12 districts, mostly in arid and semi-arid land (ASAL) region, where Cluster INSET was not conducted. This was because distances between schools hinder non-residential INSET and the funds for Cluster INSET did not cater for residential training. In the sensitization workshop, 1,113 and 897 stakeholders (TAC tutors, provincial/district/zonal QASOs) were trained in 2010 and 2011 respectively.

Table 4-7 Delivery system of SMASE INSET - Primary

Level	Objective	Participants	Trainers	Venue	Duration	Management
National	To enhance classroom practices at primary school level through introduction of	320 PTTC Tutors (as Regional Trainers)	CEMAST EA Academic staff	CEMASTE A	2 weeks	CEMASTE A
Regional		5,600 selected teachers (as Cluster Trainers)	320 RT	19 PTTCs	2 weeks	DPC
Cluster		60,000	5,600 CT	3,300	5 days	DPC

	ASEI-PDSI sessions in cluster INSET	M/S Teachers (Grade 6-8)		Cluster schools		
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Source: Government of Kenya (2008)

There are two reasons why cascade model of primary INSET was different from that of secondary. The first reason is that the SMASE-primary system was established integrating already existing primary INSET system in Kenya. Before SMASE-Primary was initiated, there was an INSET system called “School-based Teacher Development (SbTD) ¹⁸”. The SbTD project had been financially and technically supported by UK DfID (Department for International Development) from 1991 to 2005. Instead of breaking the existing system, PTTC was chosen as Regional INSET Center which links SMASE National INSET with SbTD’s Cluster INSET¹⁹. It can be referred to be a good example of harmonizing existing local system with newly built system.

The Britons had taken the primary. There was already a system, in-service system in place (at the primary level). So, instead of going to break it, they go to the teachers college. And see if they can do something in teachers colleges.
(Interview with a former national trainer M, Jan 18, 2013)

¹⁸ As a part of the SbTD project, TACs with 5 TAC tutors were strengthened or newly established in each district to function as training centers and library for in-service teachers from 1991 to 1996.

¹⁹ When SMASE-Primary was initiated (2008), the SbTD project was already finished (2005). But TACs were still functioning as Cluster INSET centers as a part of Kenyan MOE’s program.

The second reason is that it was difficult to target specific group of primary teachers to train as district trainers like SMASE-secondary. Since primary teachers basically teach all subjects, the subjects they teach can change any time depending on schools' demands. So, it was more manageable to train primary teacher training college tutors as middle-level trainers because they usually have one subject to teach.

*They want to take it to teachers colleges which are more manageable as going to the primary schools is difficult. The problem is that teachers in primary level all teach mathematics so it's easier to target the colleges.
(Interview with a former national trainer M, Feb 22, 2013)*

- Advantages and Disadvantages of Cascade Model

Cascade model was effective to spread the SMASE training to the whole country. Using the cascade model, the number of benefitted teachers could increase exponentially. Without this approach, it would be impossible to cover all secondary mathematics and science teachers. So, it could be said that cascade model was one of contributing factors that made SMASE become a national INSET system.

However, there are negative opinions on this cascade approach. According to Mattson (2006) and Knamiller (1999), the centrally developed in-service program delivered through cascade training is now quite widely discredited because of several

limitations²⁰.

One of the most frequently raised limitations from interviewee was dilution of quality. The training contents given at the national INSET could be diluted or distorted while cascading down to regional and cluster INSET. The quality of training depends on the capacity of regional or cluster trainers who understand the contents correctly and pass them down to the lower level. If they do not understand the contents or understand in a wrong way, the contents cannot be remained uniformly and would be delivered differently from what is intended. So, there is high possibility that the contents provided at the cluster INSET (bottom level) could be different from national INSET (top level).

You know now the disadvantage is that there are some dilution in the process, the way we do it here the content may not be the same when it reaches the teacher to go to the classrooms because it is passing through two people and so its effectiveness depends on those who will teacher at the cluster level or the regional level. (Interview with a national trainer C, Feb 7, 2013)

The aim is to cascade all the knowledge from the national level to school class. Unfortunately as this info is cascaded it becomes diluted. At national level, it is 100%. But this keeps declining. By the time it's getting to the primary school teacher, it could be 50%. So they cannot be able to get what we (regional trainers) have done here. And they cannot completely grasp the way we want it to be done at the classroom level. (Interview with regional

²⁰ Knamiller (1999) analyzed the limitation of the cascade model such as dilution of quality, transmission of largely theoretical and abstract ideas, lack of local relevance, and limited practical application in classrooms.

trainers W & K, Feb 4, 2013)

The cascade model usually put emphasis on passing down the fixed module of knowledge uniformly from top to bottom. However, in the cascade model, new value or information can be added from the participants as the module of knowledge cascades down. The SMASE project put emphasis on the participatory approach and encourages participants to share their experience during the INSET sessions. An interviewed Japanese expert emphasized that the aim of SMASE INSET was not just passing down information but sharing experience and ideas from the ground. That is why the term “facilitator” is used instead of “trainer” or “teachers”²¹.

We knew from the beginning, there is advantage of cascade system. That is why our training it is not module style. If module is there from unit 1 up to 10, we need to cover that module. (SMASE) INSET contents basically come from the participants' experience, it is not from facilitator. That's why we don't call them trainers or teachers. They have ideas and good experiences from the ground and they share with each other. The contents are not much there. It is asking question that is getting more ideas.

Our INSET is participatory approach. It is not just information passing down. Our INSET is not just passing information and teaching some contents and cramming. It is the people who are participating. They are the contents. Their experience is the content. (Interview with a Japanese expert U, Feb 6, 2013)

²¹ In the SMASE project, “facilitator” is mostly used to call trainers. But the researcher used the term “trainer” for fast catch-up of the meaning in this study.

From the researcher's participatory observation of national INSET, facilitators usually gave very brief instruction and discussion points. And participants were encouraged to share their ideas in a group discussion and present them in front of all. In this way, the contents are made from participants' experience and ideas during the INSET. A regional trainer said the training can be rich at the bottom level INSET by incorporating experience of both regional and cluster trainers.

As we (regional trainers) come from here (national INSET) we have added some information. These (cluster trainers) are people that we have taught and when we reach them they have more firsthand experience than us. Also when we go to the cluster people (cluster trainees) they even have more experience as they have been handling these topics. Hence, they know the challenges they are faced with and they do not imagine the challenge. At the end of this, it shall be a rich program because it incorporated experience of both regional and cluster people. (Interview with a regional trainer A, Feb 6, 2013)

Another limitation of the cascade model is local relevance and limited practical application in classrooms. To a large extent, the SMASE project tried to remedy these shortcomings. To raise the local relevance, the CEMASTEAs respected district-level initiative and the center was only in charge of monitoring and evaluation after the completion of the four cycles of SMASE INSET. The training at the district level was supposed to be planned and implemented independently by DPCs (District Planning

Committees) with CEMASTEAs monitoring. District trainers were encouraged to reconstruct training contents tailored to the needs of each district.

- Mandatory Attendance of INSET

Another reason for the SMASE project to reach all secondary mathematics and science teachers in Kenya is enforcement of the training. Making the training mandatory was possible because of the political support from the government and stakeholders.

We were lucky because the ministry was on our side. And so they demanded that every teacher must go through the program. (Interview with a former national trainer M, Jan 18, 2013)

The compulsory character of SMASE INSET is specified in the Minutes of the Stakeholders' Meeting (SMASE, 2002) organized by the national INSET Center attended by related personnel from the various districts. The Minutes of the Stakeholders' Meeting includes the act enforcing district-level training implementation and participation. The Minutes of the 5th Meeting of the Joint Coordinating Committee (2002), signed by the Undersecretary for Education as the representative of the Kenyan side, stipulates that every teacher must attend INSET and each school Headteacher is responsible for having teachers attend training. The Minutes of Meeting also states that to ensure compliance all Headteachers will be required to facilitate attendance and will be held accountable for any failures.

However, in the absence of ministerial ordinances or notifications making

training attendance compulsory, INSET is still lacking a “formal” legal framework enforcing its implementation. So, at the moment, the attendance enforcement relies on the responsibility of the Headteachers and ultimately training participation is up to decisions of teachers. Therefore, CEMASTEAs has tried to legally institutionalize the INSET attendance through governmental ordinances and notifications.

Though the enforcement of participation is not legally completed, this strategy has substantially affected on the implementation of SMASE INSET. But the process of making INSET attendance mandatory was not easy. There has been discontent and resistance of teachers against the SMASE project. There was a struggle from the start of the project because of JICA’s policy of not funding the INSET participation fees (daily allowance for participants).

SMASE came in to break a tradition where they were used to be paid for learning but us we were not paying them; hence, we had to make them understand that this (INSET) was for their own benefit. (Interview with a former national trainer M, Feb 22, 2013)

In Kenya, development partners have paid the financial incentives to training participants and it was considered a conventional practice. However, JICA broke this tradition keeping its position not to allow per diem for participants. Instead, Kenyan C/Ps (national trainers) and Japanese experts tried to remind participants that the money paid for INSET participation (SMASE Fund from school fees) had originally been used for students. And they made participants understand that INSET is for their own benefit

and capacity development and making efforts of lesson improvement is an obligation for teaching profession. The project went on without daily allowance, but the complaint about no allowance principle was not vanished.

They (Teachers) didn't like the demand that SMASE was asking of them. So they were resisting. So that also cost a lot of annoyance. Teachers had found the loophole and commercialized it so that they would have private tuition (per-diem). (Interview with a former national trainer M, Jan 18, 2013)

Making the SMASE INSET compulsory was intended to extend benefits to all mathematics and science teachers and to establish the INSET system and institutionalize it for the sustainability of the project. However, after the enforcement of the training from Phase 2, per diem issue was brought up again. Before SMASE training became compulsory to all mathematics and science teachers, those who accepted the premise of no daily allowance participated in the training, but now there is no choice. So, some teachers resisted asking for daily allowance. There has been a series of struggles while Ministry of Education and the CEMASTEAM pushed and persuaded teachers to participate in INSET.

We had a very fearless point where we needed it to be done. So some of the things that we did annoyed people. But we really don't trick, so you must come forward and make it. If you don't come, you are fired. We had to use all the strength. So we sent the most aggressive person, and tell them this is

must-be. And then we sent other persuaders. OK. Even if we said that yes will is important, we pushed and pushed. Other countries (SMASE-WECSA member countries) picked it (the SMASE-style INSET program) up, but they didn't know how we got it and what they didn't know the aggressiveness and all the things that we did. There was a lot of struggle because teachers don't like change. (Interview with a formal national trainer M, Jan 18, 2013)

Teachers wanted to add recognizable values such as certificate for promotion through the SMASE INSET. Since many other teachers spend their holidays going for Bachelor or Master Degrees and they get professional growth as a result of this degree, they wanted to be rewarded with tangible results in returns for sacrificing their holidays and participating in the INSET. However, what they could grab was only certificate which is not recognizable.

A: Teachers' motivation depends on the fact that after we are done with the training or course it will be recognizable and pushes you a step-up like when we go for masters and all that normally useful for upward growth.

B: This service (taking SMASE INSET) is not recognizable. Science teachers are being told they have to go there (SMASE INSET) while the others are left out doing their own work over the holiday. When you are done with the training, some of the moderators say you are able to improve your own work. But that's not the case because it's not recognizable. (Interview with M&S teachers in B secondary school, Feb 15, 2013)

Since participating in SMASE INSET was mandatory, most mathematics and science teachers went through the program and got certificate. Then this certificate does not add any advantage over the competitors in the promotion interview. So, teachers could not get any meaning or motivation to participate in the training.

I will comment on the professional growth. Earlier on when we started, they were giving us certificates. You see this thing is compulsory in all secondary schools in Kenya. Every science teacher will have this certificate. You don't have a certificate to present when you have been invited for an (promotion) interview, because this certificate has presented by every other teacher. So, there is nothing unique, because this thing is compulsory. In this case, since all teachers have the same certificate, there is no added advantage over your competitor. (Interview with M&S teachers in R secondary school, Feb 13, 2013)

In fact, the CEMASTE A tried to make SMASE certificates value-attached for promotion from the beginning of the project. However, the authorities would not respond to the demand, because it implied a tremendous increase of payment. (It means almost all secondary M&S teachers in Kenya need to receive increased payment.)

As a result, the enforcement of participation in INSET led to negative attitude of teachers. Because participation was not based on spontaneity of participants, a lot of dissatisfaction and resistant action was expressed by teachers. Some teachers said they

feel like being restricted and used for making the project operating.

It should not be like we are going to rubber-stamp the seminars because that is not what we like. It is a bad thing. We can account so many teachers attending, but nothing gained and it is a waste of resources, time and labor. When we went to Nyeri, they were doing double shifting and it felt like we were being used. In SMASE, some people are not scot free. (Interview with M&S teachers in B secondary school, Feb 15, 2013)

Pushing the change from the ministry to teachers (top-down approach) was not so effective to alter the attitude and recognition of teachers. The strategy of enforcing teachers' attendance made teachers more de-motivated and ask more financial rewards. During the field study in January and February 2013, teachers were still complaining that they are enforced to attend the INSET without out-of-pocket allowance and certificate valuable for promotion. Some of them even felt 'punished' because the other subject teachers were not required to attend any INSET. They argued that if attending INSET was not voluntary-based, then there had to be some incentives to motivate participants. This was also shown in the section of comments in the questionnaire survey for regional trainers and secondary teachers the researcher conducted during the field study as in the box below. Likewise, repeated complaints about financial or promotional incentives made teachers more de-motivated and this made the SMASE project difficult to be sustained and develop with teachers' support.

Complaints about No Daily Allowance

- Participants during INSETs require motivation from the government of Kenya with a form of out-of-pocket allowances.
- Regional trainers require more allowances per day.
- No monetary value, promotion, certificates are given. Hence participants are being de-motivated.
- Teachers are not treated like officers. No respect, no out of pocket.
- Out of pocket will motivate teachers like in other ministries' training.
- Teachers should be given fare, lunch and some motivation for SMASE to continue.

Complaints about No Certificate for Promotion

- If SMASE is to be taken seriously by teachers, the training should lead to certification with weight. A certificate that can be recognized like diploma in pedagogies etc. that can enable teachers be promoted to higher job groups.
- What teachers are given as certificates are just certificates of attendance which has no value.
- It will be motivating enough if the SMASE certificate is recognized by TSC for promotion purpose.
- Certificate given should add value to participants.

(Source: The result of the questionnaire to regional trainers and M&S teachers in secondary and primary schools conducted in Feb, 2013)

4.4 Financial Aspect

Establishment of the financial basis was a concern from the beginning of the project. The SMASE project could be more sustainable because financial basis was established. There are two financial strategies to make the SMASE INSET system sustainable. First, the project budget was shared by Kenya and Japan and the financial contribution ratio of Kenya became higher. In addition, since the project budget was included in the national budget framework, the project is considered one of the Kenyan

MOE's programs which can be sustained after JICA's support is finished. Second, the district INSET budget has been collected from school fees under the name of "SMASE Fund". Since there is a fund raising mechanism to be sustained, if only the collection rate was maintained, the district INSET can be sustainably available.

- Cost Sharing of Kenya

According to the Plan of Operation of SMASE Phase 3 (2008), the size of the project is 2,741,819,100 Kenya Shilling (Ksh) (equivalent of 3,225,669 USD) during the period of Phase 3 (2008-2013). 80% of the total budget was estimated to be covered by Kenya (36% by MOE, 44% by District Planning Committee (DPC)), and remaining 20% covered by JICA.

One of distinguished features of SMASE project is "beneficiary-payment principle" for self-help efforts of a partner country. It means that Kenya also needs to contribute to the project financially to some extent. For this reason, the necessity of budgetary measures by the Kenyan government was repeatedly addressed.

Therefore, when R/D (Record of Discussion) was signed in 1998, it was clearly stated that the Government of Kenya (GOK) will take necessary measures to ensure self-reliant operation of the project during and after the period of Japanese technical cooperation. "Measures to be taken by Kenya" (Inputs from Kenya) in R/D includes 1) services of the Kenyan counterparts personnel and administrative personnel, 2) land, buildings and facilities, and 3) running expenses for the implementation of the project.

In many cases, the financial commitment of a partner country is extremely

difficult to obtain for political and administrative reasons. In this project, however, the commitment of the Kenya was gradually brought about as the project proceeded. Table 4-8 below shows the enlarging commitment of budget from Kenyan side. The budget allocated to Kenya increased from 43.6% in Phase 1 to 76% in Phase 2 and even to 89% in Mid-term of Phase 3. By putting a higher proportion of the budget for the project, stakeholders started to think that it is their own project.

