JAPAN INTERNATIONAL
COOPERATION AGENCY

MINISTRY OF EDUCATION
THE DEMOCRATIC
SOCIALIST REPUBLIC OF
SRI LANKA

THE MASTER PLAN STUDY

FOR THE DEVELOPMENT OF SCIENCE AND MATHEMATICS

IN THE PRIMARY AND SECONDARY LEVELS

IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

FINAL REPORT

MAIN REPORT






FEBRUARY 2005

KRI INTERNATIONAL CORP.

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EXCHANGE RATE
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US$1.00 = ¥106.17= Rs.104.06

PREFACE

In response to a request from the Government of the Democratic Socialist Republic of Sri Lanka, the Government of Japan decided to conduct the Master Plan Study for the Development of Science and Mathematics Education in the Primary and Secondary Levels and entrusted the Study to the Japan International Cooperation Agency (JICA).

JICA selected and dispatched a study team headed by Mr. Toshikazu Tai of KRI International Corp. from November 2002 to February 2005.

The team held various discussions with the officials concerned of the Government of the Democratic Socialist Republic of Sri Lanka and conducted field surveys and analysis. This final report has been prepared on the basis of the studies conducted during the past two years.

I hope that this report will contribute to further improvement in the education sector and to the enhancement of friendly relationship between the two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of the Democratic Socialist Republic of Sri Lanka for their close cooperation extended to the Study.

February 2005

Kazuhisa MATSUOKA,
Vice-President,
Japan International Cooperation Agency

February 2005

Mr. Kazuhisa Matsuoka
Vice President
Japan International Cooperation Agency (JICA)
Tokyo, Japan

Dear Mr. Kazuhisa Matsuoka,

Letter of Transmittal

We are pleased to submit to you the Final Report on “The Master Plan Study for the Development of Science and Mathematics in the Primary and Secondary Levels in the Democratic Socialist Republic of Sri Lanka”. Under the contract with your esteemed organization, the Study was carried out for the 28-month period from November 2002 to February 2005.

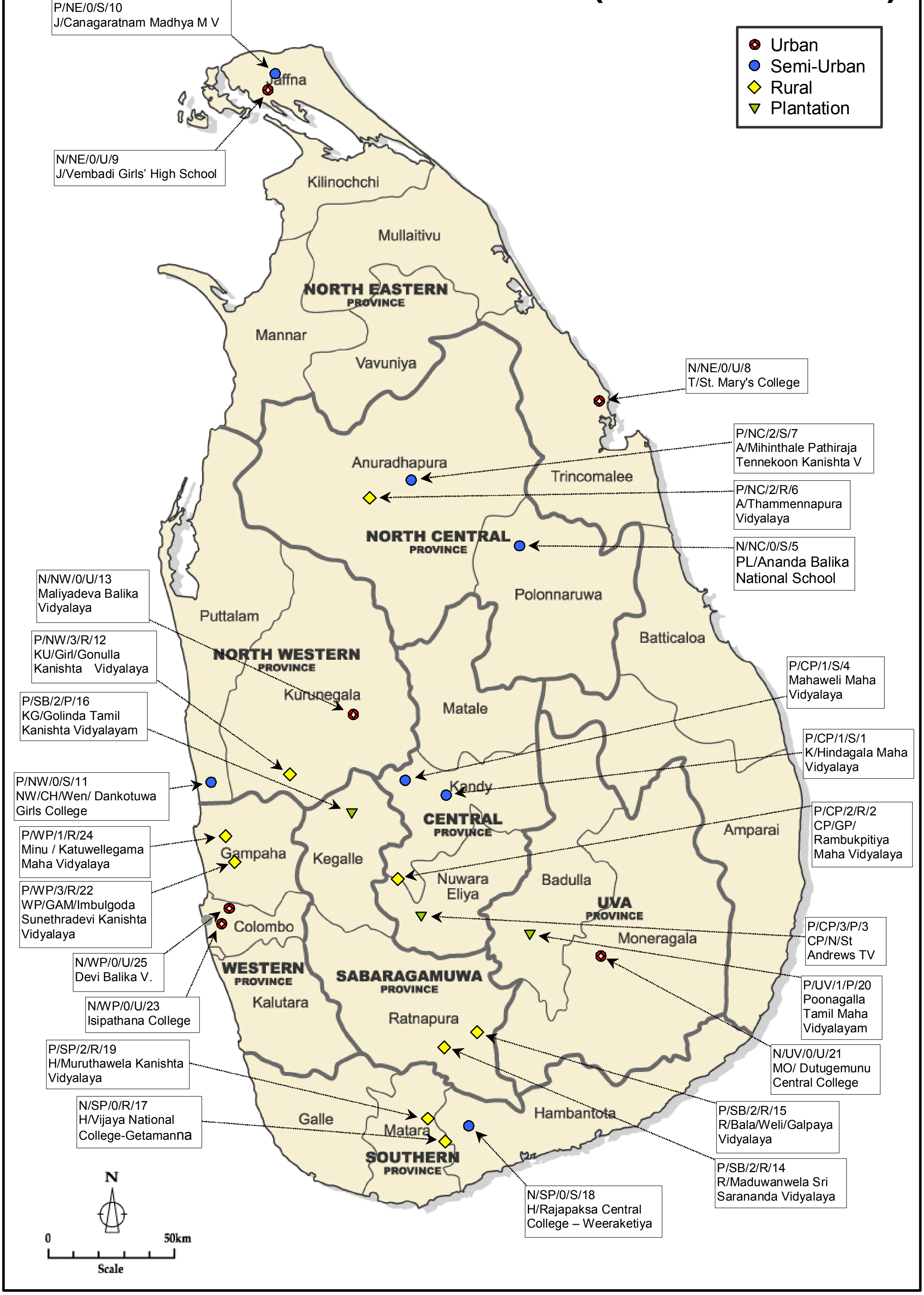
The Study formulated “The Master Plan for the Development of Science and Mathematics in the Primary and Secondary Levels” through the analysis on the current education sector as well as socio-economic aspects and the implementation of the Pilot Project. Based on the lessons learnt from the Pilot Project, the Master Plan was formulated to improve science and mathematics education in the primary and secondary levels emphasizing the school-based educational Kaizen activities.

We wish to take this opportunity to express our sincere gratitude to the Embassy of Japan, JICA, the JICA Advisory Committee members, and the JICA expert. We also wish to express our deepest gratitude to the Ministry of Education and the National Institute of Education, and concerned officers of related agencies for the courtesies and cooperation extended to the team during the course of the Study.

Very truly yours,

Toshikazu Tai
Team Leader

LOCATION MAP (25 Pilot Schools)



Improvement of School Management

A number of suggestions are submitted through the suggestion system.

Campus map was fixed with the support from parents.

Improvement of Science and Mathematics Education

Students learn through model experiments.

Students have more opportunity for activity-based learning.

Supporting Activities – Monitoring

SEIKA members discuss the progress and problems with JICA Study Team.

SEIKA represents various groups and individuals within and outside the school community.

Supporting Activities – Workshops

Teachers demonstrate the activity to understand the concept of "+" and "–" by using colored water gauge

EXECUTIVE SUMMARY

(Study Background and Objectives)

1 Sri Lanka has made a remarkable success in human development indicators since independence. In the education sector, completion rate for primary and secondary school has achieved around 98% and 83% respectively. However, the core problem in education sector is considered to lie in its 'quality' which is clearly represented in the low pass rate of science subjects in O-Level and A-Level examinations. Accordingly only less than 20% of the all candidate students qualify for university in science stream.

Under this situation, the Government of Sri Lanka requested the technical assistance to the Government of Japan. Following the agreement between the two governments, the implementation of the Study was carried out during the period of November 2002 to February 2005.

The objectives of the Study are:

- To formulate a master plan to improve the quality of science and mathematics education in primary and secondary levels; and,
- To help strengthen the planning and implementing capacity of the Counterpart Personnel through the implementation of the Study.

(Development Policy and Education Sector)

2 After the parliamentary election held on April 2nd, 2004, a new economic policy framework entitled 'Creating Our Future, Building Our Nation' was issued by the new administration in July 2004. The new policy framework puts a high priority to create a 21st century workforce through educational reforms, human resources and skills development, and improving productivity with a new ethic towards performance excellence and innovation.

Through 2002 and 2003, NEC developed a new set of reform policy proposals that were published in December 2003 as the document: 'Envisaging Education for Human Development - Proposals for a National Policy Framework on General Education.' The document is now the blueprint for general education reform in Sri Lanka for the next five years. Promotion of mathematics, science and ICT education is one of major recommendations.

3 After reviewing the current situation, problems and constraints of the education sector are summarized below.

a) Access and Equity

Access and equity have long been cornerstones of Sri Lankan education policy and they can be grouped together as a principle of 'equal educational opportunity for all children' in the nation. Without access and equity for all there can only be limited quality and efficiency in the educational system. The main access and equity problem is the inequitable facilities and human resource allocation between urban and rural schools. Inputs of improved basic infrastructure and science facilities in rural and plantation areas are urgently required. Improved human resources e.g. effective principals and good science and mathematics teachers need to be deployed to those areas. As well, effective principals would bring improved school management. These inputs are essential if access and equity targets for MOE can be reached. Also, the poor linkages between MOE, provincial and zonal authorities mean that problems of access and equity often go unheeded to the great disadvantage of students and schools in rural areas. The politicization of principal appointments and teacher deployment is an ongoing problem for the system.

Access and equity have to be the first priority of MOE for improvements in science and mathematics education in rural areas.

b) Quality and Efficiency

Quality of education is to be enhanced by inputs aimed at improving science and mathematics education. These inputs include improvements to teacher training, methodology, textbook production, curriculum, SBA, facilities such as laboratories, libraries, multimedia rooms, equipment, and ICT resources.

Efficiency will be realized by increased professionalism of educational personnel and management. Problems such as overlapping functions in government, poor linkages between MOE and provincial authorities, delayed implementation of SBM, politicization of Principal appointments and teacher deployment are all factors in hindering the efficiency of the education sector.

c) Management and Finance

Adequate financial support and good management at all levels of the education system are essential for it to function effectively. Sri Lanka has a major problem with education funding as it has been gradually decreasing as a percentage of GDP largely as a result of the ongoing conflict situation. The current level of 3% of GDP is low by world standards and this is at the center of an education system that lacks forward momentum.

There are also problems at each management level and between management levels. This is despite the efforts of external agency inputs in recent years in management strengthening and capacity building. There is politicization of the system at all levels, which results in some administrators and principals having ineffectual management skills resulting in inferior education for the schools with whom they are associated.

As Sri Lanka is moving slowly away from a centralized education to more school-based management, it is vital that there be strong leadership at all levels of the system.

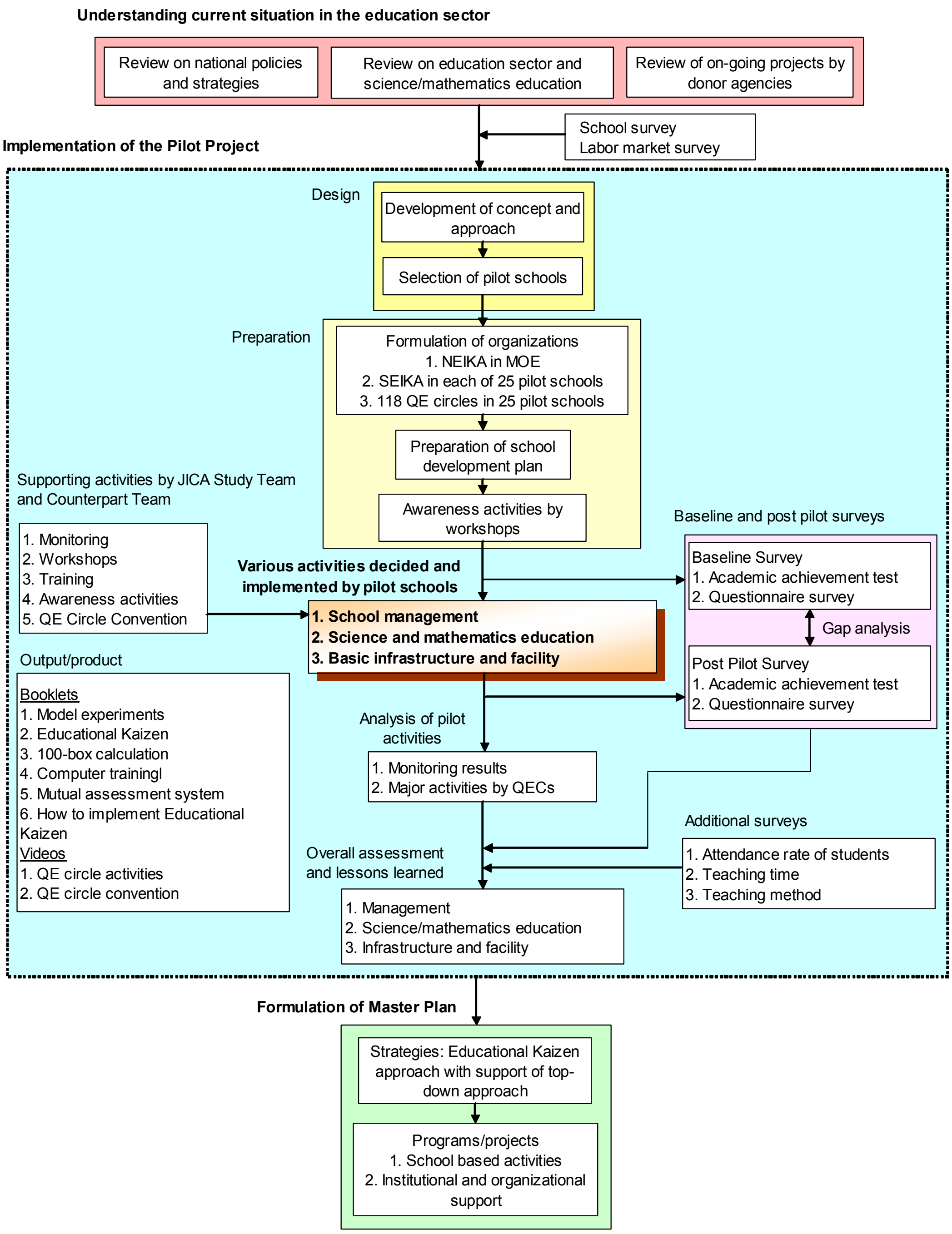
(Implementation of Pilot Project)

4 The Pilot Project was formulated by applying the school-based approach or Educational Kaizen activities to the 25 pilot schools. The challenge focused on changing school culture as a prerequisite for the development of school management, science and mathematics education and basic infrastructure and facilities.

The basic concept of the Pilot Project was to apply Kaizen approach to the education sector. Kaizen means continuous improvement involving everyone; top management, managers and workers. Kaizen activities include various methodologies of participatory approach such as 5S, suggestion system and Quality Control (QC) circle.