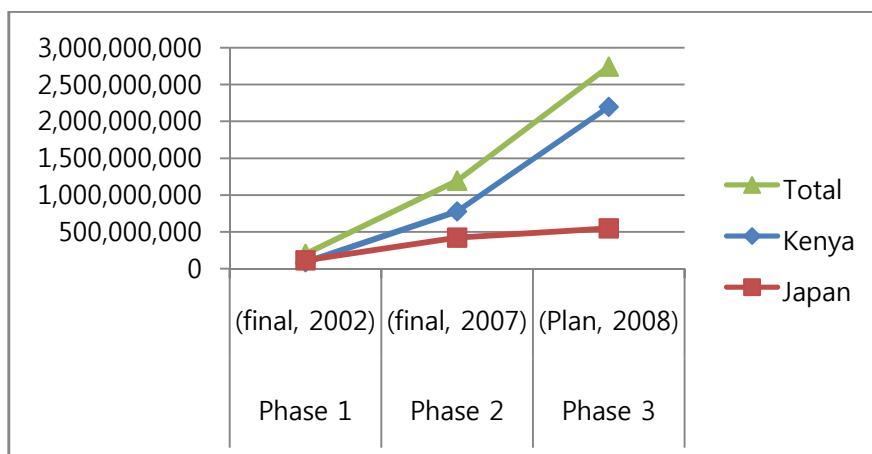
Table 4-8 Budget Expenditure of Kenyan and Japanese Sides

(Unit: Ksh)

	Phase 1 (final, 2002)	Phase 2 (final, 2007)	Phase 3 (Plan, 2008)	Phase 3 (Mid-term, 2011)
Kenya	86,912,494	776,068,590	2,196,370,000	1,223,621,836
Japan	112,161,977	418,694,374	545,449,100	151,096,219
Total	199,074,471	1,194,762,964	2,741,819,100	1,374,718,055
% of Kenya	43.6%	76%	80%	89%

Source: Final Evaluation Report of Phase 1 (2002), Final Evaluation Report of Phase 2 (2007), Plan of Operation of Phase 3 (2008), Mid-term Evaluation Report of Phase 3 (2011)

Figure 4-4 Budget Expenditure of Kenyan and Japanese Sides



Since the start of Phase 3 (2008), SMASE-Secondary cost has been fully covered by Kenya, and SMASE-Primary is also expected to be financially independent from JICA’s support from 2014. On the other hand, though there has been a suggestion to use a part of Free Primary Education Fund, the funding mechanism at primary level is not yet secured like secondary level. So, after the support from the JICA stops, there is a high possibility that it is needed to reduce the size of participants or the layers of INSETs.

During the project formulation study held in 1995, it was assumed that Kenya had a low capacity to bear the standing costs for the project. Most of the national budget allocated to education sector was used for teachers’ salaries, and the majority of other expenses were being covered by parents and communities through the spirit of “Harambee (which means “work together” in Swahili). The study team expected that although getting a budget for the national INSET might be possible, but a budget for district INSET seemed difficult to expect. Then, where did this budget come from?

There are two main funding sources; one is from the MOE at the national level and the other is from District Education Offices at the district level (SMASE Fund).

At the national level, in spite of the government's poor ability to collect taxes and fund the standing expenses, the government searched existing financial resources which could be used for the project. The Government of Kenya decided to utilize "2nd Kennedy Round (2KR) C/P Fund" and "Non-Project Grant Aid"²². Using the Non-Project Grant Aid, the national government established 108 District INSET Centers (DICs) and developed the basic facilities of the DICs (200,000 Ksh (about USD 2,630) per center). This enabled the proactive development of the project on a national scale.

In addition, the national budgetary measures for the SMASE project were specified in the Kenya Education Sector Support Program (KESSP) (2005-2010). KESSP is a five-year Sector Wide Approach (SWAp)²³ program developed by the Government of Kenya and several development partners. KESSP comprises 23 investment programs focusing on identified priorities in education sector. The implementation of the education sector support program was designed to be in line with the Medium Term expenditure Framework (MTEF) and annual budget cycle. It is intended to 'operationalize' the budget for prioritized programs through KESSP. SMASE-secondary and primary was included among 23 KESSP investment programs (5. In-Service Primary Teacher Education, 18. In-Service of Teachers at Secondary in

²² Basket Fund formed by various bilateral and multilateral donors

²³ A SWAP is a process of engaging all stakeholders in order to attain national ownership, alignment of objectives, harmonization of procedures, approaches and a coherent financing arrangement. In addition, a SWAP process involves broad stakeholder consultations in designing a coherent and rationalized sector program at micro and macro levels and the establishment of strong co-ordination mechanisms among donors and between donors and the Government. (GOK, 2005)

Mathematics and Science). Being included in KESSP, the SMASE project budget could be used more harmonized with other education budgets within a national budget framework. By being included in a national budget framework, the budget from both sides (Kenya and Japan) became more stable and sustainable.

- SMASE Fund

At the district level, SMASE Fund was established to secure budget for implementing district INSET. SMASE Fund is a part (less than 10%) of Development Fund which is a fund reserved from a part of the school fees²⁴ that the school collects from students or parents. It can be used for the operation of the school at the discretion of the Principal. It means that SMASE Fund is originally from students and parents and is collected with the agreement of principals. That is, district INSETs are funded and operated with the support of schools, principals and parents.

The funding method of using a part of Development Fund was addressed from the 1st Stakeholder Meeting in April 1999. The meeting adopted a participatory method and each group made proposals on the budgetary measures to implement district INSETs. The idea of collecting the training expenses from the Development Fund was proposed by participants and received unanimous support (JICA, 2007 a).

The collection rate of SMASE Fund increased as the training continued. The average rate of the 9 pilot districts in Phase 1 increased from 40.1% in 2000 to 72.7% in 2002 (JICA, 2002). It is assumed that this growth in the collection rate is because of

²⁴ Annual school fees for the secondary schools are 22,000 Ksh for the provincial boarding schools and 14,000 Ksh for the district day schools as of 2006. Among school fees, 2,000 Ksh is collected per student a year, and less than 10% of them, 70-150 Ksh is used for SMASE Fund.

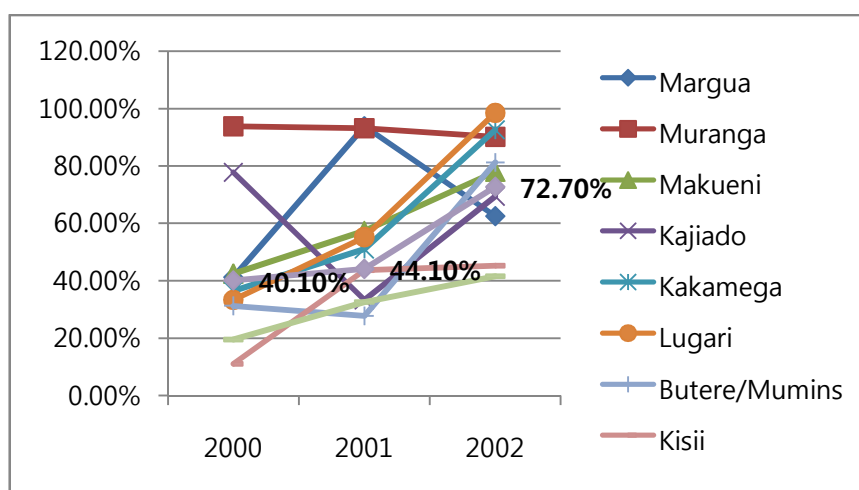
principals' and parents' better recognition of the significance of the INSET.

Table 4-9 Collection Rate of SMASE Fund in 9 Pilot Districts (2000-2002)

	2000	2001	2002
Margua	41.20%	93.80%	62.50%
Muranga	93.80%	93.10%	90.10%
Makueni	42.50%	57.40%	78.00%
Kajiado	77.70%	33.30%	69.40%
Kakamega	36.40%	51.00%	92.60%
Lugari	33.30%	55.20%	98.50%
Butere/Mumins	31.30%	27.80%	81.20%
Kisii	11.00%	43.60%	45.20%
Gucha	19.50%	32.60%	41.60%
Total	40.10%	44.10%	72.70%

Source: JICA (2002)

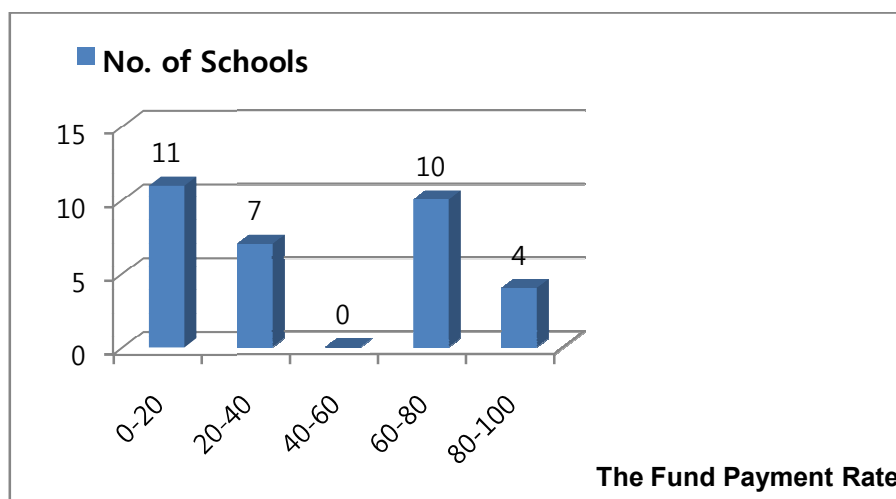
Figure 4-5 Collection Rate of SMASE Fund in 9 Pilot Districts (2000-2002)



Source: JICA (2002)

Nevertheless, there is a discrepancy in the collection rate of the SMASE Fund between schools and no district succeeded in collecting 100% of the Fund. For instance, in Baringo District, there are large differences in the collection rates of the Fund between schools. The total collection rate for the 32 schools was 45%, but one school paid 100% of the money and 11 schools paid none. For securing the SMASE Fund and sustaining the district INSET system, it is fundamental for principals and parents to accept the significance of teacher training and to support through a form of SMASE Fund.

Figure 4-6 Baringo District SMASE Fund Submission by Schools (2005)



Source: JICA (2007 a)

The management of SMASE fund has become an issue which was frequently raised in monitoring and evaluation reports of the project. Some districts did not avail financial records, and the available records indicated discrepancies in budgeting. The

misusage of SMASE Fund was pointed out several times and there was even a strike of KUPPET (Kenya Union of Post-Primary Education Teachers) not to participate in INSET demanding an audit on SMASE Fund in April 2011 (JICA Mid-Term Review Study Team, 2011). Therefore, the needs of regular auditing of SMASE accounts were raised to address issues on prudent management of the fund. As an implementing body of the project at the district level, it seems that the DPC still lacks transparency, accountability and moral which is the basis for ownership.

CHAPTER 5. DISCUSSION:

Ownership and Localization Factors affecting Sustainability of SMASE INSET System

In the previous chapter, the technical (content and human resources), financial and institutional bases and measures to establish SMASE as a sustainable national INSET system were examined. In the literature review, the old problems of technical cooperation (TC) and two emerging issues related to the sustainability of TC (ownership and localization of knowledge) were examined. Based on this review, this chapter will examine the ownership and localization of knowledge initiatives and limitations in terms of the sustainability of the SMASE INSET system.

5.1 Ownership in SMASE

The project shows several ownership initiatives and limitations that affect sustainability of the SMASE INSET system. Considering the definition of ownership “the idea that societies and persons assume the responsibilities for their own development”, ownership was ensured at the high level (national government) but it was not promoted at the lower level (end-beneficiaries) in the SMASE project. In this section, the ownership issues will be examined divided into three categories: 1) Ownership of the Government, 2) Ownership of End-beneficiaries, and 3) Japan’s ODA strategy:

enhancing self-help efforts and indirect assistance.

5.1.1 Ownership of the Government

Ownership of the Government of Kenya (GOK) on the process of the SMASE project can be broadly classified into 5 categories: 1) Joint project formulation, 2) Cost sharing, 3) GOK's political support, 4) Integrating the project into existing structure and system of the GOK, and 5) Enhancement of Ownership through SS cooperation. These factors contributed to enhancing the ownership of the GOK, which ensured that the government decided to sustain the project after the JICA's technical cooperation.

a. Joint Project Formulation based on GOK's request and ownership

Joint project formulation based on Kenya's request could have enhanced the ownership of the project by the GOK and led to more recipient-driven nature of TC. Since the SMASE project was an outcome of joint effort made by the GOK and GOJ, the project could reflect the objectives and needs of the partner country. And the foundation for equal partnership between two countries could be established.

The SMASE project started in response to the strong needs which were shared by teachers, parents, and government officials (Interview with a Kenyan consultant at

JICA Kenya Office Kibe²⁵, JICA, 2007 a). Before the project was launched, there was already a request from Kenya Secondary School Heads Association to the Ministry of Education (MOE) concerning whether In-service training for teachers could be held for each subject at the cluster level. At that time, some schools in Nairobi were already operating the INSET using the cluster approach responding to pressure from the parents. A proposal was sent to MOE for expansion of INSET to broader area.

This necessity of INSET was found during the project formulation studies which were held jointly by GOK and GOJ from 1995 to 1998. The first and second project formulation study in 1995 and 1996 aimed at understanding the capacities that Kenya should achieve and which capacities should be strengthened most. The 3rd study developed strategic scenario and the 4th and 5th study engaged in patient negotiations concerning the implementation system and method in order to develop a sustainable INSET system. By creating the implementation mechanism which ensures sustainability, the project was recognized by the GOK that it is not a short-term intervention by outsiders but a sustainable system the government should take responsibility to continue even after the technical cooperation period. The studies were carried out using participatory method to nurture Kenyan ownership of the project. The participatory approach was adopted to raise awareness of the GOK that it is a central player of the project.

The project proposal was written by personnel from the GOK. According to the interview with one of Kenyan C/Ps (national trainers) of the SMASE project, a government official wrote the proposal under the guidance of Japanese experts. The idea

²⁵ In-house consultant at JICA Kenya Office, former Secretary-General of Kenya Secondary School Heads Association

of the SMASE project was based on this proposal and the project was initiated by the Kenyan Ministry of Education. The project proposal written and submitted by the GOK made the government have higher responsibility and commitment to the project. This initiative of GOK eventually led to the higher sustainability of the SMASE project.

b. Cost Sharing

Sharing of the project cost with the partner country can enhance its self-help efforts and ownership of the project. In the project, it is assumed that accepting the entire burden by the donor discourages self-help efforts and has an ultimately negative impact on sustainable development. “When providing aid, rather than accepting the entire burden itself, Japan assumes that the developing country needs to make self-help efforts, including payment of the necessary local cost portion or land allowances, and that each project will be implemented as a joint enterprise” (Ministry of Foreign Affairs 1991). Therefore, the obligation of the partner country to bear such local costs is a principle of Japanese aid. According to this “beneficiary-payment principle” for self-help efforts, Kenya had to pay the project cost to some extent.

In order to promote strong commitment, from the beginning of the project, the GOK was requested to share some cost of the project. As a result, the cost sharing was clearly mentioned in the Record of Discussion (R/D) of the project. In the R/D, it is stated that the Government of Kenya (GOK) will take necessary measures to ensure self-reliant operation of the project during and after the period of Japanese technical cooperation (TC). The lists of inputs from Kenya is also included, e.g. project related

personnel cost, land, buildings and facilities, and recurrent costs such as expenses for the implementation of the project.

Moreover, as the project proceeded, the commitment of the Kenya was gradually increased. In Phase 1, 43.6% of budget was covered by Kenya, but it increased to 76% in Phase 2 and even 89% in the mid-term of Phase 3. By putting a higher proportion of the budget for the project, stakeholders started to think that it is their own project. It is different from the usual way of thinking technical cooperation projects as free gifts from donors on which the partner country does not have much responsibility. During an Opening Ceremony of National INSET in February 2013, a speaker from MOE proudly said that SMASE could change from “a project (funded by the development partner)” to “a program (fully covered by the GOK)”²⁶.

At the district level, District Education Offices were also required to bear part of the project cost for implementing district INSETs. In the 1st Stakeholder Meeting in 1999, a funding mechanism of using a part of school fees (SMASE Fund) were raised and unanimously adopted by stakeholders through participatory approach. It means that district INSETs are operated by the financial support from schools, principals and parents and the project is partly owned by these beneficiaries. With cost sharing scheme, District Education Offices (DEOs) and District Planning Committees (DPCs) could take responsibility to offer good quality district INSET services because they implemented the project using money from their own citizens. Once cost was shared by the beneficiary groups as well as by the local government, their ownership of the project was strengthened as they had their own investment in the project.

²⁶ The meaning of “project” and “program” is according to the terms of Kenyan personnel.

To summarize, through a cost sharing mechanism in accordance with the capacity of Kenya, the ownership and cost consciousness of the Kenyan government and district offices was enhanced. Moreover, when Kenya shoulders some cost of the project, it is expected that the project becomes more sustainable since the country can cover the cost even after the donor participation ends. By increasing the financial contribution ratio of the budget, the sustainability was more enhanced.

Nevertheless, the cost sharing strategy of the SMASE project had some limitations to some extent. Above all, though the ultimate goal of the cost sharing is establishing fade-out mechanism, this goal was not attained at this moment. SMASE-secondary unit has been financially independently operated by the Kenyan government. But as the coverage of the project was expanded to primary education in Phase 3, it seems hard for the GOK to handle the cost for the SMASE-primary unit. Though the government shows strong will to continue both SMASE-secondary and primary after the support from JICA fades out in 2014, it might not be possible to sustain the size of participants or the layers of INSETs (National-Regional-Cluster INSETs) at the primary level.

Even though the GOK shared the project cost, this cost also comes from budgetary support from other bilateral or multilateral donors (Counterpart Fund of the 2nd Kennedy Round and Non-Project Grant Aid). These funds are considered the same with the national budget which could be used by the government's needs and decision. But, the intention of cost sharing to make the partner country to accept financial burden and to have self-help efforts and ownership could be undermined.