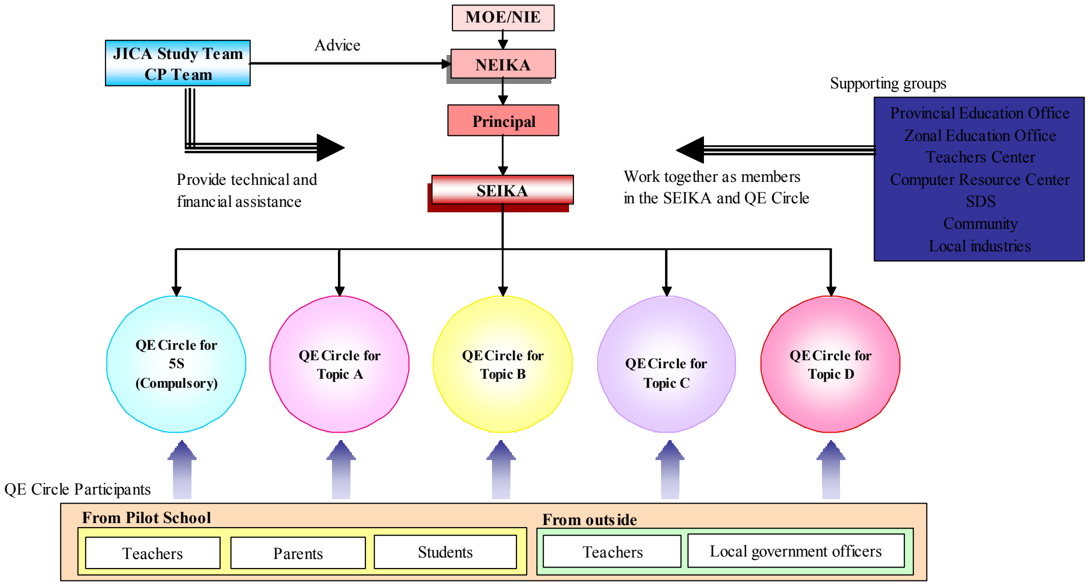
The Pilot Project utilized the Educational Kaizen concept in order for schools to improve school management, quality of science and mathematics education and basic infrastructure/facilities.

5 The overall flow of implementing the Pilot Project is illustrated below.



Overall Flow of the Pilot Project Implementation

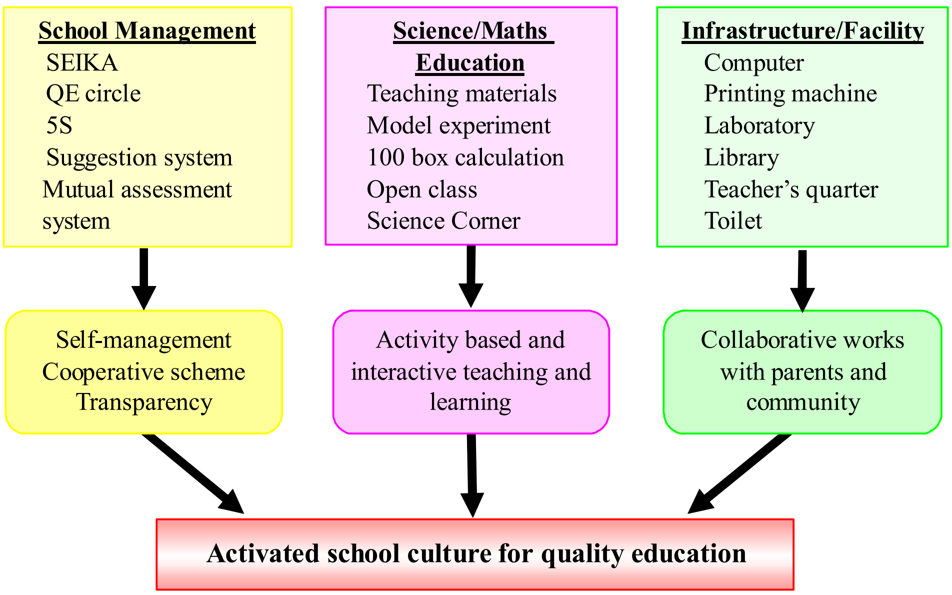
6 Proposed implementation structure for the Pilot Project is as illustrated in the following figure. The National Educational Initiative of Kaizen Activities (NEIKA) was established as a supervisory body in implementing the Pilot Project.



Implementation Organization

Under NEIKA, each pilot school formed a School Educational Initiative of Kaizen Activities (SEIKA) with the objectives of planning, implementing, monitoring and evaluating the Educational Kaizen activities at the school level. SEIKA was responsible for all the activities conducted by the school.

7 118 QE circles were formed at 25 pilot schools during the one-year operation. The number of activities implemented by the 118 QE circles was 944. The overview of QE circle activities is illustrated in the following figure.



Overview of QE Circle Activities

8 Most of the pilot schools successfully implemented the Pilot Project, based on the school development plan that they themselves had prepared. This proves that Educational Kaizen approach can be applied to various schools including small and poorly-equipped rural schools.

The key success factor was the facilitative leadership of the principal. Where the principal was authoritative, schools faced difficulties in achieving improvement through Educational Kaizen approach due to the limited and inadequate communication between the principal, teachers, parents and the community.

9 In all pilot schools, the school culture started to change, through which (i) teachers became activated, (ii) teachers started to work together, (iii) teachers started to pay more attention to students, (iv) teachers started to think and act by themselves, and (v) parents started to participate in school activities.

Through QE circle activities, teachers learned to think, plan and develop teaching materials as well as activity-based and interactive teaching and learning. As a result, teachers understood that they could improve their teaching skills by self-learning to a large extent, when they worked together and taught each other.

Most of the pilot schools improved basic infrastructure and facilities with the support from parents and community. Since the pilot schools prepared their school development plan together with parents and community, a strong sense of ownership arose, enabling the fullest cooperation from parents and community.

(Impact Assessment of Pilot Project)

10 Academic Ability Test (AAT) was implemented to measure the impact of the Pilot Project on the students' ability in solving questions in science and mathematics. The means of increments of samples are calculated for the purpose of comparison between pilot and control schools.

Mean of pilot schools is larger than that of control schools, with the difference being extremely significant by t-Test. This indicates that there was a certain impact on the students' overall academic ability by the Pilot Project.

In both science and mathematics, means of pilot schools are larger than those of control schools at a statistically significant level. In all grades, means of pilot schools are larger than those of control schools.

11 Questionnaire Survey (QS) was conducted for school staff, students, and parents to measure the impacts of the Pilot Project by comparison of pilot schools and control schools.

When compared between pilot and control schools, the improvement was larger in pilot schools in all the indicators related to school culture and school management. The improvement in pilot schools was significantly larger in the indicators of School Climate (students' rating), Parents' Satisfaction with School (both students' and parents' rating), and Parents' Support (students' rating).

Improvement was greater in pilot schools in all but one indicator related to the category of science and mathematics teaching and learning. There was a significantly greater improvement in pilot schools for Science/Maths Teaching Method (teachers' rating), Use of Teaching Aids in Maths (students' rating), Use of Teaching Aids (teachers' rating), Evaluation of Science and Maths Class (students' rating), and Parents' Satisfaction with Science and Maths Education in School (parents' rating).

Improvement in School Facilities, Infrastructure, Teaching Facilities, Science Lab, Maths Room and Computer Room was greater in pilot schools than control schools. Improvement in pilot schools was significant in the case of Infrastructure and Teaching Facilities.

12 The survey on attendance rates of students was conducted by collecting the attendance rates of students in the 25 pilot schools. An increase was seen in all grades surveyed except for grade 10 in both March and July comparisons. Though the difference in each grade is not statistically significant, the average attendance rate shows a statistically significant increase (at 5% level) in the July comparison when all the grades are combined.

13 The overall impact assessment of the Pilot Project can be summarized below:

a) The Educational Kaizen approach functioned quite well and the school management improved, which was proved by the indicators in the QS related to school management. This indicates that Educational Kaizen activities could help the pilot schools improve their managerial capabilities.

b) Having activated school culture as the foundation for improvement, a number of interventions by the Pilot Project started to take effect on improving the quality of education in science and mathematics, such as development of teaching materials by teachers, training on model experiments, introduction of open class, and implementation of 100-box calculation. This improvement was proved by the indicators related to science and mathematics education in QS and the results of AAT. It implies that Educational Kaizen activities contributed toward the improvement of quality and efficiency.

c) Activated school culture encouraged participation of parents and community in developing basic infrastructure and facilities. It was proved by the indicators in QS related to school management and basic infrastructure and facilities.

d) As a combined effect of these interventions mentioned above, the pilot schools became a valuable and attractive place for students to go everyday. Consequently, the students' attendance rates increased. It implies that Educational Kaizen activities contributed toward the improvement of access and equity.

e) In addition, these surveys discovered that the Pilot Project provided a bigger impact on non-urban schools than on urban schools and likewise bigger on non-Type 1AB schools than on Type 1AB schools. It indicates that Educational Kaizen approach could contribute to minimizing inequity among schools.

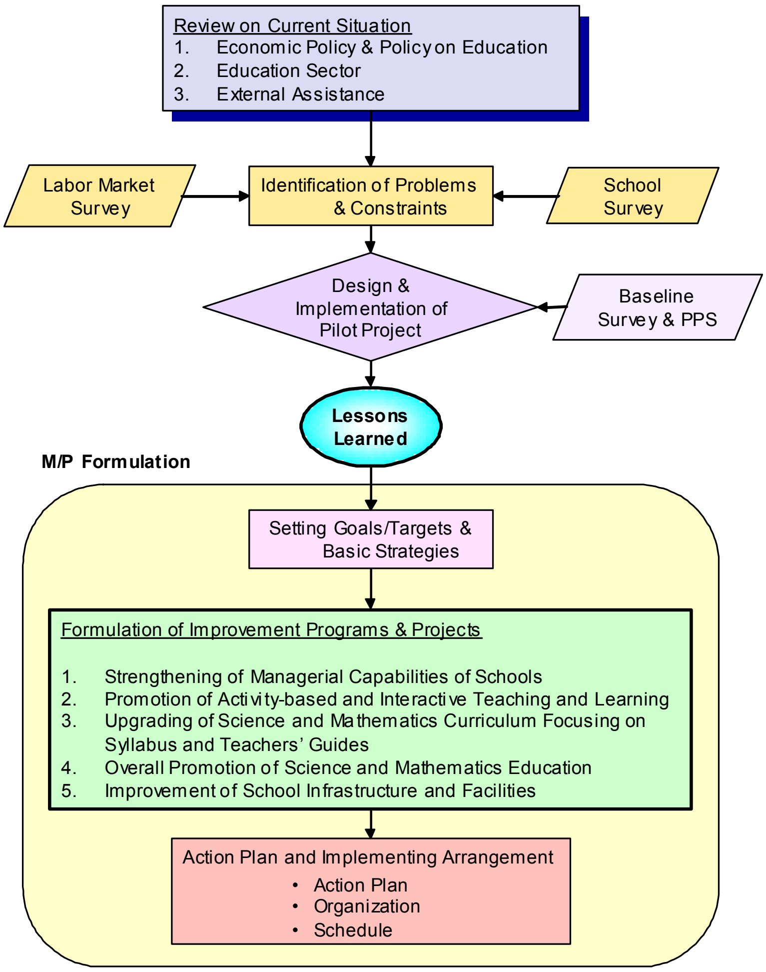
(Master Plan)

14 Formulation of the Master Plan was made by applying the experience and lessons learned through the Pilot Project to the improvement plan for Educational Kaizen activities. The school-based improvement plans were firstly prepared to be implemented at school level. Then, institutional and organizational plans for supporting the school-based activities were formulated at central and local levels of the implementing agencies.

For the preparation of the Master Plan, goals or targets were selected and set out as well as formulation of the strategies. Then, programs and projects for the development of science and mathematics education were prepared both at school and institutional levels.

Action plan was prepared selecting the early implementation projects from the proposed plans. Implementing arrangement including setting up of organizations, staff arrangement and scheduling for implementation was also planned in order to facilitate the implementation of the action plan.

15 The approach to the Master Plan is summarized and presented in the following figure.



Approach to the Master Plan

16 The Master Plan which extends over the period between 2005 and 2012 will be implemented in two phases consisting of short term (2005-2007) and long-term (2008-2012).

The following indicators concerned with efficiency, quality, sub-sector expansion, and equity are planned to be realized at the target year (2012).

- Efficiency - reduction of the drop-out rate in primary schools to less than 3% at grade 5;
- Quality - increase in the pass rates of science and mathematics in O-Level by 30% (based on the past 3 years average);
- Expansion of the science and mathematics sub-sector - increase number of students qualifying for universities in science/mathematics stream by 25%;
- Equity - improvement in equity between rural and urban schools by recruiting 100% graduate teachers for science and mathematics, and by

upgrading science facilities in Type 1AB and 1C schools particularly in rural area.

17 Strategies for the Master Plan have been set out following the review of the national policy on education presented in the Education Reform and the Education Development Plan for primary and secondary education. The review and analysis of current education issues have provided the background to the development of strategies for the Master Plan as summarized below.

a) A school-based approach or Educational Kaizen activities applied in the Pilot Project are used as the key strategy for formulating the Master Plan.

b) In the plan formulation, establishing the school framework for Educational Kaizen activities and strengthening of school management system are given first priority, together with strengthening activity-based teaching and learning at school level.

c) Then, institutional and organizational support is planned as a top-down approach for facilitating the school-based approach. This approach contains institutional and organizational development and capacity building of central and local offices of the implementing agencies.