The management of SMASE Fund has become a problem as well. The

collection rate of the fund increased during the Phase 1. However, as the project expanded to national scale, the average collection rate has not been steady and increasing. Moreover, there is a discrepancy in the collection of the SMASE Fund between schools and districts. The necessity of getting continuous support from schools, principals and parents are essential to secure SMASE Fund. Another concern with the SMASE Fund is the possibility of misusage. Considering that there was even a strike of teachers demanding an audit of the fund, it seems that the DPC lacks transparency, accountability and moral which is the basis for ownership.

c. Political Support from the GOK

Political support can be understood as the active way of express the ownership and responsibility of the government. The SMASE project could be extended to Phase 2 and 3 because there was political support from the government of Kenya. The political support can be largely divided into two ways; 1) announcement of supporting or advocating policies and 2) stipulating the SMASE project in national policies and budget framework. If the project is supported or included in the national polices, the ownership of the partner country can be enhanced.

There are many policies advocating the SMASE INSET such as Vision 2030, Sessional Paper No. 1 of 2005 on Policy Framework for Education, Training and Research from the 2005 White Paper (MOE, 2005), Master Plan on Education and Training (MPET) etc. Vision 2030 states that more resources will be devoted to scientific research, technical capabilities of the workforce, and in raising the quality of

teaching mathematics, science, and technology in schools, polytechnics, and universities. In Sessional Paper No. 1 of 2005, on Policy Framework observes that secondary mathematics and science education is characterized by poor performance in national examinations due to teacher shortages and inadequacies. The paper states that the current situation calls for an urgent development of a comprehensive INSET program to empower teachers to deliver the changes that have been made in the existing school curricula. The SMASE project was specified for the improvement of the teaching ability of in-service M&S teachers. Importance of INSET is also stressed in Master Plan on Education and Training (MPET) (1997-2010). MPET identified that it is essential to update teachers' pedagogical skills and content knowledge through regular and continuous INSET. The commitment of GOK towards INSET is also contained in the Government Action Plan for the Poverty Reduction Strategy Paper (PRSP) as part of Human Resource Development. In Economic Recovery Strategy (ERS), the GOK states its commitment to conducting INSET annually.

The engagement of SMASE in national education policy and budget program show high political support to the project. The budgetary measures for the project were specified in the Kenya Education Sector Support Program (KESSP) (2005-2010). SMASE-primary and secondary is also included in 23 investment programs of the KESSP. Since the KESSP was designed along with the Medium Term expenditure Framework (MTEF) and annual budget cycle of the Government, the SMASE project budget could be executed within the overall framework of the GOK. With this, the government's budget on the project became more stable and sustainable.

d. Integrating the project into existing structure and system

According to UNDP (2002a), an old type of technical cooperation is frequently criticized for fragmenting management by formulating Project Implementation Units (PIUs) independent from existing local organization and system. In many cases, since weak recipient management structures impede progress towards project goals, donors often circumvent existing management structures. However, the establishment of PIUs composed of capable staff with high pay tends to bypass existing administrative systems in implementing projects and causes disincentives in the staff of other government organizations. As a result, it is not likely to contribute to the strengthening of the existing total local capacity. This can undermine the capacity and ownership of the institutions the project meant to reinforce.

On the other hand, in the SMASE project, instead of creating new employment or agencies for project implementation, existing education administrative structures and personnel were utilized for operating and managing the project. For example, the CEMASTEAs were established under the auspices of the MOE and used human resources of teaching forces registered in TSC (Teacher Service Commission)²⁷. Another example is District Planning Committee (DPC). The DPCs, the management body of district, regional and cluster level INSET are under the control of District Education Offices and their members are composed of District Quality Assurance Standard Officers (D-QASOs), Teacher Advisory Center (TAC) Tutors, and principals of schools designated

²⁷ The TSC is in charge of teacher registration, management, payment, promotion and pension matters. Public primary, secondary teachers and Teacher Training College tutors are all registered under the TSC.

as District INSET Center etc. The other example is that the SMASE-primary was constructed based on the existing primary cluster INSET system made by DfID's School-based Teacher Development (SbTD) project. Instead of breaking or overlapping the existing system, the SMASE project was integrated into the existing cluster INSET system and utilized the TAC (Teacher Advisory Center) tutors as DPC members.

Utilizing the existing structure and personnel helped smooth implementation of the project, and made SMASE at the district level naturally absorbed into the national and district education system. According to the interview with a national trainer at the CEMASTEIA, using the existing structure and personnel increased the compatibility of the SMASE project along with Kenyan education management structure and secure political and administrative support from the government.

Anything new will always experience challenges. But, if I may explain the compatibility of SMASE INSET, it deals with the system in the administrative structures of managing education from the national down to the schools. We used existing structures to manage SMASE INSET. We simply did not create new ones but played along (the existing structures). So when we talk of compatibility, SMASE INSET was compatible with the existing structures. At the national level, we have the Ministry of Education which played the role as a centre for INSET. (At the district level), the DEO (District Education Officer) and the QASO (Quality Assurance Standard Officer) have always been there. So according to me, it was compatible because we did not have to create new things. (Interview with a national trainer S, Feb 7, 2013)

By utilizing existing institutions, the project could consolidate the institutional foundation within the existing administrative structure. It is a policy of JICA that PIUs should not be created and the project should not be administratively separated from the existing institutions. Working with existing public institutions could provide them with an enabling environment to strengthen their foundations by putting the project into action, which is likely to enhance public institutions' ownership and therefore sustainability of the project.

e. Enhancement of Ownership through SS cooperation

The SMASE project has two main components, which are Kenya and SMASE-WECSA (Western, Eastern, Central and Southern Africa) components. The WECSA component was initiated in 2003 to address the common challenges faced in mathematics and science education through INSET system building. Now there are 34 member countries in the SMASE-WECSA Association.

Kenya is a pivotal country in the triangular cooperation among Japan, Kenya and WECSA member countries. As a leading developing country in the region, the country has shared its development experience and knowledge with other developing countries through regional workshops, Third Country Training Program (TCTP)²⁸, and

²⁸ TCTP provides sensitization activities directed at senior education officials of member countries. Over 700 trainers of ASEI-PDSI have been prepared for 27 member countries.

Third Country Expert Services (TCE)²⁹. Specifically, Kenya has raised awareness of member countries to realize the significance of INSET and student-centered teaching methods (ASEI-PDSI) in M&S education, as well as supporting the establishment of INSET system in the countries by dispatching CEMASTEAs staffs.

The role of the CEMASTEAs and SMASE project was recognized by ADEA (Association for Development of Education in Africa), AU (Africa Union), and NEPAD (New Partnership for Africa's Development). The CEMASTEAs is expected to be a resource center for mathematics and science education and a secretariat for professional development of in-service teacher in Africa (Oyaya, 2011). Project activities inside and outside of Kenya gave opportunities to establish the presence of Kenya in the international arena. The support for South-South cooperation can boost national pride, which helped to strengthen ownership of Kenyan Ministry of Education on the project.

Another outcome of SMASE-WECSA activities was that Kenyan national trainers recognized the significance of ownership by the partner country in order to bring sustainability of the project. These regional activities became an opportunity for Japanese and Kenyan staffs share the stance that Kenyan experiences will be introduced but the establishment of the system will be left to partner country's own people.

Implementation of the training by the Malawians will nurture their ownership of the project. Without ownership, one cannot expect sustainability. The key points here are to secure the financial and to train the necessary personnel.

(Interview with a national trainer M, JICA, 2007a)

²⁹ CEMASTEAs Staff are sent to member countries and provide technical assistance to them in support to develop INSET curricula, training materials and to conduct training.

This understanding came from a failure when 4 Kenyan National Trainers were dispatched to Malawi for the first time to technically support INSET. These 4 Kenyan C/Ps did everything including creating teaching materials, implementing the training, analyzing the results and reporting them. Though they came back to Kenya in triumph, they soon realized that they should adhere to their role as assistants to ensure Malawi's ownership and bring about capacity development of counterpart personnel in Malawi and make the INSET more sustainable (Interview with JICA Experts H, JICA, 2007a). By becoming a donor's position, Kenyan C/Ps realized the importance of ownership of partner country for the sustainability of the project.

To summarize, the south-south cooperation has enhanced national pride and ownership, and instilled a strong sense of achievement and success to Kenya and the CEMASTEIA. The ability to share knowledge and experience and to serve as a model to neighboring countries also contributed to increase Kenya's confidence and sustainability of the project. In addition, by playing a role of donor in the WECSA countries, Kenya realized the significance of ownership by the recipient country to make the INSET system more sustainable.

5.1.2 Ownership of Beneficiaries

Beneficiaries of the SMASE project are various reaching from the government officials to Kenyan students. However, the most important beneficiaries in the projects are SMASE INSET trainees (mathematics and science teachers). So, in this section, the

scope of beneficiaries will be restricted to teachers and their ownership will be analyzed under two categories: 1) Reflecting local needs through participatory approach, 2) De-motivated teachers.

a. Reflecting local needs through participatory approach

For the sustainability of the project, it is important to make sure that the project reflects beneficiaries' needs. One major approach taken by JICA is reflecting local needs through participatory approach. This approach can enhance the ownership of the beneficiaries on the project. Singh (2002) also insisted that ownership is the acceptance of responsibility through the processes of stakeholders' participation, empowerment and consensus. Participatory approach can make it possible to reflect beneficiaries' views and needs on the project and thus promote their commitment, which may diminish the level of the donor-driven nature of the TC projects.

Training contents reflect the level of local needs that is important to sustainability. In this regard, Japanese experts and Kenyan C/Ps (national trainers) conducted a needs survey from September to November 1998 using participatory approach to grab the needs of Kenyan teachers and develop INSET contents based on these needs. Questionnaires, interviews, and observations of the lessons were conducted to acquire data on the local situation and needs of teachers. During the needs survey, the survey team asked the teachers what they would like to be done and incorporated that in the training content, hence making the teachers feel their ideas and opinions had been reflected in the project and they had made a contribution. In fact, teachers were asked

which topics teachers and students feel difficulty to teach and learn during the needs survey and these topics were developed as training contents. The CEMASTEAM conducted the first needs survey in 1998 and has done it continuously in every 5 years so that training contents are redeveloped based on updated needs of teachers and students.

In developing the INSET contents, this participatory approach was also taken. Teachers were invited to participate in developing the training materials together with Kenyan C/Ps and Japanese experts. Through this process, not only the relevance of the contents to the real needs of Kenyan teachers, but also their sense of ownership on the contents was enhanced.

To make the content to be acceptable even after we have made and written the papers, we made the teachers feel that they are the ones who had written that paper. So some of the information that we have may have missed, we made them add. If they would list all the contents that they really need to learn and they missed some, we add them from our own experience. So it was a collective (work). (Source: Interview with a former national trainer M, Jan 18, 2013)

Since the decision related to developing training contents were made under the initiative of Kenyan C/Ps (national trainers) and teachers, and the contents were developed reflecting the ideas and opinions of Kenyan teachers through the mechanism of a needs survey, the researcher could find strong ownership of trainers and teachers

on the INSET contents and the SMASE project.

We can say it (developing a SMASE INSET contents) was a combined effort. But when it comes to content, it was our effort because we wrote most of the information that we put down as a curriculum. (...) PDSI, it's a Japanese thing. Plan Do and See. So when they talked about it, we added I (Improvement). So that it becomes ours. (Source: Interview with a former national trainer M, Jan 18, 2013)

This collective work among national trainers, Kenyan teachers and Japanese experts based on the participatory approach increased the relevance of the training contents to the needs of Kenyan teachers. In addition, the approach made teachers think that the training contents are developed by them and have ownership on the contents and the project. Beneficiaries' ownership enhanced through participatory approach positively affected the sustainability of the project.

b. Limited participation: De-motivated teachers

Singh (2002) emphasized fruitful balance of owners. In many cases of technical cooperation, ownership is restricted to a formal endorsement by the national government which does not always speak for all their people. The most important stakeholder of the project is teachers who are trained at the end of the cascade model. However, it seems that their ownership was least developed among various stakeholders.

Even though the participatory approach was taken to integrate teachers into the project (e.g. participating in a needs survey or INSET contents development), teachers' voluntary participation is fairly restricted. The lack of participation, empowerment and consensus of participant teachers led to low motivation, discontent and resistance, which became a serious impeding factor of the project sustainability these days.

When the researcher visited some secondary schools and conducted questionnaire and oral interviews, she was very surprised at the skeptical views of the teachers on the SMASE project. The first comment from an interviewed teacher was *"Though the project's intention is great, its implementation is a problem"*. Through the questionnaire, some aggressive comments were given by the teachers as follows: *"Let SMASE not be used to intimidate teachers. If teachers do not attend, they will be sacked"*, *"SMASE should be abolished. It is making teachers be de-motivated and it is a waste of time"*.

There are several reasons for teachers' discontent and de-motivation which led to low responsibility and ownership. The fundamental reason is that teachers' participation is not based on their spontaneity but it was enforced by the national government. The compulsory character of SMASE INSET is specified in the Minutes of the Stakeholders' Meeting (SMASE, 2002) organized by the national INSET Center attended by related personnel from the various districts. However, the number of teachers who participated in the Stakeholders' Meeting was restricted and these participants could not represent all teachers' opinion on the compulsoriness of the SMASE INSET.

If the participation was based on teachers' voluntary decision and agreement on

the condition of no daily allowance and no certificate for promotion, there would not be resistant action (such as not attending the training) by the teachers who think they are forced to participate without any financial incentives. Since the compulsory attendance was required to teachers regardless of their opinion, their motivation towards the SMASE INSET was deteriorated and they could not have any responsibility and ownership on the project. Though the enforcement of participation of teachers contributed to the establishment of a national INSET system throughout the country in a short time, in-service teacher training program without teachers' responsibility and active participation cannot be sustained and developed.

The participation of teachers in the project is quite limited and is not self-initiated. The participation opportunity is usually initiated by CEMASTEAs, when teachers' opinions and ideas are needed for INSET contents development or INSET monitoring and evaluation. Because of the cascade system in the SMASE project, the contents were made at the national level (CEMASTEAs national trainers) or at the district level (district trainers or PTTC tutors). The participant teachers at the lowest level of INSET can contribute to enriching training contents by sharing their ideas and experiences during the training sessions. However, their main role is usually restricted to INSET attendance.

Of course, there are some exceptional cases of active participation and contribution of teachers to the INSET such as Muragua District where teachers organized the district teachers' association for each subject and held study meetings. Another example is Moi Girls Secondary School in Isinya. According to the interview with a former national trainer, the school picked up the rationale of the SMASE INSET

quickly and made teachers motivated using equipment provided by the CEMASTEAM. Because all these actions were initiated by teachers on their own willingness, they could feel satisfied to participate in the INSET and develop to be independent from the national support. Therefore, it could be understood that teachers' voluntary participation and responsibility is very important to make them feel ownership and make them contribute to sustainable INSET.

When we started the project, they (Moi Girls Secondary School Isinya) picked up the rationale quickly to own the whole thing of ASEI-PDSI, while others were waiting for direction. They picked up right now and they are completely independent. They don't even bother with the National Ministry of Education to seek support. Teachers still go there for the SMASE project, and they are voluntary and happy. While others had shut down, they started. Because they realized teachers needed something motivating. So they said let us use the equipment that the SMASE has given us. They also generate funds so that we can keep the teachers coming and so that when they come for ten days (training), they don't feel like 'what have I done?'. Most of the teachers who were there are still in the school. While others failed to change without transfer of the spirit of SMASE, they have sustained the spirit. (Interview with a former national trainer M, Jan 18, 2013)

Another problem is that participants' opinions were not immediately reflected to the improvement of the project. There are some devices to gather the opinions of

participants such as feedback session, open forum, pre- and post INSET questionnaire, and session evaluation sheet. When the researcher conducted participatory observation of the national INSET held at the CEMASTEPA, participants freely spoke out their complaints and suggestions during the open forum. However, their opinions have not been immediately reaching to the top level of decision making body and the same arguments have been repeated again every year. So, most of them were dissatisfied with the situation that their voices were ignored. If the national INSET faced this challenge, it is evident that the situation at lower levels of INSET was more serious. Due to the centralized features of the project, significant change or reform should be approved by the ministry and should be reflected to the revision of the PDM and the Plan of Operation. But this process needs time and patience. So, some participants strongly suggest that MOE personnel should attend the INSET and gather and reflect the opinions directly to the ministry.

Furthermore, as Riberio (2002) criticized, top-down cascade approach reinforced existing political elites rather than empowering bottom level beneficiaries. In the SMASE project, the access to power and authority of participants at the lowest level of INSET is limited and only the power of administrative structure at the national and local government is strengthened. Participants at the lowest level do not have power and rights to change the situation, which led to dissatisfaction and resistance. So, this top-down model has limitation to ensure ownership at the bottom level. Though Japan's approach to use cascade approach and to utilize existing structures and personnel could contribute to rapid and efficient diffusion and establishment of nation-wide INSET system, it failed to empower bottom level teachers and made them have more ownership

and responsibility on their capacity development. If teachers are de-motivated and unsatisfied without responsibility and ownership, the project cannot be sustained for a long time.

5.1.3 Japan's ODA strategy: enhancing self-help efforts and indirect assistance

The self-help effort as it is understood in the context of Japanese aid is the commitment of the people to their country's economic development or the government's commitment endorsed by their people's resolution (Kohama 2000). The basic policy of Japan's ODA lies in respecting partner countries' ownership, relying on their own development strategies to support self-help efforts and promoting sustainable development. The idea of self-help efforts is visibly highlighted in the ODA Charter of 2003, which clearly states: The most important philosophy of Japan's ODA is to support the self-help efforts of developing countries based on good governance.