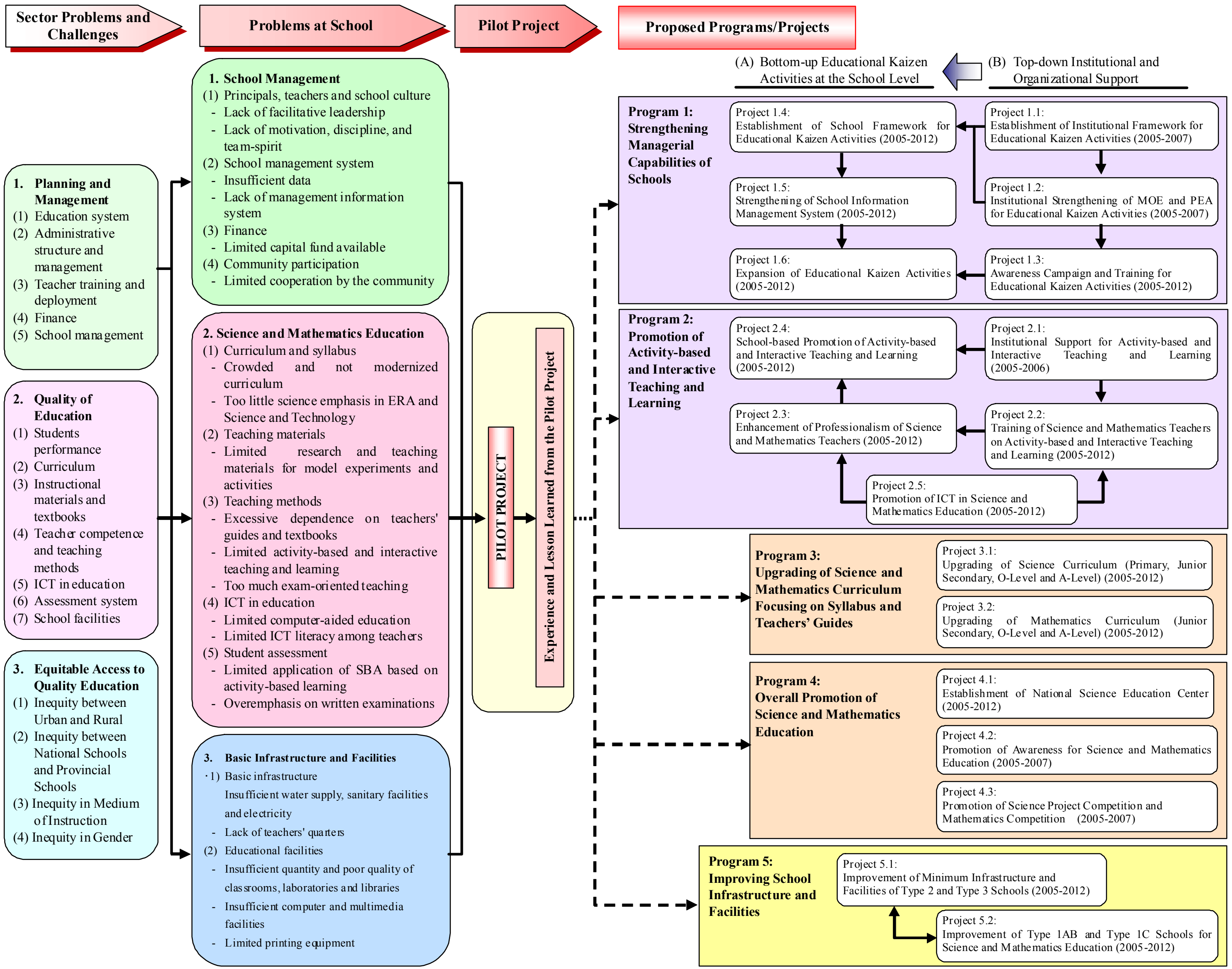
   Upgrading the curriculum of science and mathematics is also planned as well as improvement of science facilities as another top-down approach.

   The plans using top-down approaches have to be implemented simultaneously in order to achieve a smooth introduction of Educational Kaizen activities at the school level.

d) Finally, overall improvement for science and mathematics education through enhancement of the awareness is taken up as a strategy for the plan formulation in due consideration of the fact that importance of the two subjects has not been well recognized among students and parents and further promotion is indispensable for the society as a whole.

e) Practical and implementable plan formulation is another key strategy for the plan formulation.

18 The structure of the proposed plan formulated through the above process is explained below and summarized in the following figure.



Planning Process and Plan Structure of the Proposed Programs

The proposed plans consist of school-based approach and top-down approach. As for the school-based approach, promotion of Educational Kaizen activities at the school level is planned. As for the top-down approach, the institutional setup at MOE/PEA and NIE is planned. The proposed plans are finally integrated into the following five programs in due consideration of the function of the implementing organization and efficient implementation.

Program 1 is centered on "School Management", while Program 2, 3, and 4 focus on the "Science and Mathematics Education". Program 5 is proposed to address the problems in "Basic Infrastructure and Facilities" identified at school. Various projects are formulated for attaining the goals of each program. Titles, number of projects in each program, and overall goals are described below.

Program 1: Strengthening of Managerial Capabilities of Schools

Program 1 consists of six projects. Its overall goals are;

- To strengthen managerial capabilities of schools by introducing Educational Kaizen activities in 500 schools by 2007 and all (9,790) government schools by 2012, and
- To develop institutional framework within MOE and PEA to support Educational Kaizen activities

Program 2: Promotion of Activity-based and Interactive Teaching and Learning

Program 2 consists of five projects. Its overall goals are;

- To improve students' interests and achievements in science and mathematics through promotion of activity-based and interactive teaching and learning in the classroom.

Program 3: Upgrading of Science and Mathematics Curriculum Focusing on Syllabus and Teachers' Guides

Program 3 consists of two projects. Its overall goals are;

- To provide direction of relevant less-crowded curricula with both concepts and activities included reflecting modern Science and Technology and mathematics knowledge and real-life situations,
- To enable teachers to teach the curriculum using modern teaching-learning methods without loss of academic standards, and
- To enable students to enjoy learning science and mathematics in an interactive way and to improve their performance

Program 4: Overall Promotion of Science and Mathematics Education

Program 4 consists of three projects. Its overall goals are;

- To have teachers, students, parents and the general public gain an interest in science and mathematics,
- To have teachers, students, parents and the general public understand the importance and usefulness of science and mathematics education besides just being examination subjects, and
- To have parents encourage their children to take part in activities relating to science and mathematics.

Program 5: Improvement of School Infrastructure and Facilities

Program 5 consists of two projects. Its overall goals are;

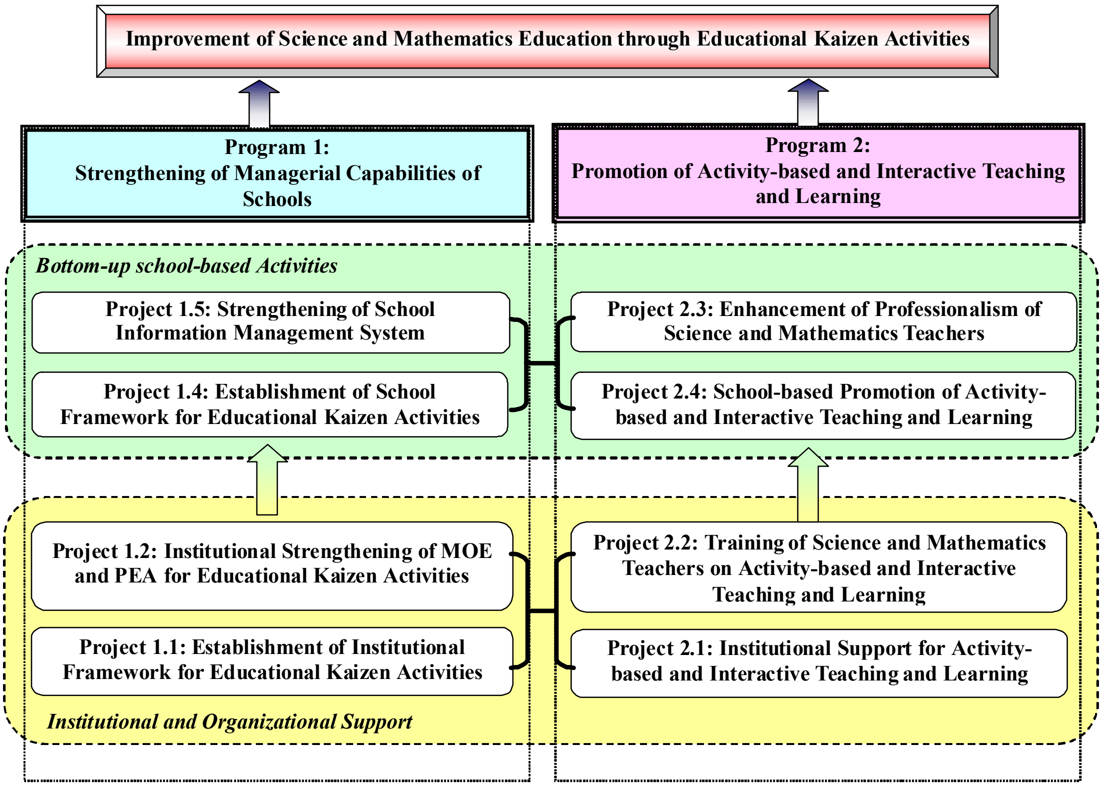
- To provide quality basic infrastructure in needy Type 2 and Type 3 schools,
- To provide O-Level science laboratories with minimum equipment and library facilities for Type 1C and Type 2 schools and to upgrade their existing laboratories, and
- To upgrade A-Level science laboratories in Type 1AB schools.

19 The total cost for implementation of the Master Plan is estimated at Rs.19,850 million: Rs.5,035 million for 2005-2007 and Rs.14,815 million for 2008-2012. The average annual cost is Rs.2,481 million for the entire program period, that is equivalent to 52.2% of the average annual capital expenditure for the general education during 1998-2002 (Rs.4,750 million). Considering this as well as the expected economic growth of the country in the future, the cost required for the proposed programs is within the range of the government finance.

The proposed programs in the Master Plan aim directly at improving managerial capabilities, quality of education in science and mathematics and basic infrastructure and facilities in the education sector. In addition to benefiting the education sector, the programs will have various socio-economic impacts on the entire nation.

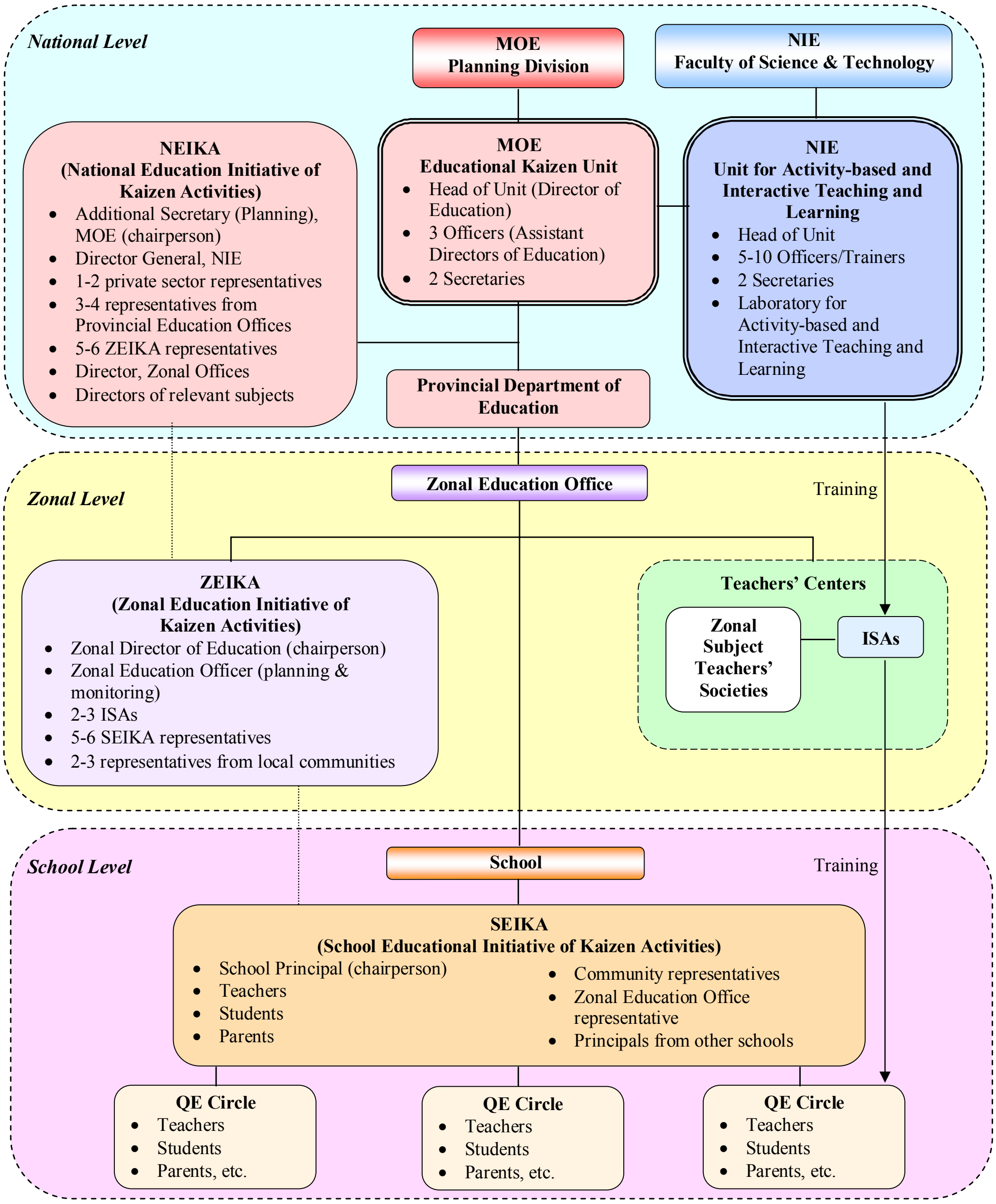
(Action Plan and Implementation Arrangement)

20 In due consideration of the fact that keeping current momentum and expansion of the Educational Kaizen activities is important and indispensable for attaining the improvement of the sub-sector, the Action Plan is formulated for realizing the short-term target, namely, expansion of the Educational Kaizen activities up to 500 schools. The relationship and order of implementation among these programs and projects are illustrated in the following figure.



Programs and Projects in the Action Plan (2005-2007)

21 Implementation Organization for the Action Plan is described in the following figure.



Implementation Organization for the Action Plan

(Conclusion and Recommendation)

22 School-based approach or Educational Kaizen activities are applied at the selected 25 schools island wide as the Pilot Project during 2003-2004. These activities are, in principle, classified into three categories, namely, "School Management", "Science and Mathematics Education" and "Basic Infrastructure and Facility" that are the three main target fields for improvement in this study. It has been proved that the Educational Kaizen activities are quite effective for the improvement in target fields. The Master Plan was formulated after implementing the Pilot Project by fully incorporating the valuable experience and lessons.

23 For promoting Educational Kaizen activities and successfully implementing the proposed projects, it is recommended that the following preparation and arrangement made by MOE in close collaboration with NIE and the related organizations.

a) Authorize the Master Plan and Prepare for Implementation

First, MOE and NIE are to authorize the Master Plan confirming the policy of promoting the school-based activities for quality improvement of the education and publicize it to all the government agencies concerned.

b) Establish New Units in MOE and NIE

For promoting Educational Kaizen activities and activity-based and interactive teaching and learning, new units are to be established in MOE and NIE.

c) Promote Awareness of Educational Kaizen Activities

Awareness campaign is to be implemented for promoting the activities.

d) Use the Models/Products Prepared through the JICA Study Effectively

Various kinds of materials for implementing activity-based and interactive teaching and learning have been prepared including model experiments, teaching aids, 100-box calculation, etc. which are to be used more intensively in the teachers' training in NIE and distributed to schools for facilitating the school-based activities.

e) Deploy Required Number of Teachers and Enforce Equitable Deployment Policy

Deployment of necessary science and mathematics teachers is to be implemented to fill the gap as soon as possible.

f) Intensify Follow-up Activities of Training on Principals and Teachers

It is strongly recommended that regular monitoring and follow-up be conducted in order to ensure the actual implementation of what was trained at the local and school levels.

g) Enhance Coordination among Stakeholders

Coordination among stakeholders is to be enhanced further by the initiatives of MOE and NIE for the successful implementation of the Master Plan.