If we look at the history of Japan's education ODA, the emphasis repeatedly appeared on respecting local ownership, pride and having modest attitude toward partner countries. This careful approach may partly have been the result of the bitter experience Japan had when it forced people in its colonies to learn Japanese language and culture. And it is also from the reflection of their own experience after the 2nd World War when Japan's education was under the control of the Civil Information and Education (CIE) in the United State's General Headquarter (GHQ) (Saito, 2009).

Supporting the self-help efforts of developing countries is widely recognized as

one of the primary principles of Japanese aid, and this approach was reflected in Japan's strategy to cooperate with Kenya and Japanese experts' attitude in the SMASE project. During the project period, 3-4 Japanese experts (Chief Advisor, Academic Advisor, Evaluation Expert, and Project Coordinator) were dispatched for long-term placement. They took their position as an indirect supporter and emphasized the independent operation of the project by the Kenyan C/Ps. According to the interview with one of 8 Kenyan C/Ps at the initial stage, she said that the Japanese staff stepped back and waited until Kenya took an action.

They (JICA) learned (from their experience in the Philippines) that if we (Kenya) don't take the leadership, it (the project) is going to fail. So when they came here, they stepped back, completely back and let us push us to do it. They said we will give you all the support. (Interview with a former national trainer M, Jan 18, 2013)

The former Chief Advisor Sugiyama adhered to his position as a joint operator with the Kenyan C/Ps in order to support self-initiated efforts made by the partner country. This attitude was derived from his belief that only with efforts by Kenyans will it be possible to gain substantial benefits which can contribute to Kenya's future (JICA, 2007a).

The Japanese experts are neither to be ignored nor to take the initiative. The role of Japanese experts is comparable to a "kuroko" (literally 'a black child')

in Japanese) who supports a theatrical play from behind the scenes, without whom the play cannot proceed. The experts should always work together with the C/Ps who try to find solutions as they go. (Interview with the former Chief Advisor S, JICA, 2007a)

He also emphasized in terms of developing the INSET contents, that the experts should try producing teaching materials together with the Kenyan C/Ps instead of trying to produce perfect materials by themselves (JICA, 2007a).

They (Japanese experts) talk about something and then they leave us (Kenyan C/Ps) to see what we can do (for content development). So they brought on board open approach. And then when we shared it (INSET contents) with the teachers, they (Japanese experts) liked it. So we'd like the fact that they stepped back. I think that it is why it (SMASE) succeeded in Kenya. (Interview with a former national trainer M, Feb 22, 2013)

Japanese experts did not come forward to speed up the process but maintained a flexible attitude considering the possibility of postponement. Japan learned lessons from the experience of the Philippines (where it tried to implement similar teacher training project) that the project will not succeed unless the partner country take initiative. Likewise, Japan's strategy of enhancing self-help efforts of the partner country and indirect assistance by Japanese experts made a room for Kenyans to take initiatives and contributed to nurturing their ownership.

5.2 Localization of Knowledge in SMASE

The localization of knowledge factors positively and negatively affected the sustainability of the SMASE INSET system. SMASE INSET contents were developed localizing foreign knowledge and utilizing local knowledge on the basis of local needs. However, in spite of this effort, SMASE-trained teachers still feel difficulty to apply the knowledge acquired by the project to the classroom practices. In this section, the localization of knowledge initiatives and limitations of the SMASE project will be examined under four categories: 1) Local knowledge initiative, 2) Localization of foreign knowledge, and 3) Difficulty of using “localized” knowledge, WHY? and 4) Japan’s ODA strategy related to knowledge.

5.2.1 Localization of Foreign Knowledge

The SMASE training contents were mostly developed utilizing local knowledge. However, the direction of the training was introduced and induced by the foreign knowledge from Japan and knowledge gained through South-South cooperation with the Philippines. This broad concept derived from outside was localized by Kenyans to be reborn as the training contents in the SMASE project.

a. Localization of knowledge from Japan

In the old model of technical cooperation, the dominance of pushing knowledge from aid donors to recipients as development answers was severely criticized. To overcome this challenge, Stiglitz (1999) emphasized the significance of localizing foreign knowledge, leaving a famous saying “Scan globally and reinvent locally”.

If knowledge is not locally reinvented and is felt unfamiliar to local people, it cannot be sustained long in the partner country. Then the short-term boost from the TC project will go back to the original status after the end of the project. More seriously, if the knowledge is not aligned with local values or cultures, it will harm targeting local community or organization, which will hamper sustainable development of the country. Then the sustainability of the project and its impact cannot be guaranteed.

So, in the SMASE project, from the very initial stage, the persons concerned agree that new idea and initiative from Japan is necessary but they need to be screened and localized to fit local context and needs. When 8 Kenyan C/Ps were recruited in 1998, they were sent to Japan to take three-month training. They observed what Japan was doing in in-service teacher training for lesson improvement. They were given guide and source of developing INSET contents through training in Japan and they picked up “what could work in Kenya”. And they localized the concept to make it more appropriate to Kenyan context.

We (Kenyan C/Ps) developed the SMASE INSET program. But after going to Japan to see what and how they do it. We looked at it and saw what could work here and what couldn't. So when we were putting together the program,

we had all these, what we had learnt and what is possible. (Interview with a former national trainer M, Jan 18, 2013)

In other words, the idea of lesson improvements towards student-centeredness (equivalent to ASEI) through lesson study (equivalent to PDSI) was introduced by the training in Japan. However, this idea was localized and the final product “ASEI-PDSI” approach was developed by Kenyan C/Ps considering the context of Kenya and the needs of Kenyan teachers. Not by transferring knowledge from Japan but only by providing knowledge from Japan as reference to develop localized materials, the SMASE INSET contents could be developed more appropriate to Kenyan context therefore more sustainable.

b. Localization of Knowledge through SS Cooperation

South-South (SS) cooperation can serve as a useful mechanism to stimulate appropriate knowledge for the partner country. SS cooperation is an approach that enables knowledge already acquired by a developing country to be further extended to other countries with financial support from donors. In this process, the executing agency is expected to further internalize knowledge they acquired by sharing it to other developing countries. Recipient countries can have opportunities to generate new knowledge by learning knowledge acquired by a country that has similar social and cultural environments to them (International Development Center of Japan, 2003b).

In the SMASE project, there have been two forms of South-South cooperation:

1) Kenya as a recipient country (Japan-the Philippines-Kenya) and 2) Kenya as a pivotal country (Japan-Kenya-SMASE-WECSA member countries). JICA implemented Science and Mathematics Education Manpower Development Project in the Philippines (SMEMDP) project from 1994 to 1999. The lessons of this project were reflected in a similar project in Kenya (SMASE).

Kenyan C/Ps visited University of Philippines – National Institute for Science and Mathematics Education (UP-NISMED) for training and consulting under auspices of JICA. The Philippines' know-how and knowledge acquired through the SMEMDP project was shared to Kenyan C/Ps. Since the knowledge was already localized to fit into the situation in the Philippines which shares similar problems and concerns with Kenya, it was easier for Kenya to accept the idea and reconstruct the knowledge according to its own context. In this way, SS cooperation had a positive effect on localization of knowledge.

Since 2003, Kenya established SMASE-WECSA Association and started triangular cooperation with member countries. These African countries share similar problems such as low academic performance in mathematics and science or teacher-centered approach. However, how to approach and introduce the SMASE-style INSET system were designed all differently in each country. For example, Rwanda, Uganda, Malawi and Nigeria were willing to accept the cascade model in their INSET system, but Zambia chose school-based approach. Before the project starts, the problem analysis is always conducted and what and how to address the problem is decided based on each country's needs, policy and system. Though the basic concept of ASEI lesson improvement through PDSI is the same, the specific contents and approach are localized.

To sum up, the emphasis on the localization of knowledge has contributed to the sustainable INSET system building not only in Kenya but also in other African countries.

5.2.2 Local Knowledge Initiative

During the process of developing INSET contents, local needs and knowledge was emphasized. First, local needs on knowledge acquisition were identified by the partner country. Second, the training contents were developed utilizing local knowledge. According to UNDP (2009), people are best empowered to realize their full potential when the means of development (such as knowledge) are sustainable – home-grown, long-term, and generated and managed collectively by those who stand to benefit. In this sense, local knowledge initiative contributed to the sustainability of the project. However, some participant teachers criticized that the training contents are too much cliché and nothing can be gained through the INSET.

a. Identification of local needs by the partner country

Technical cooperation has been frequently criticized because of not facing the local conditions and bringing development solutions regardless of local needs (Jha, et al., 2004). However, without clear understanding of local needs, TC projects may lead to a lack of local commitment, which may have negative effects on project sustainability. Therefore, local needs identification has to be considered as important as the subsequent

process of INSET contents development and INSET implementation (International Development Center of Japan, 2003). It is also important that the local needs have to be identified by the partner country. It is because the needs and problems of the partner country can be identified and given appropriate solutions most correctly by the partner country itself.

In the SMASE project, a needs survey was conducted by Kenyan C/Ps (national trainers) together with Japanese experts in 1998. During the survey, it was observed that chalk and talk methods and theoretical way of teaching was being used in mathematics and science lessons. This teacher-centered pedagogy has had negative impact on the attitude and performance of students on mathematics and science. The Kenyan C/Ps concluded that the local needs which need to be urgently addressed were to change teaching and learning attitude and process. So, the ASEI-PDSI approach was developed to make teachers to move towards student-centered teaching methods. In this way, the local needs were clearly understood through the needs survey and they were reflected in developing the training contents. In addition, needs surveys have been conducted every 5 year to update the contents based on the local needs.

Because the training contents were developed based on clear understanding of the local needs identified by Kenyan C/Ps, they could be supported by local people and the sustainability of the project could be enhanced.

b. Utilizing Local Knowledge

The development community recognized that transferring “best practices”

chosen by the donors with little or no consideration of local knowledge or context seemed effective at the initial stage, but it made neither real institutional change nor sustainable capacity development (Ellerman, 2004). For several decades, it has been generally assumed that developing countries lack knowledge and outsiders can fill the gap with knowledge transfer. Donors with this dangerous arrogance failed to pay attention to the significance of local knowledge which have been developed and used for a long time in the partner country (Hovland, 2003; Jha, et al., 2004). That is why it is better to identify and develop knowledge embedded inside rather than to bring knowledge from outside (Seo, 2012).

In the SMASE project, the INSET contents developed utilizing local knowledge by Kenyan C/Ps together with Kenyan teachers. Japanese experts also gave general guides and comments on the contents, but the initiative of developing INSET curriculum and materials was at the hand of Kenyans. According to a national trainer, the training contents were mainly from Kenya and generated by CEMASTEAs staffs.

The content of training is mainly coming from Kenya because we consider, we look at the syllabus and also some of the content we research from the internet or other resources so that we can address the different issues. Those are types of things we came up with papers to facilitate (training materials). And the Japanese also give inputs in some of the areas based on our content to make it better. (...) The content was generated by staff here, staff from this institution (CEMASTEAs). Yes, they sat and thought of a learning point,

something that people can be using for classroom practice. (Interview with a national trainer A, Feb 1, 2013)

The INSET contents were constructed on the basis of syllabus and textbooks used in Kenyan primary and secondary schools. The contents followed needs, objectives and goals of syllabus and curriculum of different subjects. Since the contents are aligned with Kenyan syllabus and textbooks, what teachers learn during the SMASE INSET can be directly applied to their lessons. For example, when science teachers learn how to construct ASEI lessons on circulatory system in the INSET, they discussed activities or experiment which can be done during the lesson. And they prepare lesson plans and practice ASEI lessons through actualization in school. If they go back to their schools, they can exercise the activities learned from the INSET in their regular lessons.

We follow the syllabus and the curriculum. We followed the content of the syllabus and needs that are being addressed by the curriculum. The curriculum also has got goals and objectives that are to be achieved in different subject. We followed these goals and objectives (when developing training contents). (Interview with a national trainer A, Feb 1, 2013)

People might think that the unfamiliar acronym ASEI-PDSI might be transferred from Japan to Kenya. However, ASEI-PDSI was developed by Kenyan C/Ps as a result of a needs survey in 1998. Though the terminology seems new, the concepts³⁰

³⁰ The basic concept of ASEI is student-centered teaching methods and that of PDSI is lesson

are what most Kenyan teachers already learned in college. They know the importance of student-centered approach but they are not just implementing them. Student-centered approach is even stipulated in the goal and objectives of national curriculum and syllabus.

It (ASEI-PDSI) is everywhere because each of the components is in line with service in the college when they are students. They all know the importance of learning activities, improvisation and also experiment. How to involve student develop their skills, planning, doing and assessing are important. They knew the importance but they were not implementing. They know that they are supposed to do that but for many excuse they are not doing that. (...)
The concept of student centeredness even exists in the goal and objective of each subject. If you read that syllabus, it is in that direction and that is why it was fitting well with Kenyan teachers and it was implemented. (Interview with a Japanese expert U, Feb 5, 2013)

In fact, most of the knowledge given during the SMASE INSET is taught in college or university. In the questionnaire conducted by the researcher during the field study, 27 regional trainers out of 29 answered that they learned the importance of learner-centered approach during the pre-service training course. So, the role of the SMASE INSET is not to transfer new advanced teaching methods to Kenyan teachers but to bring out and revitalize what they already learned but they were not implementing

planning and improvements.

due to several excuses.

In fact, ASEI-PDSI is not new and it's nearly the same with what we (PTTC tutors) teach our (pre-service) teachers. We usually teach different approaches that we use in learning e.g. learner centered approach. Thus, the SMASE training contents are almost the same with what we teach in college. The difference is the names. We have only introduced these new words (initials). But the teachers have the concept. They have just ignored it. (Interview with a PTTC tutor A, Feb 6, 2013)

Teachers have different views on learning the student-centered approach that they already knew. Some teachers expressed gratitude to remind them what they can do for lesson improvement. One interviewee said the SMASE INSET was a “reminder”. On the other hand, other teachers argued that repeating what they already learned in college is a “waste of money”. They said because committed and enthusiastic teachers are already using the student-centered method without a further training on it, the SMASE project should be removed and the money should be spent for other purposes.

(Grateful Reminder)

I cannot say that there was something very new I learnt. But the first INSET I attended was so excited because it was kind of... I had forgotten what I had learnt in college and the first one I attended was about improvisation in the lab where there is not enough apparatus. You know those days you could not

think of cutting a plastic container and using it as a beaker. You could only wait for the principal buy a beaker so that you can go to the lab and do the experiment. To me, I can say that it reminded me of something I can do and also for some hands-on activities. There are some that would not work, but surprisingly when it is done, it works and the learners get excited to do it. To me it was beneficial, it was a reminder. (Interview with M&S teachers in R secondary school, Feb 13, 2013)

(Waste of Money)

SMASE INSET should be completely removed. All the best teaching methods are taught in colleges or universities. All committed teachers use them. SMASE INSETs do not add any value to the teachers. It is a waste of money that could be channeled to other way of development of education in the country. (The comment from the questionnaire to M&S teachers in secondary schools, Feb 2013)

In the SMASE project, instead of filling knowledge gap approach, bringing out and sharing local knowledge approach was taken. The goal of the project is not transferring knowledge unit from No. 1 to 10 which is usually the case in module style training. The project aims to bringing out and sharing their knowledge and experience by asking questions and by encouraging them to participate in group discussions and presentations. The interviewed Japanese expert said, the participants themselves and their knowledge and experience is the real contents of the training. It is considered that

teachers already have good ideas and experience for the local ground. This is totally opposite to the idea of knowledge gap or Southern deficit of knowledge. Since the INSET trainers do not transfer certain set of knowledge, they are preferred to be called “facilitators” rather than “teachers” or “trainers”. Their role is to facilitate pumping up participants’ knowledge and ideas to the ground and making them search better ways of teaching and learning. The participatory approach facilitated the use of local knowledge by bring up every participants’ prior knowledge.

Knowledge in SMASE is mostly from Kenyan curriculum, syllabus, textbooks, the ideas and experiences of Kenyan trainers or teachers. The goal of the project is to bring out the local knowledge Kenyan teachers already has rather than to inject Japanese know-how. By utilizing the local knowledge, participants could become more confident and empowered and the project could be more sustainable.

5.2.3 Difficulty of using localized knowledge, WHY?

As examined in the precious sections, knowledge from Japan and SS cooperation was screened and localized by Kenyan C/Ps. And ASEI-PDSI was developed based on the needs survey by Kenyan C/Ps and teachers. The contents were mainly from Kenyan curriculum and syllabus and were constructed during the trainings by bringing out and sharing participants’ knowledge. However, the ASEI-PDSI approach is not much implemented in everyday classroom situation, though the SMASE INSET has been conducted more than 10 years (Matachi, 2011). Only 28% of the lessons were classified as tending towards learner-centered approach (CEMASTE, 2013).

The practical reasons why the ASEI-PDSI approach was not practiced in classrooms were already examined in the previous chapter. Most frequently raised reasons were as follows: 1) large class, 2) lack of resources, 3) broad syllabus (pressure of covering all in syllabus), 4) emphasis on exam results, 5) lack of time to prepare lessons, and 6) teachers' low motivation. However, in fact, these limitations were all predicted at the initial stages of the project and ASEI-PDSI was designed considering them and supplementary measures were also suggested to participant teachers.

For example, large class problem can be resolved by team learning (group works) or team teaching. For instance, large class of 80 can be split into 8 groups of 10, and group leaders are chosen. The leaders report what their groups have discussed and teachers can harmonize the reports from all groups. Team teaching is recommended by PDSI approach and it can be also a solution to large class. 2-3 teachers are in a team and they teach a class cooperatively. When it comes to lack of materials, "improvisation" in ASEI is suggested to address this challenge. Improvisation means using locally available materials instead of a full set of experiment equipments. Teachers can use alternative materials in case there is no funding for buying equipment. Moreover, now the Kenyan MOE is supporting schools to buy instructional materials through SIMBA (School Instructional Material Bank Account) system³¹. This is the account made by the government to provide schools with money for purchasing teaching and learning aids. So, if using SIMBA, teaching materials can be supplied (though the reality might be different from the policy).