THE MASTER PLAN STUDY FOR THE DEVELOPMENT OF SCIENCE AND MATHEMATICS IN THE PRIMARY AND SECONDARY LEVELS IN THE DEMOCRATIC SOCIALIST REPUBLIC OF SRI LANKA

FINAL REPORT: MAIN REPORT

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ABBREVIATIONS

AAT	Academic Ability Test
ADB	Asian Development Bank
ATS	Agency Testing Service
BESP	Basic Education Sector Program
BOI	Board of Investment
BS	Baseline Survey
CAL	Computer-Assisted Learning
CBG	Criteria Based Grants
CCD	Centre for Curriculum Development
CLC	Computer Learning Center
CRC	Computer Resource Center
DDE	Deputy Director of Education
DFID	Department for International Development - United Kingdom
GDP	Gross Domestic Product
DSD	Development of Schools by Division
EMIS	Educational Management Information System
ERA	Environmental Related Activities
ERIU	Education Reforms Implementation Unit
FC	Finance Commission
GCE	General Certificate of Education
GCE A-Level	General Certificate of Education Advanced Level
GCE O-Level	General Certificate of Education Ordinary Level
GEP	General Education Project
GEP2	Second General Education Project
GER	Grass Enrollment Ratio
GNP	Gross National Products
GOJ	Government of Japan
GOSL	Government of Sri Lanka
GTZ	German Technical Assistance Agency
HPO	Head Plus One
ICDL	International Computer Driving License
ICT	Information and Communications Technology
ICTA	ICT Agency
IEA	International Association for the Evaluation of Educational Achievement
ISAs	In-Service Adviser
ISTE	International Society for Technology in Education
IT	Information Technology
JICA	Japan International Cooperation Agency
MOE	Ministry of Education
MSE	Ministry of School Education
MT	Master Trainer
MTET	Ministry of Tertiary Education and Training
NAPITSE	National Policy on Information Technology in School Education

NATE	National Authority on Teacher Education
NCOE	National College of Education
NEC	National Education Commission
NEIKA	National Educational Initiative of Kaizen Activities
NER	Net Enrollment Ratio
NETS	National Evaluation and Testing Service
NIE	National Institute of Education
NIIR	Net Initial Intake Rate
PDE	Provincial Director of Education
PESO	Primary Education Specialist Officer
PGDE	Post Graduate Diploma in Education
PIT	Provincial Information and Communications Technology Resource Center
PPA	Past Pupils' Association
PPS	Post Pilot Survey
PSDG	Province Specific Development Grants
Q & A	Questions and Answers
QE	Quality Education
QEC	Quality Education Circle
QS	Questionnaire Survey
SBA	School-Based Assessment
SBM	School Based Management
SDB	School Development Board
SDS	School Development Society
SEDP	Secondary Education Development Project
SEIKA	School Educational Initiative of Kaizen Activities
SEMP	Secondary Education Modernization Project
SIDA	Sweden International Development Agency
SIRUP	Small-scale Infrastructure Rehabilitation and Upgrading Project
SIU	Special Implementation Unit
SLIATE	Sri Lanka Institute of Advanced Technical Education
SWAp	Sector Wide Approach
TC	Teachers' Center
TEI	Teacher Education Institute
TETD	Teacher Education and Teacher Deployment Project
TIMSS	Third International Mathematics and Science Study
TIP	Teacher In-Service Project
TPR	Teacher-Pupil Ratio
TTC	Teachers' Training College
TVEC	Tertiary & Vocational Education Commission
UNF	United National Front
UNICEF	United Nations Children's Fund
UPFA	United People's Freedom Alliance
VERP	Vanni Education Rehabilitation Project
WB	World Bank
ZEIKA	Zonal Educational Initiative of Kaizen Activities
ZIT	Zonal Information and Communications Technology Resource Center

CHAPTER I

INTRODUCTION

1.1 Study Background

Sri Lanka has made remarkable improvements in human development indicators since independence. Life expectancy marked 72 which are high as comparable to those of most middle-income countries. Adult literacy rates in terms of minimal language competency are 92% with a high level of gender parity. In the education sector, completion rates for primary and secondary school are around 98% and 83% respectively (2001)[1].

However, the core problem in education sector is considered to lie in its ‘quality’ which is clearly represented in the low pass rate of science subjects in O-Level and A-Level examinations, e.g. 42% in *mathematics*, 49% in *science* compared to 80% in *history* and 77% in *social studies* (O-Level); 51% in *chemistry*, 55% in *‘combined mathematics’* compared to 90% in *business studies* (A-Level). Accordingly only less than 20% of the all candidates qualify for university in science stream.

Under this situation, the Government of Sri Lanka (GOSL) requested the technical assistance for the Master Plan Study for the Development of Science and Mathematics in the Primary and Secondary Levels (the Study) to the Government of Japan (GOJ). In response to the request, the GOJ dispatched a preliminary survey mission in August 2002 and discussed the contents of the Study with GOSL, the results of which are compiled in the Minutes of the Meeting (M/M) and the Scope of Work (S/W) signed between the Ministry of Education (MOE)[2] and the Japan International Cooperation Agency (JICA).

Following the agreement between the two governments, the implementation of the Study was entrusted to KRI International Corp during the period of November 2002 and February 2005. The Study consisted of three field survey periods.

1.2 Objectives and Organization

1.2.1 Study Objectives

The objectives of the Study are:

[1] ‘The Development of Education’ Ministry of Education, Aug 2004
[2] Formerly ‘Ministry of Human Resources Development, Education and Cultural Affairs’

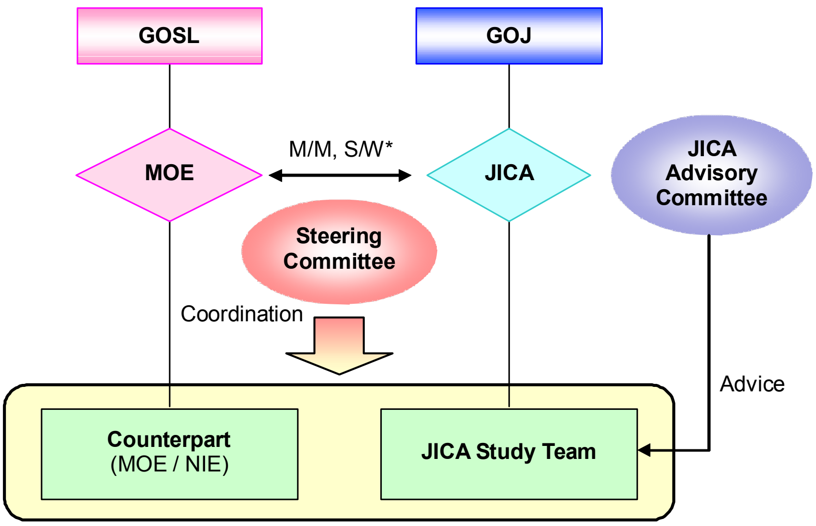
- To formulate a master plan to improve the quality of science and mathematics education in primary and secondary levels; and,
- To help strengthen the planning and implementing capacity of the Counterpart Personnel through the implementation of the Study.

The target area covered by the Study is the whole country of Sri Lanka.

1.2.2 Organizations

The Ministry of Education is the counterpart agency of the Study, and the Planning and Performance Review Division is in charge of coordination. For effective implementation and ultimately attaining the Study objectives, Counterpart (C/P) members have been selected from both MOE and the National Institute of Education (NIE), and assigned to the JICA Study Team. The field survey and analysis for the Study have been conducted by the JICA Study Team experts in collaboration with the C/P through the study period.

In addition, a Steering Committee was established as a coordination body among the organizations and agencies related. On the Japanese side, an Advisory Committee was set up in Tokyo for providing necessary advice to the JICA Study Team. The organizational structure of the Study has described as Figure1.2.1.



* M/M: Minutes of Meeting
S/W: Scope of Work

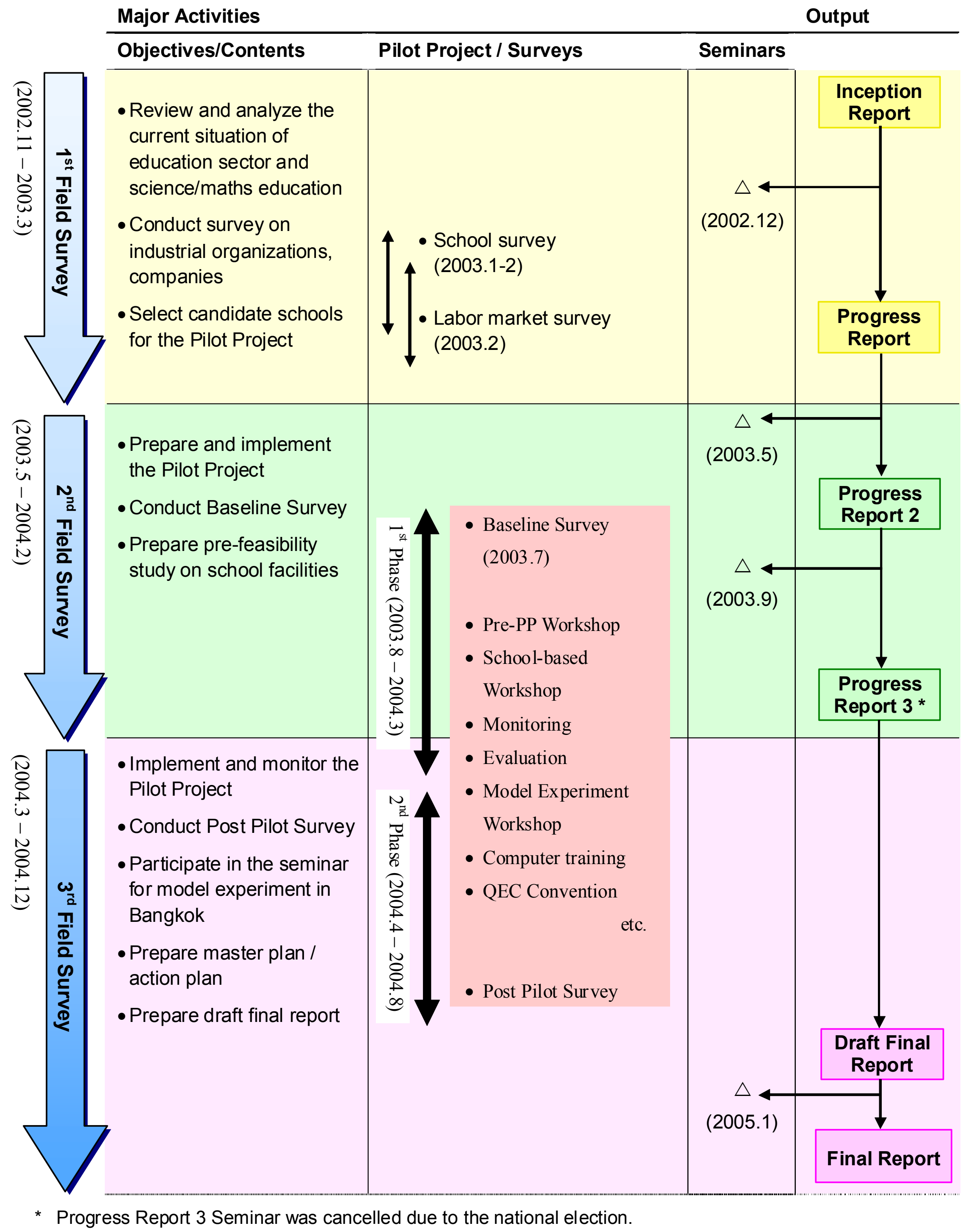
Source: JICA Study Team

Figure 1.2.1 Organization of the Study

The list of the members of the 1) Steering Committee, 2) Counterpart, 3) JICA Advisory Committee and 4) JICA Study Team is given in Appendix 1.

1.3 Major Activities

The major activities during the study period are summarized in Figure 1.3.1.



Source: JICA Study Team

Figure 1.3.1 Overall Flow of the Study

1st Field Survey (2002.11-2003.3)

After the preparatory work in Japan, the JICA Study Team commenced the 1st field survey from November 26, 2002. Following the preparation of the

Inception Report, a seminar was held to discuss the direction and the contents of the Study with related agencies. Members of the Steering Committee, representatives of the MOE both in central and provincial offices, international organizations and representatives of the Japanese Embassy and JICA were invited.

2nd Field Survey (2003.5-2004.2)

The 1st phase of the Pilot Project commenced in August 2003 and continued up to March 2004. Each pilot school prepared their own school development plan based on total 118 QE circles formulated as the central hub of all school-based activities.

The Study Team conducted several monitoring visits to the selected 25 pilot schools to evaluate progress of each QE circles and to support them with problem solving. Various workshops and events were conducted to promote the project implementation, e.g. school-based workshops, regional workshops and awareness activities.

At the end of this period, the 1st inspection program was also implemented to review all the activities and to examine all the expenditures. For the purpose of capacity building of personnel, e.g. teachers, principals and other school staffs, a number of training programs were also implemented such as model experiment workshop and computer training.

3rd Field Survey (2004.3-2004.12)

The 2nd phase of the Pilot Project started in April 2004 and was finally completed in August 2004 with participants accumulating up to approximately 20,000 man-months in total.

One of the key elements of the 3rd field survey was the QEC convention where principals and school staff gathered from all over the country to present and share their progress and findings with other pilot schools. As for the counterparts' capacity building, selected members joined the model experiment training program in Bangkok, Thailand in cooperation with the Institute for Promotion of Teaching Science and Technology (IPST). One-day workshop was held in October 2004 to discuss the possible proposed projects with counterparts and these are outlined in the master plan/action plan of the main report.

The achievements of the Pilot Project and the executed surveys are presented in the Progress Reports. Seminars were organized accordingly to discuss the progress and approach of the project inviting all related institutions and agencies.

At the last part of this period, the Team focused on preparing the draft final report to formulate an actionable Master Plan for GOSL by gathering and synthesizing all the fact-findings and lessons learned from the experiences throughout the 2-year project.

1.4 Structure of the Report

This Draft Final Report summarizes all the findings and the results of the surveys and analyses conducted. Detailed descriptions and the supporting information are found in the Supporting Report.

Following this introductory chapter, **Chapter II** examines Sri Lanka's current government strategy towards education and identifies major problems faced by reviewing the present situation with particular focus on science and mathematics education.

Chapter III explains the overall structure and implementing process of the 1-year Pilot Project including details of monitoring visits, various workshops, training and awareness activities.

Baseline Survey (BS) and Post-Pilot Survey (PPS) were also conducted before and after the Pilot Project to assess the overall impact. BS consists of Academic Ability Test (AAT) and Questionnaire Survey (QS) while PPS held an Evaluation Workshop, in addition, to collect some in-depth qualitative information. Finally lessons learned from the project are summarized.

Chapter IV presents the master plan concept and structure targeting the period 2005 to 2012. The chapter initially clarifies the rationale and methodologies used as the base of developing the master plan. After setting its goal and strategies, the selection of proposed projects is described in the programs/project profiles attached including rough cost estimations.

Five programs consisting of 18 projects are prioritized below:

- Program 1
  Strengthening of Managerial Capabilities of Schools
- Program 2
  Promotion of Activity-based and Interactive Teaching and Learning
- Program 3
  Upgrading of Science and Mathematics Curriculum Focusing on Syllabus and Teachers' Guides
- Program 4
  Overall Promotion of Science and Mathematics Education
- Program 5
  Improvement of School Infrastructure and Facilities

Following the detailed description of each selected programs/projects, the Action Plan is also discussed further. Arrangements for the early implementation of the action plan such as setting up of new organizations with required personnel and scheduling is outlined. Finally, the socio-economic impact will be examined by considering both direct and indirect impacts to Sri Lanka’s society and economy in the long term.

CHAPTER II

EDUCATION SECTOR

2.1 Government Strategy and Programs

2.1.1 Strategic Direction

(1) Development Policy and Education Sector

After the parliamentary election held on April 2nd, 2004, a new economic policy framework entitled 'Creating Our Future, Building Our Nation' was issued by the new administration in July 2004.

This new policy framework emphasizes a balanced, "pro-poor, pro-growth" development policy with the target GDP growth of 6-8% per annum, which combines market-friendly and export-oriented income generation with socio-economic development, particularly rural development, environmental protection and poverty reduction. The new administration committed to invest more for social and infrastructure development in the rural areas.

The new policy framework puts a high priority to create a 21st century workforce through educational reforms, human resources and skills development, and improving productivity with a new ethic towards performance excellence and innovation. Education is recognized as being central to economic growth and poverty reduction, and the government committed to transform and modernize the education system through the education reforms, with the objective of equipping Sri Lankan children with the requisite knowledge, skills and attitudes suited to face the rapid changes occurring in the socio-economic and global landscape of the 21st century.

This objective is to be achieved (i) by improving access to education through eliminating disparities and ensuring equity, and (ii) by strengthening the existing free, state education system of the primary, secondary and tertiary levels, through the following programs:

- Providing pre-service teacher training through the National Colleges of Education (NCOE) and in-service teacher training at zonal and divisional level in a comprehensive and systematic manner;
- Restructuring the public examinations (grade 5 scholarship, GCE O-Level and A-Level examinations) and introducing the School-Based Assessment (SBA) system;

- Training principals and teachers on School-Based Management (SBM) in order to empower them to become good leaders and managers;
- Upgrading selected rural schools in all divisions through the Navodya Schools (previously called as Development of Schools by Division [DSD] Schools) Project;
- Introducing Information Technology (IT) into the secondary school curriculum;
- Strengthening the existing university system through increasing the student placements and improving the quality of teaching; and
- Improving the match between vocational education and training and the rapidly changing labor market demand through redesigning the Sri Lanka Institute of Advanced Technical Education (SLIATE), the Tertiary and Vocational Education Commission (TVEC), National Institute of Technical Education and Vocational Training Authority.

(2) Direction of the Reform and Priorities of Science and Mathematics Education

The National Education Commission (NEC) in 1997 published the paper 'Reforms in General Education.' This paper became the basis for education reforms that were implemented over the following five years. The objectives of the reform were:

- To extend educational opportunity
- Improve the quality of education
- Provide good management and resources

Most of these reforms have commenced but with variable success. One such success relevant to our study is the new primary mathematics curriculum (DFID Project) that has been successfully implemented island-wide. However, there are still problems with management and resources, equity and quality issues.

Through 2002 and 2003, NEC developed a new set of reform policy proposals that were published in December 2003 as the document: 'Envisaging Education for Human Development - Proposals for a National Policy Framework on General Education'.

The document is now the blueprint for general education reform in Sri Lanka for the next five years and the following are the major contents related to our study.

1) Educational Opportunity

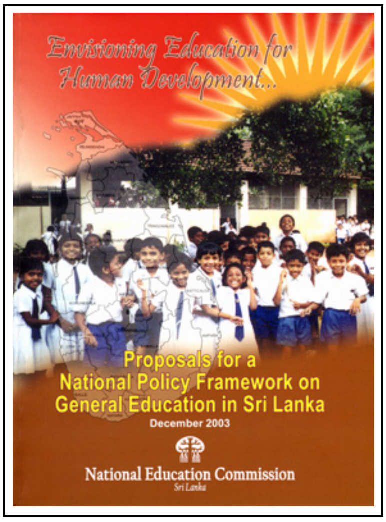
<u>Medium of Instruction</u>

- Bilingualism to be promoted with English as the medium of instruction in mathematics, science and information technology in secondary grades starting at grade 6

- Sinhala and Tamil to continue as the medium of instruction in other subjects.

2) Curriculum Renewal, Quality and Relevance, Assessment

Curriculum Renewal



- Junior Secondary grades 6-9
  - The subject s*cience* to replace 's*cience & technology'* (grades 6-9)
  - At least 20% of any subject grade be given on activity-based projects/practical skills assessed by SBA
- Senior Secondary grades 10-11
  - The subject s*cience* to replace 's*cience & technology'* (grades 10-11)
  - *'Information Technology'* to become a new O-Level subject
  - An activity-based project/assignment teaching method be used with activities a compulsory part of each subject curriculum assessed by SBA
- Senior Secondary grades 12-13
  - Science students must reach a minimum standard in a practical examination to qualify to sit for the GCE A-Level examination, examined by external panels
  - *'Information Technology'* to become a new A-Level subject

Promotion of Mathematics, Science and ICT Education at Secondary Level

The three subjects should be strengthened and expanded by:

- Establishing a science subject for grades 6-11 with a revised and expanded curriculum
- Activity-based interactive teaching and learning methods in science and mathematics
- Provision of adequate laboratory and information technology facilities
- Strengthening SBA with respect to assessing practical work, projects and assignments
- Extending the option of English medium for science students
- Popularizing science education through the media, science centers, science parks, science camps
- Introducing computer literacy in the core curriculum for secondary schools and in teacher education

- Providing facilities for '*Information Technology'* as a subject for GCE O-Level and GCE A-Level examinations
- Making facility improvements to the present Type 1C schools to upgrade them for the teaching of science and mathematics at GCE A-Level

<u>School-Based Assessment</u>

- The present system be reviewed, an objective common scheme devised for all grading and SBA be accepted as a permanent part of the assessment at O-Level and A-Level
- SBA in A-Level subjects should consider science practicals, projects, assignments and fieldwork for grading and the grades awarded be reviewed by external panels.

3) Education Government/Management

- The role of NIE be clearly defined and its role in curriculum development and educational research strengthened
- Linkages, coordination and good relations be established between MOE and Provincial and Zonal authorities
- Divisional Offices be abolished and Zonal Offices strengthened
- SBM be introduced to the school system as early as possible with training of principals and teachers and awareness programs for the wider educational system and the general public
- E-governance be introduced to the education system with the development of a National Education Information Network

4) Allocation of Resources for Education

- Education funding be increased from the current level of 3% of GDP to at least 4% to reach a long term target of 5% of GDP
- Private sector investment in education be facilitated, promoted and monitored
- Schools to generate funds from other sources and be given matching grants from government, these funds to be spent on quality improvement in their particular school
- Mechanisms and procedures to transfer funds to the Ministry, Provinces, Institutions, schools be streamlined and made efficient
- Principals with direction and advice from the School Development Board be given financial autonomy for the financial management of their school

(2) Education Sector Wide Approach (SWAp)

The IBRD and MOE have recently had discussions regarding a change in the nature of their assistance as an education development partner to Sri Lanka. The

IBRD Aide Memoire[3] outlined an approach that re-focuses Bank assistance from individual projects such as GEP1 and TETD to an education sector wide approach (SWAp). This was seen by the MOE as the most appropriate way to address the system-wide development issues faced by the Sri Lankan education system.

The key characteristics of the proposed sector wide approach will consist of:

- A comprehensive education sector development plan
- A multi-year education expenditure framework, and a long-term, output oriented education planning horizon
- Streamlined management system at central, provincial, and school level, including capacity building at each level

The sector program has four key development objectives: (i) Promoting equity, (ii) enhancing quality, (iii) strengthening capacity, and (iv) improving institutional capability. The sector program will support the government education development framework strategies with strategies to strengthen the basic and secondary education system by assisting the country to:

- Promote equitable access to basic education
- Increase learning levels and orient the education system to the world of work
- Enhance the efficiency and equity of resource allocation and distribution
- Strengthen the quality of service delivery

MOE has already decided on a bottom-up approach to SWAp by making its first task the training of principals on school level planning and the development of School Plans by the principal and the wider school community. These will be five-year plans 2006-2010 and will include rolling annual plans. Then will follow the development of Zonal Plans, Provincial Plans and finally National Plan.

2.1.2 Sector Development Plans

(1) Primary Education Development Plans

In 1999, MOE developed Five-Year Plan for Primary Education 2000-2004 in order to continue Primary Education Reform since 1997 and improve primary education further. The progress to achieve of the target set in 1999 by mid-2004 is generally good in terms of (i) extension of educational opportunity: Sri Lanka has already achieved nearly universal (around 98%) participation rate in the primary education, without gender disparity. But there is still a need to expand Primary Education Reform to more schools in terms of (ii) quality improvement

[3] IBRD Preparatory Mission Draft Aide Memoire July 26-August 12, 2004

in education, (iii) professionalization of teachers, (iv) better management of education, and (v) equitable provision of human and financial resources.

Since Five-Year Plan for Primary Education 2000-2004 will end in the end of 2004, MOE is now preparing the next Five-Year Plan for Primary Education 2005-2009, using bottom-up planning mechanism, in which Zonal Offices prepare zonal plans first, then Provincial Offices prepare provincial plans by consolidating zonal plans, and finally MOE compiles a national plan by consolidating provincial plans.

In the next Five-Year Plan for Primary Education 2005-2009, MOE plans to continue educational reform in the primary cycle, mainly through the following measures:

- Encouraging the use of toys in primary education, through developing model toy units in some primary schools;
- Introducing kid's library, a learning activity room, and a play area in primary schools;
- Improving teachers' capacity on activity-based, learner-centered teaching through a) School-based Teacher Development Program using In-School Training, and b) Teachers' Quality Circles in the divisional level;
- Training teachers for small rural schools on multi-grade teaching, on which NIE has already prepared two manuals;
- Strengthening Monitoring and Evaluation Cells at 30 pilot zonal offices, and establishing a computer-based databank on primary schools by collecting school questionnaires annually;
- Improving health and nutrition situation for primary school students by providing adequate toilets, safe drinking water, hygiene and nutrition education; and
- Introducing Child Friendly Schools[4] in 30% of primary schools in selected 7 districts[5] in collaboration with UNICEF from 2005.

(2) Secondary Education Development Plan 2004-2008

Following the document, 'Five-Year Plan for Primary Education in Sri Lanka 2000-2004' to facilitate the reforms of the Primary Cycle, the MOE has released

[4] Child Friendly Schools (CFS) are characterized as having the following 12 key determinants: 1) guarantee of children's rights, 2) learning quality, 3) reducing students' dropouts and absenteeism, 4) protective environment for students, 5) health and nutrition including life skills education for adolescents, 6) water, sanitation and hygiene, 7) early childhood development, 8) trained and motivated teachers and principals, 9) sports and recreational activities, 10) gender sensitiveness, 11) inclusiveness, and 12) children's and parents' participation.

[5] Nuwara Eliya and Mathale (Central Province); Badulla and Moneragala (Uva Province); Hambantota (Southern Province); Anuradhapura (Northern Central Province); and Rathnapura (Sabaragamuwa Province)

a document 'Five Year Plan for the Development of Secondary Education 2004-2008'. This document outlines a plan to systematize the implementation of secondary reforms to achieve set targets.

1) Access to Secondary Education

All students are entitled to quality secondary education within a reasonable distance of their home. Therefore it is planned to:

- Provide quality secondary schooling for all students living in designated geographic areas
- Ensure that class sizes of 40 in grades 6-11 and 30 in grades 12-13 are not exceeded in large schools
- Ensure that class sizes of 30 in grades 6-11 and 15 in grades 12-13 subjects are a minimum in other population areas.

2) Deployment of Teachers

Teacher excesses and shortages provide a teacher deployment problem. Teacher shortages are particularly noticeable in Physical Sciences and Mathematics A-Level subjects. There is generally a shortage of Tamil medium secondary teachers. It is planned that:

- Every school will have its correct quota of teachers and be provided with funds to pay the quota of teachers
- Teachers will be recruited and/or deployed to schools on a subject-specific needs basis
- Transfers and replacements of teachers will be closely monitored
- Small schools in remote areas will be given positive discrimination in regard to staffing

Many teachers in the system are untrained but are teaching science and mathematics. This is particularly true of Tamil teachers. It is planned that:

- Additional graduates to teach grades 12 and 13 and additional diplomates to teach grades 6 to 11 will be recruited
- Additional initial training and continuing teacher education will be provided
- An additional 15 provincial ISAs for O-Level subjects will be provided
- A-Level teachers will be trained activity-based teaching methods

3) Teaching Materials and Equipment

There have been distribution delays of materials and equipment to remote areas. Library facilities are also poor in these areas. There is a lack of remedial reading material and suitable material for teaching in the English medium. There are also equipment deficiencies at ICT Centers. It is planned to:

- Ensure the provision of required textbooks and materials on time
- Improve the capacity of teachers for designing and producing remedial teaching materials before 2005
- Before the end of 2005, prepare an action plan for materials production to improve teaching of science and mathematics based on the secondary level recommendations of JICA project
- Implement Science programs in 30 schools with upgraded laboratories in 2004-2005 and expand the program to cover all schools with GCE A-Level classes

4) School-Based Management

SBM although promised in the 1997 reforms has not yet been implemented. MOE intends to give individual schools more autonomy in the future. It is planned that there will be:

- Increased participation of school communities in school management
- Introduction of school boards
- Gradual handing over of school management to school boards in the near future
- Training of principals and teachers in SBM structures and processes
- Awareness programs conducted for SBM in 2005

5) Infrastructure

To improve access and equity, a detailed year-by-year program for secondary school infrastructure requirements for 2004 –2008 is included in the Plan.

Table 2.1.1 gives planned infrastructure requirements relevant to our study.

Table 2.1.1 Infrastructure Requirements Plan 2004-2008

Inputs	2004	2005	2006	2007	2008	Total
A-Level Labs	111	128	93	87	93	512
O-Level Labs (new)	189	182	177	170	175	893
O-Level Labs (converted)	15	14	14	12	15	70
Lab Tables	1,212	1,186	1,162	1,137	877	5,574
Lab Stools	8,675	7,060	6,810	6,810	6,810	36,165
Science Rooms (new)	63	137	57	81	40	378
Science Rooms (converted)	10	10	20	20	20	80
Science Field Centers	0	2	2	2	1	7
Libraries (new)	325	311	314	307	302	1,559
Libraries (converted)	20	20	20	20	20	100

Source: National Secondary Education Plan 2004-2008, MOE

The total cost of activities included in the plan is approximately Rs.892 billions.

An amount of Rs.233 billions can be allocated out of estimated budgetary provisions; an extra Rs.659 billions has to be found to fund the plan.

2.1.3 Collaboration with External Agencies

Several education sector projects are implemented under cooperation with external agencies. Only the projects that are supportive or related to the JICA Study are explained hereunder.

(1) Ongoing Projects

1) IBRD Projects

Second General Education Project: GEP2 (IBRD) 1997 – 2004 (extended to October 2005)

The main objective of this large top-down project is to promote quality, equity and efficiency of the system particularly for grades 1-9. This was achieved by producing new curricula and materials in all subjects and in-service teacher training and reorganization, renovation and refurbishment of Type 2 schools. Libraries were renovated, librarians trained and new books supplied. There was also management training at all levels.