³¹ SIMBA system has nothing to do with SMASE project. But the system could support the project indirectly at the school level in terms of supporting provision of instructional materials.

It (Lack of resources) is quite challenge but the government is doing something it is providing funds in what we call SIMBA (school instructional material bank account) account for buying instructional materials. SMASE demands use of many instruction materials. The gap which was there is filled by the government providing schools with money. (Interview with a regional trainer E, Feb 5, 2013)

As to the challenge of broad syllabus and emphasis on exam results, it can be addressed when teachers change their mind to teach every detail in textbooks using chalk and talk way of teaching. The problem is that teachers consider text books or national examination collection the same as syllabus. Teachers think they have to mention everything in the textbooks or previous exams. But if they go back to the real syllabus and reconstruct what students need to learn for conceptualization rather than memorization, teachers can cover more in a short time and integrate more activities. The results came out gradually but doing activities led to improvement in exam results.

When we went to the ground, we found out that they usually used the text books and the national examination collection. So when they are talking about the syllabus, it's the text books. The main problem with the examination is that they ask memory type of question and SMASE emphasizes on conceptualization hence, there is a barrier. (Interview with a former national trainer M, Feb 22, 2013)

I: Does heavy syllabus and emphasis on exam results make teachers hard to practice ASEI?

B: Not really. We have some who have successfully applied it even in colleges (though the college has broader syllabus than secondary schools). Mathematics was doing very weak 7-10 years ago. But it is now leading in terms of performance. Even in primary schools there has been great improvement in math and science as a result of pupils doing activities. So we feel that ASEI-PDSI is working and the pace is improving. It is moving from A to B to C gradually. (Interview with a regional trainer B, Feb 5, 2013)

The amount of time used for preparing and conducting ASEI lessons cannot be a problem once teachers prepare lesson plans and are accustomed to use them in implementing lessons. Preparing ASEI lessons takes time and efforts but it could enhance the implementation of lessons, which will lead to satisfaction of both teachers and students.

The amount of time available is not the problem. They are supposed to take time and plan. It may take time to plan but the implementation would be much easier. If you take the easy way out, you will find out that at the end of it won't benefit both the students and teacher. (Interview with a former national trainer M, Feb 22, 2013)

However, these supplementary measures are not available in many schools due

to poor conditions, conservative views on teaching and overemphasis on exam results than the real meaning of learning. These challenges can be overcome if teachers' motivation to change their way of teaching is strong. The problem is that there has not been any inducement to make them motivated to practice ASEI-PDSI lessons. Likewise, there are various practical reasons why ASEI-PDSI cannot be practiced in the classroom even though there are supplementary measures suggested.

Furthermore, these challenges derive from limits to localization of knowledge. Though the knowledge from Japan was localized through the process of a needs survey, content development by Kenyan C/Ps and teachers, ASEI-PDSI approach is still hard to be absorbed in Kenyan teaching and learning process. One regional trainer criticized the assumption of the project that a child in Japan is the same as a child in Kenya. Even though teachers use ASEI approach in the lesson, students are hard to accept a new concept of lesson which is different from what they know and have interacted with in the class before. It was anticipated that it must be hard to change attitude and recognition of teachers and learners because the chalk and talk style lessons are so prevalent and deep-rooted in Kenya.

I think initially the deciders of the project they must have reasoned that a child in Japan is the same as a child in Kenya and so they assumed that what worked in Japan will also work in Kenya or anywhere else and that's why they thought it is possible to align SMASE knowledge and Kenyan context. And ideally it is true. But if you are thinking about making a child learn, then it does not matter who this child is but where this child is born what he starts

interacting with in the environment is what makes the difference. The examples and the methods that teachers are using is not compatible with what students know and have interacted with before. It was possible to some extent that the local knowledge could align itself with SMASE content but there was also need to consider and remove whatever was not compatible. (Interview with a regional trainer W & K, Feb 4, 2013)

In many cases, the usefulness of the ASEI-PDSI approach is well recognized by teachers but the approach is not considered implementable in the poor conditions and circumstances of local schools. One interviewed regional trainer compare the ASEI-PDSI approach to “meat”. People know that meat is good for their health, but it is hard to eat because they are struggling to get daily basic needs. That means the ASEI-PDSI is a luxurious thing for Kenyan teachers to enjoy because they suffer from other fundamental problems (such as poor facility and equipment in school, low treatment to teachers, or teachers’ low level of understanding subject content matters). The interviewees said that the ASEI-PDSI approach is like recommending eating “meat” in the situation where there is even no “bread”.

K: We went to a college where there is a lot of poverty and people are struggling even to get a daily basic needs. And you are telling them I am going to train you how to eat meat which is quite expensive and you even give them samples of meat to taste and tell them how to eat the meat and that it is good for their health. It is useful that they know meat is good for their body.

But are they going to be eating the meat simply because you have told them it's good? So, in terms of the usefulness of the ASEI-PDSI approach, it is very useful those ideas are useful but are they implementable?

W: Actually when they (teachers) come for regional training, they tell us that those things are really good but the circumstances they are operating it cannot allow them to apply. The usefulness of ASEI-PDSI can be said to be around 60% and in the real classroom they may not be able to implement much of it.

(Interview with a regional trainer W & K, Feb 4, 2013)

Another reason was raised from the lack of compatibility or harmonization with the existing knowledge used by local institutions. In Kenya, among various formats of lesson plan, the one developed by KIE (Kenya Institute of Education)³² is most frequently used. The lesson plan which is used in the SMASE project is different from KIE's lesson plan. To establish SMASE as a national INSET system, it was needed to harmonize these two formats and make it more convenient to use. However, this process of harmonization was not there and made teachers confused. Since KIE lesson plan format has been given more weight, the SMASE format could not be used much in practice. This discrepancy in lesson plan format is one example that shows the lack of cooperation among the CEMASTEAs and KIE, TSC and other stakeholder institutions. Considering the establishment of a sustainable INSET system, the knowledge which was not compatible and harmonized with that of local institution,

³² KIE is a national institute under the Ministry of Education. It is in charge of developing national curriculum in primary and secondary education.

which has strongly influenced beneficiaries for a long time, hampered the acceptability and sustainability.

We have KIE lesson planning and we also have ASEI-PDSI lesson planning. The two formats differ and that's what brings in the difficulty and hence unless you inject one approach into the other. It becomes difficult, so most teachers need to be taught on how to inject the ASEI-PDSI approach into the KIE approach, but still it's not yet been endorsed or approved. So the teaching practice in schools, they plan using KIE approach, is it true. (Interview with a regional trainer B, Feb 5, 2013)

That's the truth because the major components of both the ASEI-PDSI and KIE approach on lesson planning are the same, but there are other details not in KIE but they are in SMASE. (...) ASEI-PDSI lesson plan is not examinable. And when the students are taken through methodology, schemes of work and lesson plan, they use the KIE. So that gives KIE more weight than what we are doing here (Interview with a regional trainer E, Feb 5, 2013)

I was talking of a clear policy guideline from the ministry of education that there should be harmonization of schemes of work and lesson plan from KIE and SMASE. If these have mandated to be a full training then whatever they come out with, they should harmonize with what was there and come up with a way forward. Harmonization has not been done over the years though the

teachers have been suggesting since there has been challenges. (Interview with a regional trainer B, Feb 5, 2013)

To sum up, there are practical reasons why teachers cannot apply ASEI-PDSI approach in the classroom even though the supplementary measures are suggested to them. This challenge might derive from the limits to localization of knowledge. One limitation is that teachers are recommended to practice too luxurious things in the situation where basic needs are not satisfied. Another thing is that the training contents are not compatible with existing knowledge of other stakeholder institutions due to the lack of cooperation with them. As a result, this low application of training contents made the effect of the project less tangible, therefore, has been impeding the sustainability of the project.

5.2.4 Japan's ODA Strategy: Use of Japanese experience but with culturally careful approach

There are two notable features of education ODA in relation with knowledge. Japan has emphasized its own development experience/knowledge and tried to apply it to TC projects. However, at the same time, the country has been very careful to touch knowledge in education sector, in particular, basic education sector, because it is culturally sensitive and closely related with national identity or sovereignty (Sawamura, 2002). Even today, Japan mainly supports science and mathematics education that is believed to be culturally neutral.

This explains why Japan was reluctant in providing aid to basic education and preferring vocational education before the early 1990s, and why Japan stressed primarily the ‘hardware’ aspect of assistance (construction of school facilities, supply of equipment etc.) rather than the ‘software’ aspect (Carr-Hill & King, 1992). However, with the global trend of focusing basic education, Japan reexamined the direction of education ODA and started technical cooperation projects in two areas: 1) Mathematics and science lesson improvement through INSET, 2) School management improvement through community participation and strengthening district education administration (Saito et al., 2009).

The SMASE project was the second project focusing on M&S lesson improvement through INSET following a similar project in the Philippines. Following the SMASE as the flagship, around 50 M&S INSET projects were conducted in various developing countries. The reason why Japan has focused on M&S education is that Japan has comparative advantage in this sector and M&S subjects are culturally neutral compared to other subjects (Hara, 2009).

‘Systemizing Project Experiences of Mathematics and Science Education Cooperation’ (JICA, 2007b) explains that there are two comparative advantages Japan has in M&S education. First, in Japan, through the medium of “lesson study” especially in M&S education, teachers have bridged the gap between the national curriculum and classroom lessons, and brought about changes in teaching by adding practical improvements. Japan thought this know-how can be shared with developing countries. Second, Japan has an experience of introducing Western ways of thinking which are quite different from its traditional ones. But Japan made use of them successfully for its

development. Japan thought that this experience can help partner countries to adapt and internalize external knowledge more effectively.

Hara and JICA's research shows that Japan has confidence in M&S education and tries to apply its education model to developing countries based on Japan's own experiences and comparative advantage. But they also emphasize that this effort has to be implemented in accordance with partner countries' demand and initiative. For the purpose of self-reliance and sustainable development, it is important to design develop education cooperation projects not for transferring knowledge, but for encouraging endogenous capacity development at the level of individuals, schools, and the government. The SMASE project is taken as an example of realizing these ideas successfully.

Since Japan has committed to supporting mathematics and science INSET projects in a similar approach (See figure 5-1), the researcher's first assumption was that there is a module based on Japan's experience and knowledge and this module has been transferred to all partner countries. It is true that the bigger approach and the common focus (M&S lesson improvement through INSET) was the same. However, the specific approaches were all different to each partner country to make the knowledge more locally adaptable and sustainable.

The purpose of the SMASE project was said not transferring Japanese knowledge to Kenya. The specific intervention which was considered most appropriate for Kenyan context was designed with Kenya's initiative. Dispatched Japanese experts kept their position as indirect supporter which is comparable to a "Kuroko" (who supports a theatrical play from behind the scenes). The process of needs survey or

training content development was carried out jointly by two countries took longer than the time needed when Japanese experts worked by themselves. But this joint work was considered necessary for the Kenyan side to reach their own decisions in order to ensure localization of the knowledge in the project. Such a waiting stance and open approach gave Kenyan people time and opportunity to develop their own materials, know-how and knowledge which can contribute to the establishment of a sustainable INSET system.

Figure 5-1 Japan's Technical Cooperation Projects in M&S INSET³³

Nation	Title of the project	94'	95'	96'	97'	98'	99'	00'	01'	02'	03'	04'	05'	06'	07'	08'	09'	10'	11'	12'	13'	14'
Indonesia	Expanding Prim, Sec M&S Edu																					
Indonesia	Strengthening Sec M&S Teacher Training																					
Indonesia	Comprehensive Plan for Improving Sec Edu																					
Indonesia	Improving the Quality of Sec Edu																					
The Philippines	Improving Prim, Sec M&S Edu Package Cooperation																					
The Philippines	Strengthening Prim, Sec M&S Teacher Training																					
Vietnam	Improving M&S Teacher Training																					
Laos	M&S Teacher Training																					
Cambodia	Improving M&S Edu 1																					
Cambodia	Supporting Sec M&S Textbook Selection																					
Cambodia	Improving M&S Edu 2																					
Myanmar	Research for Basic Edu Improvement																					
Myanmar	Strengthening Children-centered Edu																					
Bangladesh	Strengthening Prim M&S Edu																					
Mongol	Improving Teaching Methods for Supporting Children's Development																					
PNG	Improving Lesson Plan using TV Broadcasting																					
Afghanistan	Strengthening Teacher Education 1																					
Afghanistan	Strengthening Teacher Education 2																					
Egypt	Improving Prim M&S Lessons																					
Egypt	Improving Prim M&S Edu																					
Honduras	PROMETAM1 (Improving Math Teaching Capacity)																					
Honduras	PROMETAM2																					
Guatemala	Improving Math Teaching Capacity																					
Dominican Republic	Improving Math Teaching Capacity																					
Nicaragua	Improving Prim Math Teaching Capacity																					
El Salvador	Improving Prim Math Teaching Capacity																					
Colombia	Strengthening M&S Teacher Education System																					
Chile	Improving Math Edu																					
Kenya	SMASSE1																					
Kenya	SMASSE2																					
Kenya	SMASSE3																					
Uganda	Strengthening Sec M&S Edu1																					
Zambia	Strengthening Sec M&S Edu2																					
Zambia	Supporting SMASTE Lesson Study1																					
Nigeria	Supporting SMASTE Lesson Study2																					
Malawi	Sec M&S In-service Teachers Retraining1																					
Malawi	Sec M&S In-service Teachers Retraining2																					
Mozambique	Strengthening Prim Edu																					
Niger	Strengthening Sec M&S Edu																					
Senegal	Improving M&S Edu																					
Burkina Faso	Improving Prim M&S INSET																					
Rwanda	Strengthening Sec M&S Edu																					
Ghana	Improving Prim, Sec M&S Edu																					
Ghana	Supporting INSET Policy Implementation																					
South Africa	Sec M&S In-service Teachers Retraining1																					
South Africa	Sec M&S In-service Teachers Retraining2																					

Source: JICA (2007b)

³³ Prim: primary, Sec: Secondary, M&S: mathematics and science, Edu: education

5.3 Implication to Korea's Education ODA

This section is especially added to provide Korean readers with implications of the SMASE project to Korea's education ODA. Since the SMASE project is a representative software-oriented project in Japan's education ODA, it can provide some lessons to Korea which recently started to increase software-oriented education ODA projects.

Most of the software-oriented education ODA projects implemented by Korea do not overcome donor-driven and gap-filling approach and still focus on knowledge transfer. In planning and implementing ODA projects, the control and decision making process is managed by dispatched Korean experts rather than local personnel in the partner countries. It seems that self-reliant efforts and endogenous capacity development of the partner country are rhetorically emphasized, but they are not really practiced in implementing the projects. In addition, rather than focusing on local needs and starting at this point, development modules have been developed on the basis of Korea's development experience and comparative advantage. These modules are transferred to developing countries through the form of short-term training or consulting. On this process, localizing Korean knowledge or using local knowledge from the partner country hardly happened. ODA projects were usually framed in 1-3 year period even though education sector needs long-term engagement to make tangible outcomes. Sustainability of the project after the exit of donor's technical and financial support was not considered important.

Overcoming these limitations of Korea's education ODA and increasing the sustainability of the ODA projects, the author suggests five implications from the

SMASE project. These implications derive not only from the successful outcomes from the SMASE project but also from its failures. First, during the whole project period, various stakeholders in the partner country need to be involved and have power to make decision in operationalizing the project. With the “indirect” support from Korean experts, these stakeholders need to take the initiative of project formulation, implementation, monitoring and evaluation, therefore, have ownership of the projects. The important thing is that not only government officials or high-level positions in partner institutions but also end-beneficiaries such as teachers in the SMASE project need to have rights to controlling the project. Only participation cannot empower the beneficiaries, but providing them with power to make change can encourage them to have ownership.

Second, cost sharing or establishing a sustainable financing mechanism are good measures to make the partner country have more accountability on the project and make the project more sustainable. If a donor country provides 100% of the project budget and stops funding after the project period, the possibility of the partner country to sustain the project is very low. If the proportion of the partner country becomes higher as the project goes on and eventually 100% of the project budget is covered by the partner government or institution, the project could be owned by them in a real sense and sustained without external financial support. One option for the partner government to gradually increase the proportion of the project budget is to make a sustainable financing mechanism such as the “SMASE Fund”.

Third, when developing knowledge in education ODA projects, it is very important to start with the local knowledge and to localize foreign knowledge. If foreign experts are dispatched to the partner country and transfer their knowledge through

training or consultation without localizing the knowledge from their countries, this knowledge cannot be absorbed and utilized in the local context. Knowledge in education ODA projects need to be developed by education experts and teachers from the partner country in order to make sure that it is appropriate and can be practicably utilized on the local ground.

Fourth, South-South cooperation can be an effective aid modality to enhance ownership and localization of knowledge as in the case of the SMASE project. If a partner country plays a leading role by sharing their experience of implementing the project and localized knowledge with surrounding countries, the country can have more ownership on the project and produce more localized knowledge in the process of South-South cooperation.