There is still work underway on textbook and education publications, school facilities rationalization, ICT inputs, and English language teaching material.

GEP2 is very much related to the reform cycle just completed and the major components implemented but ongoing school facilities rationalization and ICT inputs are relevant to our study.

Teacher Education and Teacher Deployment Project: TETD (IBRD) 1996 – 2004 (extended to October 2005)

The main objective of this project is to improve the quality, effectiveness and efficiency of the teaching service. This was achieved by:

(i) Rationalization of teacher recruitment, (ii) deployment and training, (iii) strengthening teacher training authorities by focusing teacher training in Universities, NCOE and NIE. As well, new NCOE and teacher's centers were built and existing teacher training institutions refurbished. There were inputs in in-service teacher training and science equipment for NCOE. However, teacher deployment and in-service training of new graduate teachers remain a problem and some of the inputs in teacher education are still to be implemented.

Extension of the Two Projects

Both projects have been extended until October 2005 and have been refocused towards three priorities for the present Sri Lanka education system. These are: (i) Education in conflict-affected areas; (ii) promotion of English language teaching and learning; and (iii) support for ICT.

2) ADB Projects

Secondary Education Development Project: SEDP 1994-1999

This project involved three components:

- Development of curriculum and learning materials grades 6-11;
- Improvements of examination and evaluation system including the establishment of NETS; and
- School facilities improvement - infrastructure, equipment.

With the curriculum development there was coordination with the GEP2 project and with the physical infrastructure component, there was coordination with SIDA.

Secondary Education Modernization Project: SEMP 2001-2005

SEMP in many ways complements GEP2 in that it concentrates on grades 10-13 and is heavily concerned with examination reform through SBA. Many of its inputs e.g. curriculum strengthening in science and mathematics, upgrading Type 1C schools to Type 1AB schools with science labs, ICT inputs are relevant to our study.

The main objective of this project is to raise national examination results for both O-Level and A-Level students. This is to be achieved by quality improvements in grades 10-13, access to quality instruction for disadvantaged schools and efficiency in management and supervision.

The outputs for SEMP relevant to the JICA Study are: (i) Curriculum strengthening of all Type 1AB and Type 1C schools in Science, Mathematics, Computer Education and other subjects, (ii) establishment of CLCs, (iii) assistance with SBA and SBM, (iv) upgrading Type 1C schools with science labs, (v) provision of reference books in Sinhala, Tamil and English for A-Level classes, (vi) establishment of Environment Related Activities Centers. Many of these outputs are still ongoing, especially SBA and SBM.

3) UNICEF Projects

Child Friendly School Program, UNICEF 2002

The Child Friendly School Program (CFS) commenced in 2002 is an ongoing venture. The Program assisted in the development of 124 Child Friendly Primary Schools in the North Western Province as a pilot. The Program assisted in these areas: (i) school management and buildings, (ii) teachers' morale, (iii) teaching and learning including assessment focused on new assessment skills and attitudes as well as knowledge-based performance in written examinations. This is a school-based project and shares many common objectives with our study.

4) DFID Projects

DFID (UK) has been responsible for two primary school projects both now completed. These were: Primary Mathematics Project (1998-2004) and Primary English Project (1996-2002).

Both projects have been successfully implemented and will continue as government policy for the next primary cycle. The mathematics project is particularly relevant to our study.

5) GTZ (Germany) Projects

Basic Education Sector Program (BESP) – 2001-2005

This program is very broad with the main inputs being in primary teacher training and school education in conflict areas. The program related to our study is Teacher In-Service Program (TIP) 1999 - 2005 concerned with primary in-service training that emphasizes competency-based, learner-centered and activity oriented teaching and learning approaches, strengthening of school culture and in-service training for ISAs, principals and teachers. MOE has officially adopted the "Joyful Learning" manual form TIP for all primary in-service teacher training. TIP is a school-based island-wide program and complements the activities of the Pilot Project.

(2) Proposed External Assistance

1) Secondary Modernization Project: SEMP2 Project (ADB)

SEMP2 is particularly relevant to our study as it proposes a much more bottom-up school-based approach than it predecessor SEMP.

SEMP2 has two broad goals namely, to support GOSL strategy to improve the quality, equity, and management efficiency of secondary education and make it more responsive to new labor market requirements. Particular emphasis will be upon upgrading Type 1C schools to Type 1AB schools. SEMP2 will also coordinate efforts with (i) North East Community Restoration and Development Project (NECORD) (multi funded) and (ii) Small-scale Infrastructure Rehabilitation and Upgrading Project SIRUP II (JBIC funded) so as to avoid duplication of building school facilities.

The following are the proposed components of SEMP2:

- Component 1: Improvements in Quality and Equity of Secondary Education
- Component 2: Provincial and Zonal Capacity
- Component 3: Supporting Government Policies and Reforms for improving Education System Management

Special features of SEMP2 relevant to the JICA Study are:

(i) Continuous monitoring and supervision of school performance, (ii) school development plans; (iii) equity island-wide; (iv) promotion of science teaching and learning; and (v) decentralized education management.

2) Sector Wide Approach (SWAp) to Future Education Funding (IBRD)

The IBRD after discussions with GOSL and other donors UNICEF, SIDA and DFID have proposed a new approach of Sector Wide funding for education projects in the future. (Details are explained in 2.1.1 of the report.)

2.2 Development Challenges

The current situation of the education sector, focusing on science and mathematics education is discussed in this sub chapter. This discussion includes the accomplishments and problems of the sector from the viewpoint of quality, equity, and planning and management.

2.2.1 Quality of Education

(1) Curriculum

1) Current Situation

The suggested curriculum reforms under the 1997 General Education Reforms document have now taken place and preliminary moves are underway to commence another cycle of reforms especially at the secondary level. This new cycle of reforms should commence in 2005. The Centre for Curriculum Development (CCD) at NIE is responsible for the design and development of the school curriculum at Primary, Junior Secondary, and Senior Secondary Levels. The present school curriculum is explained below:

Primary Grades 1-5

Table 2.2.1 below describes the Primary School Curriculum by grade and subject.

Table 2.2.1 Primary School Curriculum

Key Stage 1 (grade 1/grade 2)	Key Stage 2 (grade 3/grade 4)	Key Stage 3 (grade 5)
First Language	First Language	First Language
Mathematics	English	English
Religion	Second National Language	Second National Language
Environmental Activities	Mathematics	Mathematics
Oral English activities	Religion	Religion
Interaction-grade 6 children	Environmental Activities	Environmental Activities
	Oral English Activities	Oral English Activities

Source: National Curriculum Process Plan June 2000 Annex 6

MOE have decided that the present primary curriculum will remain for another cycle. The curriculum is competency-based and the five grades are arranged in three key stages

Junior Secondary (Grades 6-9) and GCE O-Level (Grades 10-11)

Table 2.2.2 outlines the grades 6-11 curriculum. Grades 6-11 have a common curriculum except for the choice of additional subjects in grades 10-11.

Table 2.2.2 Junior Secondary Curriculum

grade 6	grades 7-9	grades 10-11
Religion	Religion	Religion
First Language	First Language	First Language
English	English	English
Mathematics	Mathematics	Mathematics
Health & Physical Education	Health & Physical Education	Technical Subject
Aesthetic Subjects	Aesthetic Subjects	Aesthetic Subjects/Literature
Social Studies & History	Social Studies & History	Social Studies & History
Environment Related Activities	Science & Technology	Science and Technology
Sinhala/Tamil (second language)	Sinhala/Tamil (second language)	Additional Subject I
		Additional Subject II

Source: National Curriculum Process Plan, June 2000, Annex 6, MOE

Students study Environment Related Activities (ERA) as their science subject at grade 6 and *'science and technology'* in grades 7-11.

GCE A-Level (grades 12-13)

Each student studies three academic subjects in grades 12 and 13.

The three academic subjects are available in three streams. These streams are university faculty entry requirements. The three streams are: Science (Biological Science or Physical Science), Commerce and Arts

Biological Science stream students study *biology*, *chemistry* and *physics*. Physical Science stream students study *chemistry*, *physics* and *'combined mathematics'*. Practical work in *biology*, *chemistry* and *physics* is supposed to be compulsory but this rule is not enforced.

2) Review of Syllabuses

The syllabuses are well presented and detailed. However, there are too many topics in the Junior Secondary, O-Level and A-Level syllabuses and the degree of difficulty of some A-Level content is high. Many teachers have problems in completing all the topics in a particular syllabus. As more time in the school calendar is required to be given to SBA activities, it will be necessary to consider modifications to most syllabuses to allow for this change. There is little mention of ICT in the Junior Secondary, O-Level and A-Level syllabuses.

a) Science

Primary Environment Related Activities (ERA)

Grades 1-5 Environment Related Activities explores the world in which the primary children lives, commencing with familiar things like animals, trees, wind, etc. and then looking at issues such as pollution, small scale gardening. The content is arranged in themes. A criticism is that simple science concepts are neglected in the syllabus.

Junior Secondary and GCE O-Level Science and Technology

The Junior Secondary and O-Level *'science and technology'* syllabus is a broad approach to science and its applications and was devised to overcome the more academic approach of the previous science subject at Junior Secondary and O-Level. However, the curriculum in some places does not make links with science concepts. There could also be a reduction in the content of the curriculum. Grade 6 environment related activities is a bridging course between primary and junior secondary and is very much based on informal practical activities to illustrate science concepts. These concepts are integrated with social studies in a thematic approach.

GCE A-Level Science

The A-Level syllabuses are of international standard but could still be reduced in content. The content in the three science subjects is very academic particularly in *chemistry* and *physics*. Each subject has a good experimental program (Practicals Program).

b) Mathematics

Primary Mathematics

A new primary mathematics curriculum was prepared as part of the DFID project (1998-2004) and contains content to the highest international standard. The syllabuses, teachers' guides and textbooks are excellent.

Junior Secondary and GCE O-Level Mathematics

The syllabuses from grades 6 to 11 have similar content and standard to syllabuses internationally. They are concept and skills based and would be better if more applications were included and some topics left to A-Level. These topics could be part of a bridging course between O-Level and A-Level.

GCE A-Level Mathematics

The syllabuses are highly academic and of international standard but could be reduced in content. Applied mathematics with dynamics and statics used to be called mechanics is very oriented to mathematical physics. Other applications of mathematics like many from discrete mathematics are excluded. These are more relevant for students in the computer age.

(2) Textbooks and Instructional Materials

1) Textbooks and Distribution System

General

Textbooks are provided free to schools for distribution to all students island-wide up to grade 11. These include Sinhala and Tamil versions of each book in the various school subjects from grades 1-11, English language books for English as a second language classes in grades 3-11 and English medium classes in grades 6, 7 and 8. In grades 12 and 13, some students buy their own textbooks and others are distributed to students under various schemes.

SEMP has provided several Type 1AB schools with a number of English medium reference books in *biology*, *chemistry*, *physics* and *mathematics*.

Although NIE officers design and prepare the syllabuses and teachers' guides they do not write the textbooks. Teams of teachers write the textbooks with some assistance from education officers and university people.

Primary

Primary mathematics textbooks for grades 1-5 have been produced by the DFID project team and distributed to schools over the past five years. They follow the syllabuses closely and are of high quality. Included are attractive student centered activities as well as the usual mathematics computation sections. They are attractively presented in several colors. There is no textbook for primary ERA.

Junior Secondary and GCE O-Level

There are separate mathematics textbooks for each grade from 6 to 11 and these compare favorably with publications from overseas education systems except in the quality of production. They follow the syllabuses closely. However, some revisions need to be made particularly at the grades 6-9 levels. These revisions include closer adherence to the various syllabuses, more detail on specific topics with clearer explanations, increased numbers of examples, better layout and correction of errors in the answers section. There also need to more student activities included in the textbooks. These additions will take place in the next curriculum cycle.

The grade 6 Environment Related Activities textbook is unique in that it was produced in 1999 for the special grade 6 bridging course introduced in Sri Lanka schools. The textbook provided is a color edition but the standard of color, layout and artistry is varied. This integrated subject covers Social, Natural and Manmade Environment and the textbook covers topics from both science and social science. Junior Secondary ‘s*cience & technology’* grades 7-11 follow on from the grade 6 Environment Related Activities and the grade 7-11 textbooks capture the unique nature of this subject. The textbooks are activity-based and integrate ideas from *biology*, *chemistry*, *physics* and *technology*. They have excellent illustrations and applications and the units covered are relevant to local society and culture. However, several units are not sufficiently linked to the science concepts that they contain.

GCE A-Level

A-Level Textbooks for *biology*, *chemistry*, *physics* and *‘combined mathematics’* are in English medium and come from overseas publishers. Fortunately, the content in books, particularly from the United Kingdom, Singapore and India is similar to the Sri Lankan A-Level curriculum content. Teachers select material from the textbooks that corresponds to the local syllabuses.

SEMP is providing extra library copies of *biology*, *chemistry*, *physics* and *‘combined mathematics’* textbooks to Type 1AB schools.

Publication and Distribution of Textbooks

Prior to 2002, the Education Publications Department of MOE arranged for the printing and distribution of all textbooks that are free for students. From 2002, private firms have tendered to the Education Publications Director for the writing and production of textbooks. The private firms employ people to write the textbooks (usually teachers). The Educational Publications Department is responsible for the distribution of the textbooks to schools. The private sector is to be asked to tender for this service from 2004 onwards. The Educational Publications Department buys copies of the first choice book of the schools, one for each student. As well, the department distributes one copy per subject per grade of two other books to each school as library reference books for teachers and students. At present, the Educational Publications Department distributes the textbooks island-wide through Divisional Offices from where they are delivered to schools. There have been problems with lateness, non-delivery and errors. It is intended that the distribution of the textbooks be put out to private sector tender to increase efficiency of delivery.

2) Teachers’ Guides and Reference Materials

Teachers’ Guides

NIE Curriculum Officers produce Teachers’ Guide(s) corresponding to each syllabus they prepare. The Teachers Guides provide learning objectives for each subject, sequence of topics, allocation of time to topics, teaching notes on content, learning/teaching strategies and assessment details. From subject to subject, they vary in detail with the Science Teachers' Guides providing more information for the teacher than the Mathematics Teachers' Guides. There was also evidence to suggest lack of correlation between Teachers' Guides and textbooks in some cases. Relevant Teachers' Guides are distributed to teachers through the Divisional Offices and teachers receive training from ISAs on their use. As in most countries, many teachers teach from the textbook but make use of teachers' guides as their only reference book. However, the quality of teacher's guides varies from subject to subject.

Reference Materials

Sri Lankan teachers have little access to reference material in the Sinhala or Tamil medium. There are some small publications in science and mathematics on selected topics but these have limited circulation. With the upgrading of Type 1AB school libraries, GEP2 has provided a good range of English medium Science and Mathematics reference books. As well as these reference books, some schools have limited material on CD, DVD and video for A-Level classes. There is little ICT material in schools.

Activity-based and student-centered teaching and learning places much emphasis on the teacher preparing his/her non-written material from locally available resources. The school survey reported that there was much local material available to use in the classroom. School visits showed that primary teachers have taken up the reforms to make up their own materials both with many well equipped classrooms displaying charts, mobiles, models, teaching aids made from various local materials etc. This was not evident in many secondary classes where more traditional textbook, "chalk and talk" methods are still preferred to student-based active learning.

(3) Teacher Competence and Teaching Methods

Teachers play key roles in improving education in schools. Without improving teachers' motivation and capacity for teaching, education reform will not bear any fruitful results at the school level.

Since teacher's qualifications are only a small part of teachers' capacity to teach, it is important to assess the level of teachers' actual capacity to teach. School Survey conducted by JICA Study Team in 2003 shows that according to the principal's evaluation, teachers' teaching capacity is ranked at the highest in private schools, and teachers in urban schools are perceived to have higher teaching capacity than those in rural schools.

In Sri Lanka, many school children suffer not only from shortage of qualified teachers, but also from teachers' absenteeism. While MOE can set the required teaching time for each subject, it is up to teachers how many minutes are actually allocated for education, because teachers are often absent from classrooms due to various reasons.

JICA Study Team investigated the situation of the lost teaching time for science and mathematics lessons in 25 pilot schools. This survey indicates that more than 30% of the required teaching time for grade 8 and 10 students and more than 20% of the required teaching time for grade 4 students was lost due to absent teachers. More than 60% of the reasons for this are teachers' leave: teachers are entitled to take a total of 41 days of annual leave, and most of teachers are taking 100% of their leave.

Considering the pleas of children who suffer from lack of teachers in their classroom, it is important to arrange substitute teachers for teachers taking leave, and the required number of teachers for a school must take into account the need for substitute teachers. If increasing the number of teachers is not possible for the time being, it may be necessary to adjust the contents of curriculum to fit the actual teaching time by teachers.

In Sri Lanka, while co-curricular activities such as sports and club activities after regular school hours are encouraged in the new curriculum, most of teachers leave school just after 2 pm, when their required work hour finishes. This is partly because many teachers work in private tuition classes after school hours, or many female teachers (about 70% of teachers are female) are busy in household work.

Teachers' high absenteeism may be the reflection of low professionalism of teachers, because teachers put higher priority on their personal interest and convenience over children's needs. Lack of professionalism is also identified in the fact that around 10-15% of NCOE graduates refuse to work in rural schools due to their personal convenience, although they are mandated to work in rural schools for at least 3 years.

This tendency is found not only in NCOE graduates, but also in university graduates, some of whom become A-Level teachers. Both of them are a part of a small number of the privileged students who are admitted to higher education (only 2.5% of 20-24 years old age-group is enrolled in universities), but unfortunately most of them lack the commitment to work for the profession. It is important to improve teachers' professional ethics and commitment in improving urban-rural inequality for the betterment of all Sri Lankan children during pre-service training in NCOE as well as universities.

Education reform in 1997 recommended introducing student-centered learning especially in the primary level, which requires teachers to learn and use various new teaching methods in classrooms. During implementing the Pilot Project, JICA Study Team conducted a survey on the actual teaching methods applied in science and mathematics lessons at 6 pilot schools. The summary result of the survey is shown in Table 2.2.3, which indicates that while student-centered activities are more practiced in primary level than in secondary level, still traditional teaching methods such as lecturing by teachers and exercise by students are prevailing especially in secondary level.

Table 2.2.3 Average Time Spent for Various Teaching Methods (%)

Subject	Grade	Teacher-centered teaching methods						Student-centered teaching methods				Inactive Time
		Lecturing by teacher	Q & A between teacher & students	Exercise by students	Experiment Demonstra-tion by Teacher	Other	**Sub-Total**	Discussion among students	Presentation by students	Experime nt by Students	**Sub-Total**	
Mathematics	4	23.4%	20.0%	45.4%	0.7%	0.0%	**89.6%**	2.2%	2.7%	3.2%	**8.1%**	2.3%
	8	34.7%	16.1%	33.2%	1.9%	0.6%	**86.5%**	3.0%	5.0%	0.0%	**7.9%**	5.5%
	10	30.5%	8.0%	41.8%	0.4%	0.0%	**80.8%**	5.0%	1.7%	0.2%	**6.8%**	12.4%
	All	30.0%	14.3%	39.8%	1.0%	0.2%	**85.4%**	3.4%	3.2%	1.0%	**7.6%**	7.1%
Science	4	18.4%	18.0%	20.0%	5.0%	2.0%	**63.4%**	3.0%	7.1%	23.4%	**33.5%**	3.1%
	8	33.5%	18.0%	19.0%	7.0%	0.6%	**78.2%**	2.6%	7.0%	6.8%	**16.4%**	5.4%
	10	30.9%	12.9%	26.0%	4.7%	0.0%	**74.5%**	2.2%	3.3%	9.3%	**14.8%**	10.6%
	All	28.3%	16.2%	21.8%	5.6%	0.8%	**72.7%**	2.6%	5.7%	12.5%	**20.7%**	6.6%

Source: Survey on Teaching Time, JICA Study Team

Problems on science and mathematics teachers' competence and teaching methods are summarized below.

- *Insufficient training of secondary level science and mathematics teachers on activity-based and interactive teaching and learning:* While many teachers in primary schools are now utilizing student-centered learning techniques, teaching in secondary schools is still dominated by one-way lecture style due to examination-oriented curriculum. Since secondary education is the important part in basic education for all, it is important to use activity-based and interactive teaching an learning, especially for science and mathematics, in order to make science and mathematics more practical, relevant and enjoyable subjects for all students.
- *Low professionalism and little cooperation among science and mathematics teachers:* Even if teachers are trained in new teaching methods, many teachers are afraid of practicing them in their classrooms, because there is limited support from their colleague teachers and ISAs. Experience in JICA Pilot Project suggests that if teachers are encouraged to work and collaborate in a group (such as a QE circle), they are more eager to try new teaching methods due to good support from their colleagues as well as peer pressure from them. Teachers' teamwork is an important way to promote their self-development and enhance their professionalism.
- *Weak emphasis on practical application of science and mathematics:* Since examination-oriented curriculum tends to make science and mathematics education only for theory understanding and memorization, it is necessary to emphasize more practical application of science and

mathematics in their real life situation in order to make science and mathematics education relevant to all students.

- *Little use of teachers' hand-made teaching materials for science and mathematics experiments and practicals:* While schools often request modern science laboratory equipment, it is important to encourage teachers to develop their own teaching materials by using locally available resources for science and mathematics experiments and practicals. Teachers' creativity should be encouraged in making hand-made teaching materials, which can stimulate children's interests in application of science and mathematics in their own life and environment.

(4) ICT in Education

1) Government Policy

The National Policy on Information Technology in School Education (NAPITSE) of the Government of Sri Lanka was issued in 2001 by the IT Unit of MOE. It emphasizes ensuring ICT literature for all school leavers and the use of ICT throughout the curriculum at secondary level.

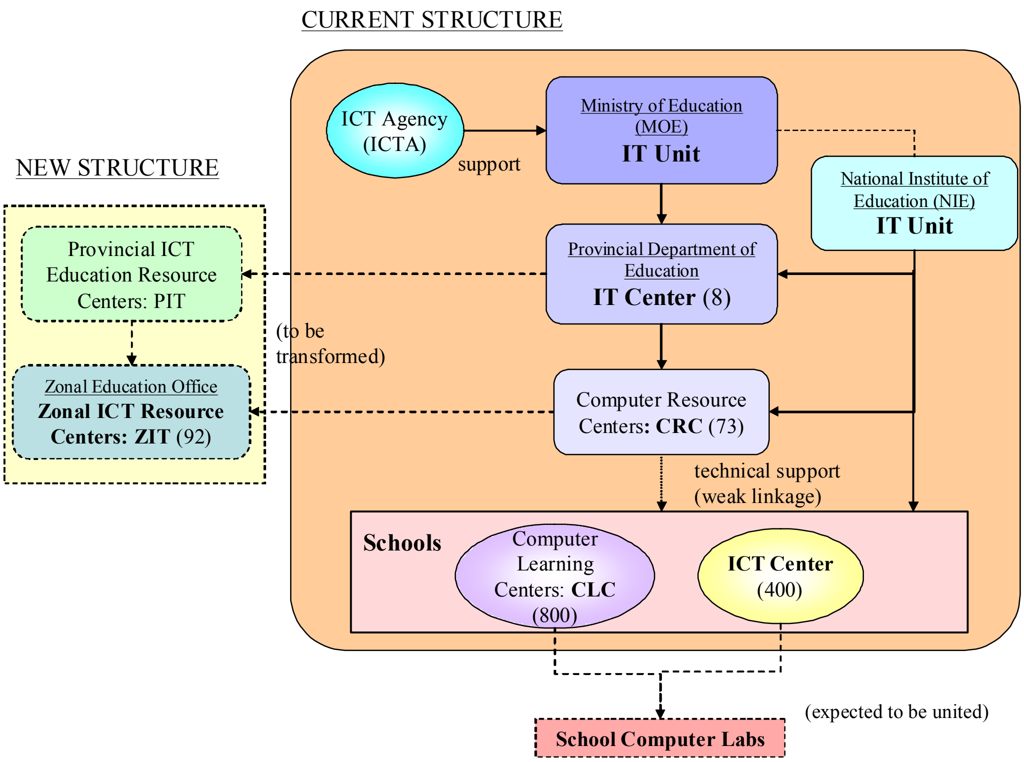
The practical implementation of the national policy is predominantly under the responsibility of development projects funded by international donors. The major ongoing or completed projects are GEP2 (Second General Education Project) and TETD (Teacher Education and Teacher Deployment) funded by the IBRD, and SEMP funded by ADB. A total of 8 Provincial IT Centers for teacher training and 1,200 school computer laboratories have been established under these three projects. Both ADB and the IBRD have also supported in-service teacher training in ICT and teaching material production for schools.

2) Institutions and Supporting Organizations

The major bodies of ICT education and their interrelations are illustrated in Figure 2.2.1.

<u>National Institute of Education (NIE)</u>

The IT Unit of NIE is responsible for in-service teacher training, evaluation of ICT curriculum, development of CLC and ICT Centers, as well as development, production, distribution and evaluation of educational software. There are five academic officers assigned to conduct the ICT functions. In addition, NIE can utilize a resource pool of specialists, mainly from the staff of CRCs.



Source: MOE, NIE

Figure 2.2.1 Organizational Structure of ICT Education (Oct 2004)

Computer Resource Centers (CRC)

The main functions of the 73 CRCs are ICT education for students waiting for their examinations results, teacher training, and technical support to CLCs and ICT Centers. Most of the equipments installed in CRCs are already outdated since only a few have been renewed after its establishment back in 1994.

The distribution of CRCs is not even, favoring the most developed Western Province and disfavoring especially the conflict-affected North Eastern Province. According to the plans of the IT Unit of MOE, a network of 92 Zonal ICT Resource Centers (ZIT) will be established based on the existing CRCs.

3) Curriculum, Syllabus and ICT Education Conducted

Generally, the overall goal is to introduce ICT in the curriculum of each subject at secondary level. Currently there is only two separate optional IT subjects:

Classes in General IT for grade 12 commenced in June 2002. It is intended to implement in all Type 1AB schools where they have computer centers. A teacher's guide for teachers and a resource book for students are also provided.

Classes in GCE O-Level Information Technology (grades 10-11) started as a pilot program in 2003. The subject is planned to be launched island-wide in January 2005.

The curriculum of ICT education targeting grades 6 to 9 is still underway, and the installation of the ICT Centers is not yet complete. However, they are also aiming to introduce ICT into the curriculum of each subject in these grades.

4) Teaching Materials and Teacher Training

Basic MS-Office applications including Excel, Word, PowerPoint, Access and Internet Explorer are available in all of the different types of computer centers. CAL material on CD-ROM media is being produced for both CLCs and ICT Centers, containing a wide sample of software targeted to science and mathematics education. Production of learning software by individual teachers is encouraged, and private ready-made software is also available. Off-line digital encyclopedias are available in computer centers, as well as resource books to guide the use of the applications.

In-service teacher training for general educational ICT skills, maintenance of ICT Centers, IT subject instructions as well as production and evaluation of CAL software has been provided through both ADB and the IBRD projects. Training has been conducted in NIE, Provincial IT Centers, CRCs, and recently also by private training companies. The total number of teachers accessed to these trainings is estimated to be approximately 20,000 by the end of December 2004. The long-term goal of SEMP is to offer International Computer Driving License (ICDL) certificate to all teachers at schools with CLCs.

Main issues are the capacity limit of NIE and insufficient resources of other bodies such as CRC and Provincial IT Centers. Poor command of English is another major obstacle for teachers to obtain ICT skills.

5) Facilities and Equipment

Computer Learning Centers (CLCs) were established under the SEMP funded by ADB. After recent decisions, the goal is to set up a total number of 1,200 CLCs island-wide by 2005, out of which 800 should be completed by December 2004. Information and Communication Technology Centers (ICT Centers) was established under the GEP2 funded by the IBRD. The goal of setting up 400 centers has reached in 2004. An estimate of the number of computers distributed to the schools by Government or international donors is 17,800.

6) ICT for Science and Mathematics Education

The major problems that face ICT for science and mathematics education are as follows:

Insufficient ICT literacy among teachers

Low ICT skills of teachers prohibit them from using ICT in their teaching practices. Lack of applicable teaching and learning material is another reason why ICT tools such as Excel are not widely used in science and mathematics education. As mentioned earlier, English is a notable obstacle to many teachers in adopting the necessary ICT skills, as the interface language of applications and resource materials are predominantly English.

Lack of teaching materials

The overall goal of the use of ICT is to support developing experimental and student-centered learning. Educational software is prepared to help the understanding of key concepts and support the promotion of multiple assessment modalities. Spreadsheet and text processing software should find extensive use whenever student reports are made, especially in A-Level science education.

In addition lack of Sinhala and Tamil media software and resource materials makes it difficult for students especially below O-Level to follow instructions or the course of educational software.

Lack of equipment, poor maintenance and low quality of facilities

The majority of government schools still lack computer laboratories. Together with poor facilities in many schools (no air-conditioning, no shelter from insects or humidity), poor basic maintenance may lead to deterioration of equipment and endanger progress in developing ICT literacy.

Lack of Internet access

High cost of Internet access and lack of cable connections in rural areas result in very few schools with access to the Internet. Strengthening the necessary network infrastructure requires government interventions and strong support.

(5) Assessment System

1) Public Examination System

The National Evaluation and Testing Service (NETS) administers the Public Examination System. There are three public examinations conducted each year, namely:

- Grade 5 Scholarship Examination
- GCE O-Level Examination (end of grade 11)
- GCE A-Level Examination (end of grade 13)

Grade 5 Scholarship Examination

This examination is held in August every year and has two major objectives:

One is the provision of financial assistance scholarships (bursaries) to the parents of clever students from disadvantaged economic or geographical backgrounds. The other is that Scholarship holders together with those who 'qualify' are eligible to go to popular schools.

292,000 candidates sat the examination in 2003. Only 10,000 candidates obtained scholarships, while another 13,000 students 'qualified' in the examination. This means that 23,000 students were eligible to attend popular schools.