Lastly, especially in the software-oriented education ODA projects, dispatched foreign experts need to become indirect supporters of local initiatives with culturally careful intervention. In most of the Korea's ODA project, it is required to show tangible outcomes in a limited time (sometimes in less than six months). It makes Korean project officers and experts to come forward and speed up the process. The process of jointly conducting needs survey, developing contents, monitoring and evaluation takes longer time than the time needed when Korean experts work by themselves. But the joint work can make the partner country to reach their own decision and develop their locally adaptable contents. The waiting stance and open approach named as the attitude of "kuroko" is necessary in Korea's education ODA.

CHAPTER 6. CONCLUSION

This study aims at critically analyzing the factors which positively and negatively affected the sustainability of the SMASE (Strengthening Mathematics and Science Education) INSET (In-service teacher training) system in Kenya. To find out how they are related to establishing the sustainability of the SMASE INSET system, the study examined content, human resources, financial and institutional aspects of the SMASE INSET system. The Study also analyzed various factors which contributed and hindered sustainability of the SMASE INSET from the perspective of ownership and localization of knowledge.

Most previous studies on the SMASE project focus on its impact on students' participation in lessons, their academic achievement or teachers' teaching methods. But there is no research which analyzes focusing on sustainability and its contributing and impeding factors in terms of ownership and localization of knowledge. Therefore, this study will help understanding the project from this new perspective.

This study adopted qualitative research approach to focus on the complex process of establishing the SMASE INSET system. The researcher used four kinds of data collection: 1) interviews, 2) participant observation, 3) document analysis and 4) questionnaire. The collected data was analyzed under the four categories of bases which contributed or hindered the sustainability of the SMASE INSET system (content, human resources, institutional and financial bases). These findings were interpreted from the perspective of ownership and localization of knowledge using analytical frameworks designed by the researcher based on literature review.

In Chapter 4, four bases of establishing a sustainable SMASE INSET system was examined. The findings of the study indicates that the SMASE INSET system has been established because there were training curriculum and contents developed by the effort of Kenyan trainers and teachers on the basis of teachers' needs and Kenyan education context. However, what teachers learned during the INSET (ASEI-PDSI approach) was not actively utilized by teachers in the classroom.

In terms of human resources, there are three main factors which have contributed to sustainability of the SMASE INSET system. First, the CEMASTEIA (Center for Mathematics, Science and Technology Education in Africa) served as a center for teacher capacity development in mathematics and science education. Second, there are relatively well-functioning management structures from national to district level. Third, there are trained human resources such as INSET trainers and administrative personnel working for the project. In particular, utilizing Kenyan personnel within existing administrative structure helped smooth implementation of the project. However, the lack of capacity of trainers and administrative personnel at the district and cluster level has hampered the sustainability of the SMASE INSET system.

For the SMASE project to reach all secondary mathematics and science teachers in all districts in the country there were two institutional frameworks: 1) cascade model from national to district and cluster, 2) enforcement of the training to all secondary mathematics and science teachers. These institutional frameworks have contributed to the fast, broad diffusion and establishment of the INSET system. However, top-down approach and compulsoriness which failed to bring out teachers' support and nurture their responsibility have threatened the sustainability of the project.

The SMASE project could be more sustainable because financial basis was established. There are two financial strategies to make the SMASE INSET system sustainable. First, the project budget was shared by Kenya and Japan and the financial contribution ratio of Kenya became higher. Second, a sustainable fund raising mechanism for district INSETs was established under the name of “SMASE Fund”. Nevertheless, there is a discrepancy in the collection rate of the SMASE Fund between schools and no district succeeded in collecting 100% of the Fund. In addition, the management of SMASE fund has become an issue which was frequently raised.

In Chapter 5, the factors contributing and impeding the sustainability of the SMASE INSET system was analyzed in relation with ownership and localization of knowledge. The project shows several ownership initiatives and limitations that affect sustainability of the SMASE INSET system. Ownership was ensured at the high level (national government) but it was not promoted at the lower level (end-beneficiaries) in the SMASE project. Ownership of the Kenyan Government (GOK) was enhanced by joint project formulation, cost sharing strategy, GOK’s political support, integrating the project into existing structure and system of the GOK, and South-South cooperation with SMASE-WECSA member countries.

In terms of nurturing ownership of the most important beneficiaries which are teachers, their needs were reflected through participatory approach during needs surveys and INSET contents development. However, their participation, empowerment, consensus was quite limited under the condition of the cascade model (top-down model). The enforcement of participation by the Government made teachers de-motivated. Unless teachers consider their role as the agent of change and take ownership of the

project, the project cannot be sustained successfully.

The localization of knowledge factors also positively and negatively affected the sustainability of the SMASE INSET system. The direction of the training was introduced and induced by the foreign knowledge from Japan and knowledge gained through South-South cooperation with the Philippines. However, this broad concept derived from outside was localized by Kenyans to be reborn as the training contents in the SMASE project. Localization of foreign knowledge contributed to making the training contents more compatible with the condition of the partner country therefore more sustainable and friendly to local people. During the process of developing INSET contents, local needs on knowledge acquisition were identified by the partner country and the training contents were developed utilizing local knowledge.

In spite of this effort, however, SMASE-trained teachers still feel difficulty to apply the knowledge acquired by the project to the classroom practices. Though it was considered that knowledge was localized enough to be absorbed in the local context, it was still struggling with surrounding circumstances which hinders the actualization of the knowledge. This challenge derives from the limits to localization of knowledge. One limitation is that teachers are recommended to practice advanced teaching methods which are inadequate in the situation where even basic needs are not satisfied. Another thing is that the training contents are not compatible with existing knowledge of other stakeholder institutions due to the lack of cooperative institutional network with them. As a result, this low application of training contents made the effect of the project less tangible, therefore, has been impeding the sustainability of the project.

Considering Japan's ODA strategy related to ownership and localization of

knowledge, enhancing self-help efforts of the partner country and indirect assistance by Japanese experts made a room for Kenyans to take initiatives and contributed to nurturing their ownership. In addition, waiting stance and open approach gave Kenyan people time and opportunity to develop their own materials, know-how and knowledge which can contribute to the establishment of a sustainable INSET system.

The study showed that the establishment of the sustainable INSET system was considered in various ways in the SMASE project. However, the project could not consider the importance of the ownership of teachers as the main stakeholders and the necessity of motivating teachers to empower themselves and take responsibility to change classroom practices on their own. Another missing piece is that the project was too much focused on the lesson improvement assuming that other basic challenges can be overcome by teachers' attitude. However, the surrounding circumstances were making teachers hard to be innovative and proactive. Only training teachers cannot lead to teachers' capacity development and lesson improvement. There needs to be comprehensive approach to make teachers more motivated to change their teaching methods.

Considering the limitations and suggestions, several further studies can be suggested. First, further study is needed on the specific situations of rural areas, in particular, ASAL (Arid Semi-Arid Land) areas. Though ASAL area accounts for more than a third of the territory, it was always considered exceptional cases and did not have special attention and care. More studies need to be conducted about how the SMASE INSET system is operationalized in this region. Second, econometric research can be designed to set sustainability as a dependent variable and ownership and localization as

independent variables. Though it will need much effort to make tightly structured questionnaire to measure ownership and localization and their relation with sustainability, this study can include more samples and identify the relationship among the variables more clearly. Third, the sustainability of the SMASE INSET system depends on motivation and willingness of teachers. Further study is needed to focus on why participant teachers are dissatisfied with the project and what made teachers hesitate to practice ASEI-PDSI approach and how to address these issues.

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Annex 1: SMASE Project Design Matrix

(Phase 1)

Project Title: Strengthening of Mathematics and Science in Secondary Education (SMASSE) in Kenya

Executing Bodies: Ministry of Education, Science and Technology (MOEST) and Japan International Cooperation Agency (JICA)

Duration: 5 years from 1st July, 1998 to 30th June, 2003

Preparation: PCM Workshop in 1996

Revision: SMASSE Internal Workshop in 2000

NARRATIVE SUMMARY	VERIFIABLE INDICATORS	MEANS OF VERIFICATION	IMPORTANT ASSUMPTIONS
(Overall goal) Capability of young Kenyans in Maths and Science is upgraded.	1. Performance in National examinations at secondary level in Pilot District.	1. Kenya National Examinations Council	
(Project Purpose) Quality of Maths and Science education at secondary level is strengthened through In-Service Training (INSET) of teachers in the Pilot Districts	1 By the end of the project, INSET at Kenya Science Teachers College (KSTC) is carried out three times and over 140 INSET participants at KSTC obtain mean of over 3 on the scale of 0 to 4 in the overall assessment of Lesson Innovation Index of ①Attitude, ②Quality of Teaching, ③Quality of Learning through the administration of Monitoring and Evaluation tools formulated by the Monitoring and Evaluation Task Force. 2 By the end of the project, INSETs at Pilot Districts are carried out three times and over 500 INSET participants at Pilot Districts obtain mean of over 2.5 on the scale of 0 to 4 in the overall assessment of Lesson Innovation Index	1 & 2 SMASE Project Monitoring and Evaluation reports.	1 Funds for the project both at KSTC and in districts are appropriately managed by both national and district committees to maintain financial accountability and transparency.

	<p>of</p> <p>①Attitude, ②Quality of Teaching, ③Quality of Learning</p> <p>through the administration of Monitoring and Evaluation tools formulated by the Monitoring and Evaluation Task Force.</p>		
<p>(Output)</p> <p>1. A system of training for the District trainers in Pilot Districts in Maths and Sciences will be established at KSTC.</p> <p>2. A system of INSET in Maths and Science will be established in the Pilot Districts.</p>	<p>1(a) By the end of the project, over 24 Kenyan Academic Staff and over 6 Administrative Personnel at KSTC work for the project.</p> <p>1 (b) By the end of the project, Kenyan Academic Staff at KSTC obtain over B score in the total assessment of the Capacity Building Index by External Task Force.</p> <p>1 (c) By the end of the project, INSET at KSTC obtain mean of over 3 on the scale of 0 to 4 in the Quality of INSET Assessment Index through Pre- and Post-INSET and Session evaluation instruments administered by the Monitoring and Evaluation Task Force.</p> <p>2 (a) Every year, over 140 District Trainers and over 40 administrative staff at the Pilot Districts work for the project.</p> <p>2 (b) By the end of the project, District Trainers at Pilot Districts obtain mean of over 3 on the scale of 0 to 4 in the overall assessment of the Capacity Building Index administered by the</p>	<p>1 (a) (c) SMMASE Project Monitoring and Evaluation reports.</p> <p>1 (b) External Task Force Reports</p> <p>2 (a) (b) (c) SMMASE Project Monitoring and Evaluation reports.</p>	<p>Assistance of District Education Board will continue.</p>

<p>3. Role of KSTC and District INSET centers as resource centres will be strengthened.</p>	<p>Monitoring and Evaluation Task Force. 2 (c) By the end of the project, INSETs at Pilot Districts obtain mean of over 2.5 on the scale of 0 to 4 in the Quality of INSET Assessment Index through Pre- and Post- INSET and Session evaluation instruments administered by the Monitoring and Evaluation Task Force. 3 (a) By the end of the project, over 14 titles of materials are prepared and more than target number of copies are printed and circulated to people who engaged in education. (The detail of volumes and the target number of copies are showed in the list of Materials Disseminated) 3 (b) By the end of project, the pilot districts prepare and produce INSET training materials once or more.</p>	<p>3(a)(b) SMASSE Project records</p>	
<p>(Activities) 1-1 To investigate, analyse and evaluate the present situation, problems and needs of Maths and Science education at secondary level in Pilot Districts. 1-2 To study the subject methods and contents of pre-service teaching manuals on the four subjects. 1-3 To enhance the ability of counterparts in implementation of the project. 1-4 To develop and produce syllabi/ curricula</p>	<p>(INPUTS) 1.Kenya side: a Buildings and other facilities necessary for the project. b Offices and other facilities c Assignment of Kenyan full-time counterpart personnel at KSTC. d Assignment of administrative personnel. e Expenses necessary for the implementation of the Project. f Expenses for Maths and Science teachers to attend INSET at KSTC and in Pilot Districts.</p>		<p>The counterparts at KSTC and key trainers in Pilot districts remain in those positions.</p> <p>Preconditions: TSC supports the Project for strengthening Maths and Science</p>

<p>for INSET on the 4 subjects.</p> <p>1-5 To develop and produce training materials for the INSET on the 4 subjects.</p> <p>1-6 To select district trainers in Pilot Districts.</p> <p>1-7 To try out teaching/learning materials in several secondary schools in the Pilot Districts.</p> <p>1-8 To train District trainers for Pilot Districts at KSTC.</p> <p>1-9 To carry out monitoring and evaluation of the effectiveness of INSET</p> <p>1-10 To carry out follow-up activities to supplement INSET.</p> <p>1-11 To develop and produce teachers' guides and manuals for experiments which are applicable to local situations in Pilot Districts.</p> <p>1-12 To develop and produce manuals for management of teaching/learning resources.</p> <p>2-1 To select trainees and schools for INSET in Pilot Districts.</p> <p>2-2 To improve teaching and learning facilities in Maths and Sciences at the selected schools in Pilot Districts.</p> <p>2-3 To implement INSET in the selected schools in Pilot Districts</p> <p>2-4 To promote educational management courses for relevant officials of MOEST and</p>	<p>2.Japanese side:</p> <p>a Dispatch of long-term experts</p> <p>b Dispatch of short-term experts when necessary</p> <p>c Training of Kenyan counterpart personnel.</p> <p>d Provision of equipment</p>		<p>Education at secondary level.</p>
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<p>school managers in Pilot Districts.</p> <p>3-1 To publish the Project Newsletter etc. and disseminate relevant information.</p> <p>3-2 To establish the mechanism to exchange information on subject matters among secondary school teachers when need arises.</p> <p>3-3 To promote and implement Maths and Science activities when need arises.</p>			
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(Phase 2) Kenya Component

Project Title: Strengthening of Mathematics and Science in Secondary Education (SMASSE) in Kenya Phase II

Executing Bodies: Ministry of Education, Science and Technology (MOEST) and Japan International

Cooperation Agency (JICA)

Duration: 5 years from 1st July, 2003 to 30th June, 2008

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
(Overall goal) Capability of young Kenyans in Mathematics and Science is upgraded.	Performance in National examinations at secondary level in the National level.	Kenya National Examinations Council SMASSE Project Impact Assessment Survey (SPIAS)	
(Project Purpose) Quality of Mathematics and Science education at secondary level is strengthened in Kenya through In-Service Training (INSET) of teachers.	(1) By the end of the project, the preparedness for lesson innovation index will obtain a mean of more than 3 on the scale of 0 to 4. (2) By the end of the project, the results of lesson observation by ASEI/PDSI checklist and lesson observation instrument will obtain a mean of more than 2 on the scale of 0 to 4.	SMASSE Project Monitoring and Evaluation reports.	Teachers continue to practice ASEI/PDSI
(Output) 1. A system of training for the District Trainers in Mathematics and Sciences will be strengthened at the National INSET Centre.	1(a) By the end of the project, over 83 Kenyan Academic Staff and 57 nonacademic staff at National INSET Centre work for the project. 1(b) By the end of the project, INSET at National INSET Centre is carried out 4 times and trains over 900 district trainers. 1(c) By the end of the project, INSET at National INSET Centre obtain a mean of over 3 on the scale of 0 to 4 in the Quality of INSET Assessment Index through the instruments administered by the	1. Project Monitoring and Evaluation reports.	1. Other programs do not adversely affect teachers' participation. 2. Assistance of MOEST will continue.

<p>2. A system of INSET in Mathematics and Science will be established in the Districts.</p> <p>3. Role of SMASSE National INSET Centre and District INSET Centres as resource centres will be strengthened.</p>	<p>project's Monitoring and Evaluation Task Force.</p> <p>1(d) By the end of the project, over 14 titles of materials are prepared and more than target number of copies are printed and circulated to people engaged in education</p> <p>2(a) Every year, over 900 District Trainers and over 480 (115 for phase I and 365 for phase II) administrative staff in the Districts work for the project.</p> <p>2(b) By the end of the project, INSETs in the Districts are carried out four times and train over 15,000 (3,000 for phase I and 12,000 for phase II) teachers</p> <p>2(c) By the end of the project, District Trainers in the Districts obtain a mean of over 3 on the scale of 0 to 4 in the overall assessment of INSET Building Capacity INDEX of the Project's Monitoring and Evaluation Task Force tools.</p> <p>2(d) By the end of the project, INSETs in the Districts obtain a mean of over 2.5 on the scale of 0 to 4 in the Quality of INSET Assessment Index of the project's Monitoring and Evaluation Task Force tools.</p> <p>3(a) By the end of project, National INSET Centre publishes and distributes more than 10 newsletters.</p> <p>3(b) By the end of project, the Districts prepare and</p>	<p>2. SMASSE Project Monitoring and Evaluation reports.</p> <p>3. SMASSE Project records</p>	
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	produce INSET-training materials at least once.		
<p>(Activities)</p> <p>1-1 To investigate, analyse and evaluate the present situation, problems and needs of Mathematics and Science education at secondary level in the Districts.</p> <p>1-2 To enhance the ability of counterparts in implementation of the Project.</p> <p>1-3 To teach demonstration lessons in selected secondary schools.</p> <p>1-4 To review and develop curricula for INSET on Mathematics and Science.</p> <p>1-5 To develop training materials for the INSET on Mathematics and Science.</p> <p>1-6 To select District Trainers.</p> <p>1-7 To train key trainers for the Districts at the National INSET Centre.</p> <p>1-8 To carry out monitoring and evaluation of the INSET.</p> <p>1-9 To carry out follow-up activities to supplement INSET.</p> <p>1-10 To develop model ASEI lesson plans and other teaching materials which are applicable to local situations in the Districts.</p> <p>1-11 To explore the possibility of adapting ASEI/PDSI to mathematics and science teachers in TIVET and tutors in PTTC.</p> <p>2-1 To select schools for</p>	<p>(INPUTS)</p> <p>1. Kenya side:</p> <p>a. Buildings, Offices and other facilities necessary for the project.</p> <p>b. Assignment of Kenyan full-time counterpart personnel at National INSET Centre.</p> <p>c. Assignment of non-academic staff.</p> <p>d. Expenses necessary for the implementation of the Project.</p> <p>e. Expenses for Mathematics and Science teachers to attend INSET at National INSET Centre and in the Districts.</p> <p>2. Japanese side:</p> <p>a. Dispatch of long-term experts.</p> <p>b. Dispatch of short-term experts when necessary.</p> <p>c. Training of Kenyan counterpart personnel in Japan.</p> <p>d. Training of Kenyan counterpart personnel in the third countries.</p> <p>e. Provision of equipment.</p> <p>f. Expenses necessary for the implementation of the Project.</p>		<p>The counterparts at National INSET Centre and key trainers in the Districts will continue to work for the project.</p> <p>Preconditions: All stakeholders do not oppose the project.</p>

<p>INSET centres in the Districts.</p> <p>2-2 To improve teaching and learning facilities in Mathematics and Sciences at the District INSET Centres.</p> <p>2-3 To facilitate implementation of the INSET at the Districts INSET Centres.</p> <p>2-4 To organize INSET system management workshops for relevant officials of MOEST and school managers in the Districts.</p> <p>3-1 To publish the Project Newsletter etc. and disseminate relevant information.</p> <p>3-2 To promote and implement Mathematics and Science activities when need arises.</p> <p>3-3 To establish the mechanism to exchange information on subject matters among secondary school teachers when need arises.</p>			
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(Phase 2) SMASSE-WECSA Component

Project Title: Strengthening of Mathematics and Science in Secondary Education (SMASSE) in Kenya (Phase

II): SMASSE-WCSA

Executing Bodies: Ministry of Education, Science and Technology (MOEST) and Japan International Cooperation

Agency (JICA)

Duration: 5 years from 1st July, 2003 to 30th June, 2008

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
(Overall goal) Quality of Mathematics and Science Education at secondary level in member countries is strengthened.	Practice of ASEI lessons by mathematics and science teachers in member countries.	Country Reports.	Policy frameworks in member countries are supportive of Mathematics and Science Education.
(Project Purpose) ASEI/PDSI lessons are practiced in teacher training institutions and secondary schools in member countries.	By the end of the project, the results of lesson observation by ASEI/PDSI checklist and lesson observation instrument will obtain a mean of more than 2 on the scale of 0 to 4	SMASSE Project Monitoring and Evaluation Reports.	Teacher training and INSET based on ASEI/PDSI continue.
(Output) 1. Trainers for ASEI/PDSI based INSET will be produced in member countries. 2. SMASSE National INSET Centre will be consolidated as resource centre for Mathematics and Science in Africa. 3. SMASSE National	1. By the end of project period, 1(a) INSET at the SMASSE INSET Centre is carried out 5 times 1(b) At least 300 participants attend the INSET at the SMASSE INSET Centre 1(c) At least 40 sets of training materials are produced. 1(d) Monitoring and Evaluation tools applicable to member countries are developed and practiced. 2. By the end of the project period, 2(a) ASEI/PDSI prototype lesson plans are developed by the participants from member countries. 2(b) At least 10	1(a), (b) & (c) Records at the SMASSE INSET Centre. 1(d) SMASSE Project Monitoring and Evaluation Reports. 2 INSET Reports and Country Reports. 3(a), (b) & (c) Records at the SMASSE	Training for enhancing ASEI/PDSI lesson continues in member countries.

<p>INSET Centre will function as secretariat of SMASSE-WECSA.</p>	<p>newsletters are published. 3. By the end of the project period, 3(a) Regional conferences are held at least 4 times. 3(b) At least 6 Kenyan Academic Staff at National INSET Centre work for the SMASSE-WECSA secretariat. 3(c) At least 30 African counties participate in SMASSEWECSA</p>	<p>INSET Centre.</p>	
<p>(Activities) 1-1. To investigate, analyse and evaluate the present situation, problems and needs of INSET systems in member countries. 1-2. To develop curricula for INSET (regional training in Kenya). 1-3. To develop training materials for regional training. 1-4. To organize regional training. 1-5. To develop monitoring and evaluation instruments adaptable for regional training. 1-6. To conduct monitoring and evaluation on the impact of regional training. 1-7. To assist to develop INSET curricula for Mathematics and Science in member countries. 1-8. To assist to develop of monitoring and evaluation tools for project activities. 2-1. To publish newsletters and other publications for disseminating information. 2-2 To conduct technical exchange with member countries. 2-3 To hold joint workshops with member</p>	<p>(Input) 1. Kenya side: a Buildings, Offices and other facilities necessary for the project. b Assignment of Kenyan full-time counterpart personnel at the SMASSE National INSET Centre. c Assignment of support personnel at the SMASSE National INSET Centre. 2. Japanese side: a Training of SMASSE-WECSA Counterpart personnel in Kenya. b Attachment of long-term Japanese experts. c Provision of equipment. d Expenses necessary for the implementation of the Project.</p>		<p>Support and understanding are obtained from member countries to SMASSEWECSA Activities sustain.</p> <p>Precondition Member countries have or will have plans of developing Mathematics and Science Education at secondary level.</p>

<p>countries.</p> <p>2-4 To assist to construct sustainable INSET systems in member countries.</p> <p>3-1 To organize SMASSEWECSA meetings.</p> <p>3-2 To sensitize education Ministries from member countries on ASEI and PDSI approaches in the teaching/learning of Mathematics and Science.</p> <p>3-3 To promote coordinating activities with other donor agencies.</p>			
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(Phase 3) Kenya Component

Project Title: Strengthening of Mathematics and Science Education (SMASE)

Executing Bodies: Ministry of Education (MOE) and Japan International Cooperation Agency (JICA)

Duration: 5 years from January 2009 to December 2013

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
<p>(Overall goal) Capability of young Kenyans in Mathematics and Science is upgraded.</p>	<p>(a) Performance in National Examinations at primary and secondary education</p> <p>(b) Results of original achievement tests, such as SPIAS at the secondary level</p>	<p>Kenya National Examinations Council SMASE M&E report</p>	
<p>(Project Purpose) Quality of Mathematics and Science education at Primary and Secondary school levels in Kenya is strengthened through INSET.</p>	<p>By the end of the project, the results of the lesson observation by following monitoring tools reach the targeted figures;</p> <p>(Primary level)</p> <p>(a) Lesson Innovation Index (target figure: 3.0)</p> <p>(b) ASEI/PDSI Check List (target figure: 2.0)</p> <p>(c) Lesson Observation Index (target figure: 2.0)</p> <p>(d) Student Participation Index (target figure: 2.5)</p> <p>(Secondary level)</p> <p>(a) ASEI/PDSI Check List (target figure: 3.0)</p> <p>(b) Lesson Observation Index (target figure: 3.0)</p> <p>(c) Student Participation Index (target figure is 3.0)</p>	<p>SMASE Project M&E reports</p>	
<p>(Output)</p> <p>1. A system of National INSET for Regional Trainers is established at CEMASTEAs.</p>	<p>By the end of the project:</p> <p>1 (a) 4 cycles of training materials and programs for the National INSET for the primary education are developed.</p> <p>1 (b) Over 250 Regional</p>	<p>1. SMASE Project M&E reports.</p>	<p>Other programs do not adversely affect teacher</p>

<p>2. A system of Regional INSET and Regional workshop is established at PTTCs.</p> <p>3. Existing system of cluster INSET is strengthened.</p> <p>4. Secondary M/S teachers' ASEI/PDSI practices in classroom are enhanced.</p> <p>5. Role of CEMASTEAs as resource centre for M/S education is strengthened.</p>	<p>Trainers are trained at CEMASTEAs.</p> <p>1 (c) National INSET for the primary education at CEMASTEAs obtain mean of over 3 on the scale of 0 to 4 in the Quality of INSET Assessment Index.</p> <p>2 (a) Regional INSET for Cluster Trainer at PTTCs is carried out four times.</p> <p>2 (b) At least 5,600 Cluster Trainers are trained.</p> <p>2 (c) Over 1,000 TAC Tutors and 8 provincial, 140 district and 1,000 Zone QASOs are trained.</p> <p>2 (d) Regional Trainers obtain mean of over 2.5 on the scale of 0 to 4 in the overall assessment of Capacity Building Index at the Regional INSET at PTTCs.</p> <p>2 (e) Regional INSET at PTTCs obtain mean of over 2.5 on the scale of 0 to 4 in the Quality of INSET Assessment Index.</p> <p>3 (a) A guideline/manual on management of M/S INSET for primary school teacher is developed.</p> <p>3 (b) At least 60,000 primary school teachers drawn from every cluster in the country participate in Cluster INSET.</p> <p>4 (a) INSET and workshop contents for introducing lesson</p>	<p>2. SMASE Project M&E reports.</p> <p>3. SMASE Project M&E reports.</p> <p>4. SMASE Project M&E reports.</p> <p>5. SMASE Project M&E reports.</p>	<p>s' participation.</p>
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	<p>study are developed.</p> <p>4 (b) 360 principals are trained at National workshop.</p> <p>4 (c) Over 6,000 Principals are trained at District workshop.</p> <p>5 (a) At least 8 newsletters are published and distributed.</p> <p>5 (b) At least 2 titles on ASEI/PDSI practices are published and distributed.</p>		
<p>(Activities)</p> <p>1-1 To assess INSET training needs of primary M/S teachers</p> <p>1-2 .To develop manuals and materials for National/Regional/Cluster INSET.</p> <p>1-3 To develop/review monitoring and evaluation tools for National/Regional/Cluster INSET.</p> <p>1-4 To conduct National INSET for Regional Trainers at CEMASTE A.</p> <p>1-5 To organise workshops for PTTC Principals and Deans of Curriculum/heads of M/S department on understanding of SMASE INSET & ASEI/PDSI classroom practices.</p> <p>1-6 To carry out monitoring and evaluation on quality of National INSET.</p> <p>1-7 To carry out monitoring and evaluation on impact of National INSET.</p> <p>2-1 To conduct national sensitisation workshop for DEO, QASO, TAC Tutor.</p> <p>2-2 To select Cluster Trainer.</p> <p>2-3 To provide PTTCs with training materials/apparatus as necessary for regional INSET and workshop.</p> <p>2-4 To develop the workshop contents and materials by CEMASTE A.</p> <p>2-5 To organise Regional workshops.</p> <p>2-6 To conduct Regional INSET for Cluster Trainers at PTTCs.</p> <p>2-7 To carry out monitoring and evaluation on quality of Regional INSET.</p> <p>2-8 To carry out monitoring and evaluation on impact of Regional INSET.</p> <p>3-1 To provide training materials/apparatus as necessary for Cluster INSET and District Workshop.</p>	<p>(INPUTS)</p> <p>Kenyan side:</p> <ol style="list-style-type: none"> 1. Buildings, Offices and other facilities necessary for INSET activities 2. Assignment of adequate Kenyan full-time academic counterpart personnel at CEMASTE A 3. Assignment of adequate non-academic personnel at CEMASTE A 4. Expenses necessary for the project activities to be implemented in Kenya 5. Expenses for repair, maintenance and improvements of CEMASTE A facilities <p>Japanese side</p> <ol style="list-style-type: none"> 1. Dispatch of long-term experts 2. Dispatch of short-term experts 3. Training of Kenyan 	<p>The counterparts at CEMASTE A and key trainers in the-developed cascade levels will be motivated enough to continue to work for the project</p>	

<p>3-2 To conduct Cluster INSET. 3-3 To conduct District workshop. 3-4 To carry out monitoring and evaluation on quality of the cluster INSET. 3-5 To carry out monitoring and evaluation on the impact of cluster INSET and ASEI/PDSI classroom practices. 3-6 To develop handbook on management of primary INSET system in accordance with MOE policy.</p> <p>4-1 To assess the current situation of M/S teachers' ASEI/PDSI classroom practices 4-2 To develop INSET content for lesson study. 4-3 To assess the current situation of capacity of school leadership on supervision of ASEI/PDSI classroom practices. 4-4 To develop workshop content for principals. 4-5 To conduct National workshop for selected principals. 4-6 To conduct District workshop for all principals. 4-7 To carry out monitoring and evaluation on ASEI/PDSI classroom practices.</p> <p>5-1 To publish newsletters, manuals and reports. 5-2 To establish networks with agencies/institutions involved in related activities. 5-3 To organise symposia on good ASEI/PDSI classroom practices. 5-4 To compile good practices of ASEI/PDSI and disseminate.</p>	<p>counterpart personnel in Japan and in third countries</p> <p>4. Provision of training materials and equipment for INSET activities</p> <p>5. Expenses necessary for SMASE-WECSA activities</p> <p>6. Local operation cost for administration of the Project</p>	<p>Preconditions : Teacher s' union support the project.</p>
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(Phase 3) SMASE-WECSA Component

Project Title: Strengthening of Mathematics and Science Education (SMASE)

Executing Bodies: Ministry of Education (MOE) and Japan International Cooperation Agency (JICA)

Duration: 5 years from January 2009 to December 2013

Narrative Summary	Verifiable Indicators	Means of Verification	Important Assumptions
<p>(Overall goal) Quality of Teaching and Learning of Mathematics and Science in member countries is improved</p>	<p>(a) Practice of ASEI/PDSI Index obtain a mean of 2.5 on a scale of 0-4 (b) Quality of learning Index attains a mean of 2.5</p>	<p>M & E Reports</p>	
<p>(Project Purpose) Capability of INSET providers to implement ASEI/PDSI based INSET in member countries is strengthened</p>	<p>By the end of the project period: (a) Lesson Innovation Index attains a mean of 2.5 (b) INSET providers obtain a mean of 2.5 on a scale of 0-4 in the overall assessment of Capacity Building Index for INSET provision</p>	<p>SMASE Project Monitoring and Evaluation Reports</p>	<p>Policy frameworks in participating countries will be supportive of INSET for Mathematics and Science teachers</p>
<p>(Outputs) 1. ASEI/PDSI based INSET providers from member countries are trained. 2. SMASE-WECSA network is strengthened.</p>	<p>1. By the end of the project period: a) TCTP at CEMASTE A is carried out five times. b) At least 400 participants attend the TCTP at CEMASTE A c) At least 40 sets of training materials are produced d) M & E tools applicable to member countries are developed and used 2. By the end of the project period:</p>	<p>1. SMASE Project M&E reports. 2. SMASE Project M&E reports. 3. SMASE Project M&E reports.</p>	

<p>3. Role of CEMASTEAs is strengthened as resource centre for Mathematics and Science education in Africa.</p>	<p>a) Regional conferences and SMASE-WECSA delegates meetings are held at least four times</p> <p>b) Increased number of countries participating in SMASE-WECSA activities and implementing INSET.</p> <p>c) Technical exchange notes: LOU, MOU etc.</p> <p>3. By the end of project period:</p> <p>a) ASEI/PDSI prototype lesson plans, developed by member countries, are compiled and disseminated.</p> <p>b) At least 4 SMASE-WECSA newsletters are published.</p>		
<p>(Activities)</p> <p>1-1 To assess the current situation and needs of INSET systems in SMASE-WECSA member countries</p> <p>1-2 To review and develop TCTP course content for mathematics and science educators from SMASE-WECSA member countries</p> <p>1-3 To review and develop training manuals and materials for the TCTP</p> <p>1-4 To train INSET providers from SMASE-WECSA member countries</p> <p>1-5 To offer technical support in the construction and strengthening of INSET system for mathematics and science education for member countries</p> <p>1-6 To monitor and evaluate the quality of TCTP</p>	<p>(Input)</p> <p>1. Kenya side:</p> <p>a Buildings, Offices and other facilities necessary for the project at CEMASTEAs</p> <p>b Assignment of adequate Kenyan full-time counterpart personnel at CEMASTEAs</p> <p>c Assignment of adequate support personnel at CEMASTEAs</p> <p>2. Japanese side:</p> <p>a Dispatch of long term experts</p>	<p>Support and understanding are obtained from member countries to sustain SMASE-WECSA activities.</p>	

1-7	To monitor and evaluate the impact of TCTP	b	Expenses necessary for Training of SMASE-WECSA Counterpart personnel at CEMASTE A	
2-1	To sensitise officials of education ministries in member countries on ASEI-PDSI classroom practices as need arises			
2-2	To conduct technical exchange visits with member countries as need arises	c	Expenses necessary for dispatch of teams for Technical exchange visits, Technical assistance and Third	
2-3	To promote joint workshops with member countries as need arises			
2-4	To organise and participate in SMASE-WECSA Regional conferences and delegates meetings		Country Expertise among member countries	
2-5	To participate in relevant regional and international conferences and other activities	d	Expenses necessary for holding Regional conferences and SMASE-WECSA delegates meetings	Pre-condition <i>Member countries have or will have plans of improving Mathematics and Science Education at basic level.</i>
3-1	To establish / strengthen networks with Regional and International organisations involved in related activities	e	Expenses necessary for SMASE-WECSA counterparts to attend international conferences	
3-2	To collect materials and reference books for SMASE-WECSA activities			
3-3	To establish/equip a library	f	Provision of machinery, equipment and materials to CEMASTE A as resource centre	
3-4	To disseminate information on SMASE-WECSA activities through the website, newsletters and other publications			

Appendix 2: Questionnaire of the Study

Questionnaire for SMASE Regional INSET Trainers

I am Nyota (HanByul LEE) from Seoul National University in South Korea. I am doing a research on SMASE for my Master's degree. I have been together with you from last week and this week. But I have not talked with everyone of you. So, I would like to get your opinion through this questionnaire. If you are willing to accept my request, please answer the questions given below.

1. Which college are you from? _____
2. Which subject do you teach? _____
(_____)
3. Are you male or female? _____
4. Which one do you have?
a. Ph.D./ Ed.D. _____ b. Master in Education
c. Bachelor in Education _____ d. Diploma _____ e. P1
Certificate
f. Any other qualification (_____)
5. How long have you taught in a PTTC? _____ Years
6. What did you do before you became a PTTC tutor?
_____ (e.g. secondary math
teacher)
7. When did you first participate in SMASE national INSET?
_____ (e.g. 2008)
8. When did you start training cluster trainers at your PTTC?
_____ (e.g. 2008)
9. How many cluster trainers do you teach per year in your PTTC?

10. Did you participate in the baseline survey for starting SMASE at the primary level in 2008(9)?
a. Yes. b. No.

10-1. If yes, what did you do for the baseline survey?

(e.g. Questionnaire for teachers and students, lesson observation etc.)

11. Have you ever participated in any other in-service training?

- a. Yes. b. No.

11-1. If yes, how many INSET(s) did you participate in before SMASE?

11-2. If yes, what was the name of the training project?

_____ (e.g. Tafakari, PRSIM, SbTD, TEPD etc.)

(Please tick the answer you agree with.)

13. Compatibility with Kenyan Knowledge and Context

	Strongly Agree	Agree	Disagree	Strongly disagree	Don't know
a) SMASE INSET contents in general are compatible with Kenyan knowledge and context.					
b) ASEI-PDSI approach is compatible with Kenyan knowledge and context.					
c) The way of applying ASEI-PDSI in subject topics (e.g. Circulation system or scale drawing) is compatible with Kenyan knowledge and context.					
d) Facilitation skills are compatible with Kenyan knowledge and context.					
e) ICT skills are compatible with Kenyan knowledge and context.					
f) There are conflicts between Kenyan knowledge and context and SMASE INSET contents.					

14. Understanding and Internalization of ASEI-PDSI

	Strongly Agree	Agree	Disagree	Strongly disagree	Don't know
a) When I first heard ASEI-PDSI, the concept was new to me.					
b) I learned the concept and the importance of learner-centeredness and activities in pre-service training (in Univ or college).					
c) I learned the concept and the importance of learner-centeredness and activities in other INSET before SMASE.					
d) I internalized ASEI-PDSI approach and applied it in my teaching and training.					

15. Applicability of ASEI-PDSI in Classroom Practices

	Strongly Agree	Agree	Disagree	Strongly disagree	Don't know
a) I find that ASEI-PDSI approach is practicable / workable in real classroom practices in Kenya.					
b) Primary teachers find that ASEI-PDSI approach is practicable / workable in real classroom practices in Kenya.					
c) SMASE-trained primary teachers have actually applied ASEI-PDSI in their classroom.					
d) Large classes are an intervening factor when applying ASEI-PDSI in the classroom.					
e) Lack of resources is an intervening factor when applying ASEI-PDSI in the classroom.					
f) Heavy syllabus is an intervening factor when applying ASEI-PDSI in the classroom.					
g) Outcome-based education (Emphasis on KCPE outcomes) is an intervening factor when applying ASEI-PDSI in the classroom.					
h) Teacher's low motivation is an intervening factor when applying ASEI-PDSI in the classroom.					
i) Teachers' lack of time to prepare lessons is an intervening factor when applying ASEI-PDSI in the classroom.					
j) ASEI-PDSI approach adds workload of teachers.					
k) Intervening factors mentioned above are all excuses by teachers and they can overcome these barriers.					
l) ASEI-PDSI approach can be aligned with Kenyan situation and contexts.					
m) ASEI-PDSI approach needs to be customized considering Kenyan situation and contexts.					

16. Implementation of SMASE INSET

	Strongly Agree	Agree	Disagree	Strongly disagree	Don't know
a) It should be mandatory for teachers to attend SMASE INSET.					
b) Making SMASE INSET mandatory makes teachers de-motivated.					
c) Cascade model of INSET is appropriate for Kenyan teacher education system.					
d) Cascade model can make distortion while cascading down.					
e) The same contents cascaded down may be inappropriate for bottom level considering teachers' level of understanding and their negative attitude to INSET.					
f) The same contents cascaded down can be inappropriate for some regions (e.g. ASAL area).					

g) SMASE should be a “program” which is fully funded by government without JICA’s support.					
h) SMASE should be sustained after finishing of the four cycles in 2013.					
i) SMASE should be included in a law or constitution.					
j) SMASE should become a semi-autonomous organization independent from the Ministry of Education.					
k) SMASE INSET management system (e.g. RPC, DPC, ZPC) is appropriate for Kenya teacher education system.					
l) Regional Planning Committee(RPC) is functioning well for SMASE INSET management.					
m) Regional Planning Committee(RPC) is functioning well for SMASE INSET monitoring and evaluation.					

17. Participants’ Feedback and Improvement in SMASE

	Strongly Agree	Agree	Disagree	Strongly disagree	Don't know
a) SMASE INSET encourages Kenyan trainers and teachers to contribute and incorporate their knowledge and ideas.					
b) There are feedback loops like “Open forum” where you can speak out your opinion and ideas.					
c) The opinions you raised were incorporated for the improvement of SMASE INSET contents or management.					
d) You used the opinions raised by cluster trainees to improve the quality of SMASE national and regional INSET.					

18. Any other comments and suggestions are most welcome.

Appendix 3: Informed Consent Form for Interview

Research Title: Factors Affecting the Sustainability of Japan's 『Strengthening Mathematics and Science Education』 Project for Teacher Training in Kenya

You are being asked to take part in a research study of the factors affecting sustainability of the SMASE INSET program. I am asking you to take part in this study because you are the right person who can provide me with relevant information for my research. Please read this form carefully and ask any questions you may have before agreeing to take part in the study.

What the study is about: The purpose of the study is to critically analyze the factors which positively and negatively affected the sustainability of the SMASE (Strengthening Mathematics and Science Education) INSET (In-service teacher training) system in Kenya.

Your answers will be confidential: The records of this study will be kept private. In any sort of report we make public we will not include any information that will make it possible to identify you. Research records will be kept in a locked file; only the researchers will have access to the records. If you later do not want me to use some answers that you have said, then you can tell me at any time.

Taking part is voluntary: Taking part in this study is completely voluntary. There is no obligation and payment for taking part. You are free to decide whether you want to talk or not. If you are not comfortable with any question, you do not need to answer. Please be assured that there is no correct or wrong answer. You can withdraw the study at any time, and the researchers will omit your responses if you want. We will sometimes record our talking or take notes.

Questions and Contact Details

This study is being conducted by HanByul LEE (Nyota) who is a master's candidate in Global Education Cooperation Program at Seoul National University, South Korea. If you have any questions now or at any other time about this research or your participation, please feel free to ask. I can be contacted at +254-724-978-658(Nyota). You will be given a copy of this form to keep for your records.

Statement of Consent: I have read the above information, and have received answers to any questions I asked. I consent to take part in the study.

Your Signature _____

Date _____

Your Name _____

Appendix 4: Official Letter to Request Authority to Conduct Research



Department of Global Education Cooperation College of Education, Seoul National University

606-1, 10-1, College of Education, Seoul National University
1 Gwanak-ro, Gwanak-gu, Seoul 151-742
22nd, January 2013

Mr. Atsushi Matachi, Mr. Patrick Kogolla

Director CEMASTE A, P. O. Box 24121-00502, Nairobi, Kenya

Mr. Yoshifumi Yamanaka, Mr. Samuel Kibe

JICA Kenya Office, Rahimtulla Tower, 10th & 11th floor, Upper Hill Road, P.O. Box 50572-00200, Nairobi, Kenya

The National Council for Science and Technology

Utalii House, 8th and 9th Floor, P.O Box 30623, Nairobi, Kenya

REQUEST FOR THE AUTHORITY TO CONDUCT RESEARCH ON SMASE

The Department of Global Education Cooperation in College of Education, Seoul National University requests the authority to conduct research on the SMASE (Strengthening Mathematics and Science Education) project. This study is being conducted by HanByul LEE who is a master's candidate in this department. The title of the study is "*Factors Affecting the Sustainability of Japan's 『Strengthening Mathematics and Science Education』 Project for Teacher Training in Kenya*". The main purpose of the study is to critically analyze the factors which positively and negatively affected the sustainability of the SMASE INSET (In-service teacher training) system in Kenya.

For quality research, we would like to ask your permission on these four components;

(i) Observation of SMASE INSET

- (ii) Visits to District INSET Center in Nairobi (e.g. Jamuhuri High School)
- (iii) Interviews with Japanese experts and Kenyan C/Ps and beneficiaries
- (iv) Collecting the results of monitoring and evaluation tools of SMASE (e.g. SPIAS)

The data collected will be used only for the research. We will be sincerely appreciated for your support for the research.

Yours

Prof. Ki-Seok KIM
Seoul National University



국문초록

일본의 케냐 수학과학교육역량강화(SMASE) 교원연수 사업의 지속가능성 요인 분석

SMASE(Strengthening Mathematics and Science Education: 수학 과학 교육 역량 강화) 프로젝트는 기술협력의 구(舊) 모델이 가진 단(短)기간의 사업 수행과 공여국 중심의 특성으로 인해 한창 비판을 받던 1990년대 후반에 시작되었다. SMASE 프로젝트는 이러한 기술협력의 한계를 극복하고, 기술적, 제도적, 재정적 기반 위에 지속 가능한 현직교사연수(INSET) 시스템을 설립하고자 하였다. 이러한 기반은 케냐와 일본, 특히 케냐의 주도적인 이니셔티브와 자조 노력에 의해 공동으로 형성되었다. 본 연구는 케냐에서 구축된 SMASE INSET 시스템의 지속가능성에 영향을 미친 요인을 분석하는 것을 목적으로 한다. 구체적으로, 지속 가능한 SMASE INSET 시스템을 수립하기 위해 마련된 다양한 기술적, 제도적, 재정적 기반을 살펴보고, SMASE INSET 시스템의 지속가능성에 영향을 준 주인의식과 지식의 현지화 이니셔티브의 성과와 한계를 논한다.

본 연구의 Finding에서는 SMASE INSET 시스템의 지속가능성을 높이기 위해 콘텐츠, 인적자원, 제도, 재정적 수단이 마련되었음을 밝히고 있다. SMASE INSET의 교육과정과 콘텐츠는 케냐 교사교육가와 교사들이 케냐의 교육 맥락과 교사들의 요구에 기반을 두고 개발한 것이다. SMASE 프로젝트의 일환으로 수학, 과학 교사들의 역량 강화를 위한 아프리카의 구심점으로서 기능하는 CEMASTE(Africa Center for Mathematics, Science and Technology Education in Africa: 아프리카 수학, 과학, 기술 교육 센터)가 설립되었으며, 이 센터에서 교사교육가와 행정관료와 같이 프로젝트 수행을 위한 인력이 정기적으로 양성되었다. CEMASTE의 리더십 하에, SMASE 프로젝트는 국가부터 시도(district)까지 연결된 기존의 행정구조와 관료를 활용하여 실시되었다. SMASE 프로젝트가 국가-시도-클러스터 수준의 케스케이드 모델로 이루어진 것과, 모든 중등 수학, 과학 교사들에게 SMASE 연수가 의무화된 것은 SMASE INSET 시스템의 빠르고 폭넓은 확산과 구축에 기여하였다. 또한 케냐와 일본 정부간의 비용 분담과 ‘SMASE 기금’이라 불리는 지속 가능한 재정 조달 메커니즘을 통해 SMASE INSET 시스템의 지속가능성을 높일 수 있었다.

하지만 동시에 SMASE 프로젝트의 지속가능성을 방해하는 요소들도 존재하였다. 첫째, SMASE 연수의 핵심인 ASEI-PDSI(Activity, Student-centered, Experiment, Improvisation - Plan, Do, See, Improve) 접근법의 교실 내 활용도가 떨어진다는 점이다. 둘째, 시도와 클러스터 수준의 교사교육가와 행정관료의 역량이 부족하다는 것이다. 셋째, 하향식(Top-down) 접근과 연수의 강제성은 교사들의 SMASE 프로젝트에 대한 지지와 책임감을 저하시켰다. 넷째, SMASE 기금의 징수율이 학교별로 편차가 크고 어느 지역도 100%의 징수율을 보이지 못하였다. 또한 동 기금 관리의 불투명성이 여러 차례 문제가 되었다.

Discussion에서는 SMASE 프로젝트를 기술, 제도, 재정적 측면에서 분석한 결과를 연구자가 문헌연구를 토대로 만든 분석적 틀을 사용하여 주인의식과 지식의 현지화 관점에서 해석하였다. 연구의 결과는 고위급(중앙 정부) 수준의 주인의식은 보장되었으나 최종 수혜자 수준의 주인의식은 확보되지 못했음을 보여준다. 케냐와 일본의 공동 프로젝트 형성, 비용 분담 전략, 케냐 정부의 정책적 지지, 케냐 정부의 기존 구조 내 SMASE 시스템 통합 전략, SMASE-WECSA(Western Eastern Central and Southern Africa: 서, 동, 중앙, 남 아프리카) 회원국과의 남남협력 등은 케냐 정부의 주인의식을 높이는 데 크게 기여하였다. 하지만 프로젝트의 가장 중요한 수혜자인 교사의 주인의식을 고려하면, 교사들의 참여, 합의, 자력화는 케스케이드(하향식) 모델 내에서 상당한 제약을 받았다. 또한 케냐 정부에 의한 SMASE 연수 참석의 의무화는 교사들의 동기를 저하시켰다. 교사들이 자신의 역할을 변화의 주체로 설정하고 SMASE 프로젝트에 대한 주도권을 잡지 않는다면 프로젝트는 성공적으로 지속될 수 없을 것이다.

SMASE 연수의 방향은 일본의 외래 지식과 남남협력을 통해 필리핀에서 획득한 지식에 의해 설정되었다. 하지만, 케냐의 현지 수요 발굴과 연수 콘텐츠의 개발은 케냐 카운터파트(C/Ps)의 현지 지식을 기반으로 하여 이루어졌다. 외래 지식의 현지화와 현지 지식의 활용은 협력국의 조건과 더 부합하는 연수 콘텐츠를 만들어내는데 도움이 되었다. 이는 SMASE 프로젝트가 케냐에서 더 지속가능하고 케냐 현지인들에게 더 친근감을 주는데 기여했다. 이러한 노력에도 불구하고, SMASE 연수를 받은 교사들은 연수를 통해 습득한 지식을 교실 현장에서 활용하는 데 어려움을 겪고 있었다. 케냐의 교사들은 SMASE 연수에서 배운 지식의 실천을 방해하는 열악한 주변 교육 환경과 여전히 씨름하고 있었다. 이러한

한계에는 2가지 이유가 있다. 첫째, 교사들은 기본적인 욕구가 충족되지 않는 실제 케냐 교육 환경을 고려할 때 적절치 못한 학습자 중심 교수법 등의 소위 “선진” 교수법을 활용하도록 요구 받고 있었다. 둘째, SMASE 연수 콘텐츠는 케냐의 다른 기관과의 네트워크 부족으로 인해 교사연수 유관기관의 기존 지식과 일치하지 않는 부분이 존재했다. 이와 같이 교사들의 SMASE 연수 콘텐츠 활용도가 낮은 것은 프로젝트 효과의 가시성을 떨어뜨리고 동시에 프로젝트의 지속가능성에 부정적인 영향을 주었다.

SMASE 프로젝트는 어떻게 주인의식과 지식의 현지화 담론이 실제로 개발협력 사업 현장에 적용되고 있는지, 또한 어떻게 이러한 노력들이 사업의 지속가능성으로 이어질 수 있는지를 보여준다. SMASE 프로젝트가 케냐 정부에 의해 시작되고 진행되었으므로 정부의 주인의식은 강력했다고 볼 수 있다. SMASE 연수 콘텐츠 또한 케냐 교사들의 수요와 케냐 교육과정에 기반하여 케냐인들이 개발한 것으로 지식의 현지화도 고려되었다. 하지만 SMASE 프로젝트는 변화의 주체로서 교사의 주인의식의 중요성을 고려하는 데 한계가 있었다. 또 다른 한계점은 본 프로젝트에서는 교사들이 태도를 바꾸면 모든 기본적인 도전과제들을 극복할 수 있다고 전제하고 수업 개선에 지나치게 집중했다는 것이다. 오직 교사를 연수시킴으로써 교사들의 역량 강화와 수업 개선을 도모하는 것은 어렵다. 그 이유는 교사들을 둘러싼 주변환경이 교사들이 혁신적이고 주도적으로 변화하기에 협조적이지 못하기 때문이다. 따라서 교사들이 스스로 교수 태도와 교수법을 바꿀 수 있도록 동기를 부여하는 통합적인 접근법이 필요하다.

.....

주요어 : 일본의 공적개발원조(ODA), 케냐의 수학과학교육역량강화 (Strengthening Mathematics and Science Education: SMASE) 프로젝트, 현직교원연수(In-Service Teacher Training: INSET), 지속가능성, 주인의식, 지식의 현지화

학 번 : 2011-21635