However, the small number of scholarships being offered is an access and equity problem as the number of students sitting the examination has risen in recent years and the number of scholarships has remained the same. Additional scholarships need to be offered to give more disadvantaged students an opportunity to have a better education.

GCE O-Level Examination

The examination is held in December each year at the end of grade 11 and more than 330,000 school students sat the examination in 2003. A total of 59 subjects are offered in the curriculum.

An O-Level "pass" is passing 6 subjects (including first language and mathematics at one sitting) from a minimum of 8 subjects studied. For a student to qualify for A-Level studies three of these subjects must be at credit level and to enter a science stream in A-Level, one of these must be in science or mathematics. In 2003, 44% of students sitting the O-Level examination qualified for A-Level studies. For the O-Level written examination component, there are two papers for each of *'science and technology'* and *mathematics*, one multiple choice and the other a traditional written answer paper.

SBA grades are the same as for the written examination (A, B, C, S and Weak) and a student's results have two columns (parallel reporting) of their SBA grade and their examination grade.

The main issues for the GCE O-Level examinations are: Poor pass rates in *'science and technology'* and *mathematics*. These are still low and require improvements in teaching methods, syllabus modifications, provision of more instructional materials and the high dropout rate between O-Level and

A-Level studies. This problem is linked to the low pass rates and will only improve if the pass rates improve.

GCE A-Level Examination

The examination is held in April/May each year at the end of grade 13 and more than 171,000 school students sat the examination in 2004. Government policy states that this examination is to serve a dual purpose, an attainment examination and a means of selection to University.

Students study only three subjects out of a total of fifty subjects. To qualify for university they must obtain sufficient marks to pass in those three subjects. They must also take the Common General Test (not counted for assessment) and may also take General English as an option. SBA will be implemented for the 2005 examination.

The three subjects that students study are designated in streams and are pre-requisites for university studies in particular undergraduate courses. These streams are:

- Biological Science (*biology*, *chemistry*, and *physics*)
- Physical Science (*chemistry*, *physics*, and *'combined mathematics'*)
- Commerce
- Arts

An (A-Level) "pass" is passing three subjects at one sitting. For each of the three science subjects, students sit for two papers, one a multiple-choice paper and the other a longer traditional written paper. For each of the two mathematics papers, students sit for a pure mathematics paper and an applied mathematics paper, both papers being traditional written papers.

Main issues for the GCE A-Level examination are; a) poor pass rates particularly in *chemistry*, *physics* and *'combined mathematics'*. These many able students miss out on university education and have to seek employment or other forms of further training; and b) there are limited places at universities compared with those who qualify from the A-Level examination. This creates intense competition for places and examination-oriented teaching. This linkage of the A-Level examination to University entrance also produces a curriculum that is geared only to subject performance and not to broader social and communication skills written into all subject curricula. This is the reason for the huge tuition class industry in Sri Lanka.

Reluctant acceptance of SBA by some principals and teachers is a common issue for both O-Level and A-Level examinations. MOE policy is that SBA is to be equal partner with the written examination component in assessment and should be equitable across all schools. At A-Level there should be external monitoring of SBA.

2) School-Based Assessment (SBA)

Both NIE and NETS are involved in SBA. NIE is responsible for SBA in grades 6-9 and NETS for SBA in grades 10-13. SBA was introduced to schools as part of the 1997 Reforms. At present, SBA has been implemented up to O-Level in the school system and is in the final implementation stages at A-Level. Parallel SBA grades were reported for the first time on the 2002 O-Level Examination Certificate. Parallel SBA grades will be reported on the 2005 A-Level Examination Certificate.

SBA concentrates on formative as well as summative tasks. These include projects, assignments, quizzes etc as well as end of year tests. Monitoring SBA at the school level involves principals, teachers, parents and students. As well, education officials such as provincial, zonal subject directors are expected to monitor SBA across schools to maintain consistent standards of reporting etc. The new student-based, activity-based teaching methodology introduced under the 1997 Reforms is also part of SBA.

Changes to teaching methodology at all levels of schooling are a major aim of education reforms to improve the quality and efficiency of education. SBA requires teachers and students to use much more activity-based interactive teaching and learning in their classrooms

However, there have been problems with SBA. Most teachers now understand the principles behind SBA but many are still unsure of procedures. Research by NETS has also shown that there is a lack of uniformity of grading across schools. Also, some teachers, particularly in mathematics, are still using the results of various short tests rather than assignments and projects to arrive at their SBA grades. Other related issues are the lack of a common objective scheme for all grades and subjects that is clearly understood by principals and teachers and that any adaptation of the scheme to specific school contexts has to be objective.

(6) Student Performance

The National Evaluation and Testing Service (NETS) conduct three Public examinations each year to measure student performance island-wide. The results are summarized below.

1) Results of Grade 5 Scholarship Examination

This examination is conducted in August each year and is both a measure of performance and potential at the end of primary school. It is not a syllabus-based examination and many of the test items included are of the "intelligence test" type.

Table 2.2.4 gives the historical trend for the grade 5 scholarship examination.

Table 2.2.4 Grade 5 Scholarship Results

Year	No. Sat	No. of students qualified	% of students qualified	No. of scholarships awarded	% of scholarships awarded
1999	256,139	25,889	10.1	9,924	3.9
2000	248,373	24,737	10.0	9,976	4.0
2001	274,656	24,414	8.9	9,987	3.6
2002	283,469	24,297	8.6	10,000	4.1
2003	292,483	23,205	7.9	10,000	4.3

Source: NETS Statistical Handbooks 1999, 1999-2001; R&D Branch, NETS (Department of Examinations), 2004

The figures show a very slim rate of success for candidates, being between 3.6% and 4.3%. Qualified students together with the scholarship winners are able to enroll in popular schools from grade 6. The number of students sitting the examination has increased while the number of students qualifying has decreased.

2) Results of GCE O-Level Examination

The O-Level examination is held in December each year and is for students completing grade 11. The examination qualifies students for A-Level studies, vocational courses or employment. The results of the examination are presented in Table 2.2.5.

Table 2.2.5 GCE O-Level Examination Results

Year	No. Sat	Qualified for A-Level %	
		No.	%
1999	346,796	130,892	37.7
2000	349,464	129,242	36.9
2001	347,315	127,741	36.8
2002	305,518	126,812	41.5
2003	300,205	132,107	44.0

Source: R&D Branch, NETS (Department of Examinations), 2004

The table shows a steady trend for three years and then a 4.7% increase from 2001 to 2003 and a 2.5% increase from 2002 to 2003. The year 2002 was the first time that SBA was a component of the O-Level examination and this may have an effect on the qualification rate.

Table2.2.6 gives the historic trend for pass rates in six subjects from the O-Level curriculum – *mathematics*, ‘*science and technology*’ and four other subjects for comparison.

Pass Rates in *mathematics* and ‘s*cience and technology*’ are very low compared with the other four subjects. As well, from 2001 to 2003, there has been a decrease in the pass rate both for science and *mathematics* and ‘s*cience and technology*’.

Table 2.2.6 School Candidate Passes in GCE O-Level Examination

Subject	% Passes		
	2001	2002	2003
Mathematics	44.1	40.0	42.1
Science & Technology	53.9	54.6	49.0
Social Studies and History	76.1	78.0	77.0
History	65.2	52.1	80.2
Geography	57.0	50.7	62.7
Development Studies	81.3	70.1	88.2

Source: R&D Branch NETS (Department of Examinations), 2004

Note: Figures for the years 1999, 2000 are not comparable as both science and mathematics were examined with two papers of differing degrees of difficulty.

Main issues on the GCE O-Level examination results are (i) poor pass rates in '*science and technology'* and *mathematics* compared with other subjects and (ii) the high non-qualification rate for A-Level studies (56%) of all O-Level candidates.

3) Results of GCE A-Level Examination

The A-Level Examination is held in April each year for students completing grade 13 (final year of school education). The examination qualifies students for university studies, other tertiary courses or employment.

Table 2.2.7 gives the A-Level university qualification rate for 2003 and 2004.

Table 2.2.7 GCE A-Level Examinations - Overall Results

Year	No. of Candidates sitting A-Level Examinations	Qualified for University Entrance	
		No. of Candidates	%
2003	185,825	82,192	44.2
2004	171,152	94,228	55.0

Source: R&D Branch, NETS (Department of Examinations), 2004

About 40-50% of all candidates sitting the A-Level examination were qualified for university entrance.

Table 2.2.8 gives historic trend of pass rates for A-Level science stream subjects and three other A-Level subjects.

Table 2.2.8 GCE A-Level Examinations – Historic Trend Subject Results

Subject	Year					
	1999	2000	2001	2002	2003	2004
Biology	81.0%	79.0%	74.7%	71.3%	70.3%	75.5%
Chemistry	66.6%	66.9%	52.6%	50.1%	52.4%	50.5%
Physics	65.3%	63.1%	68.6%	62.4%	59.9%	59.4%
Combined Mathematics	49.0%	42.7%	52.2%	54.1%	55.6%	54.5%
Agriculture	70.8%	73.9%	77.3%	N/A	N/A	86.6%
Economics	61.6%	66.3%	67.1%	N/A	N/A	63.9%
Business Studies	71.2%	89.6%	93.7%	N/A	N/A	90.0%

Source: R&D Branch, NETS (Department of Examinations), 2004

Note: Less than 60% shaded

Pass rates of *chemistry*, *physics* and *'combined mathematics'* are low compared with *agriculture* and *business studies*.

University Admission

Table 2.2.9 gives figures on places available for the various university streams and the numbers of students qualified for those streams.

Table 2.2.9 Numbers of Candidates Qualifying and Admitted to University

Year of A-Level	2000 (2001/2002*)			2001 August (2002/2003)			2002 April (2002/2003**)		
Subject Streams	NQ	NA	%	NQ	NA	%	NQ	NA	%
Arts	50,756	4,283	8.4	53,629	4,328	8.1	46,441	4,370	9.4
Commerce	24,497	2,372	9.7	27,002	2,494	9.2	27,890	2,862	10.3
Physical Science	5,594	2,819	50.4	6,951	2,843	40.9	7,996	3,009	37.6
Biological Science	10,829	2,670	24.7	10,844	2,766	25.5	9,969	2,799	28.1
Total	91,676	12,144	13.2	98,426	12,431	12.6	92,296	13,040	14.1

*Year of admission
**There were two intakes of students into university courses in 2002/2003
Source: Sri Lanka University Statistics 2003, University Grants Commission
Note: NQ - the number of students who qualify for university
NA - the number of students admitted to university courses

The overall admittance rate for those qualified is low of the order of 12-14%. The admittance rate for qualified Physical Science stream students and Biological Science stream students are much higher than those for Arts and Commerce.

Major issues on the A-Level examination results are poor pass rates particularly in *chemistry*, *physics* and *'combined mathematics'* compared with other subjects and the limited number of places at universities even for those who qualify at the A-Level examination.

4) Repetition and Dropout Rates

Repetition and Dropout Rates for Grades 3, 5, 9 and 10

Table 2.2.10 shows repetition and dropout rates island-wide for grades 3, 5, 9 and 10 in 2001 and 2003.

Table 2.2.10 Repetition and Dropout Rates for Grades 3, 5, 9 and 10

Grades		grade 3		grade 5		grade 9		grade 10	
School Type		2001	2003	2001	2003	2001	2003	2001	2003
Repetition Rate %	Sinhala	0.7	0.3	1.3	0.6	0.5	0.5	0.4	0.2
	Tamil	3.1	1.9	4.2	2.2	1.6	1.6	1.5	1.4
	National	2.3	0.8	2.7	1.1	1.2	0.6	0.9	0.5
Dropout Rate %	Sinhala	0.1	0.2	0.5	3.7	5.1	4.4	5.1	4.9
	Tamil	-0.6	1.1	4.0	6.3	9.2	10.4	8.5	10.0
	National	-0.2	0.5	2.9	4.8	7.6	5.6	6.3	6.1

Source: School Census 2001, 2003, MOE
Note: Negative figures indicate growth in numbers.

Both the total repetition and dropout rates have generally improved between 2001 and 2003. Tamil speaking students still have both higher repetition and dropout rates than Sinhala speakers.

(7) School Facilities

1) Basic Infrastructure

The existing situation of basic infrastructure and school facilities was assessed using the results of the school survey[6] conducted by JICA Study team in 2003. Several school visits were also conducted during the course of the study. Both the survey and school visits showed that there is a wide gap between the official minimum standards and the condition of schools.

The school survey revealed that one third of rural schools and more than one half of plantation schools had no electricity. There were also many schools without telephones particularly Type 2 and Type 3 schools and 25% of these schools had no tap water. Rural and plantation schools were the most disadvantaged with basic infrastructure.

2) Facilities

Facilities for science and mathematics

Science rooms or multi-purpose rooms for grades 6 to 9 are single-storey structures with facilities for *'science and technology'* as well as for other technology skills. Nearly 80% of schools lack science rooms and have to use normal classrooms for science education. More than 50% of Type 2 and Type 3 school laboratories if they have one are in very bad condition.

O-Level science laboratories are single-storied structures with laboratory tables for students and a demonstration table for the teacher. There is a separate tiled worktop with two sinks of water and drainage, and two steel cupboards are available. Less than 40% of both urban and rural schools have O-Level laboratories, and 75% of those lack proper minimum facilities.

A-Level science laboratories are two-storied structures usually with separate physics and chemistry laboratories at ground level and biology laboratories at the upper level. There are two small adjoining rooms for storage and preparation. Except in the better urban schools, the general condition of the

[6] School survey was conducted sampling 144 schools in total from all provinces and of all four different types of schools from January to February 2003.

laboratories is poor. Maintenance is often poor, and most schools do not have a laboratory assistant.

3) Equipment

Laboratory Equipment for Science and Mathematics

All schools are supposed to have a complete set of standard equipment and materials because of quality input supply. Most have the equipment but the problem is lack of proper storage and poor usage.

Office Equipment

Absence of such modern basic equipment as overhead projectors, photocopiers, television sets (only 24% of schools island-wide can receive television) and even older duplication machines is a major issue especially in rural and plantation areas. Development of school-based teaching material and modern interactive teaching methods are severely hindered by this lack of equipment.

2.2.2 Equitable Access to Quality Education

(1) Inequity in Urban and Rural

Many examples of inequities between urban and rural schools were found during school visits, school surveys and the Pilot Project. The greatest problem is an ongoing one - urban schools are getting bigger and rural schools are getting smaller. The gap is widening because wealthier parents observe the better pass rates and facilities in the ‘popular’ schools and have their children leave rural schools to attend a ‘popular’ school.

Rural schools have the following disadvantages compared with urban schools.

1) School management and community support

Many rural schools are small with poor leadership. Some principals are local political appointments who have had little or no training. They also lack administrative and financial management skills. With weak parental and community support in many schools, there are financial constraints and an inability to apply for quality funds even though they are available. Many parents of rural students are also poor and have little educational background. The combination of these problems means that there is a lack of ‘ownership’ of the school by the school community and thus the education of the children suffers.

2) Available infrastructure and facilities

Many small rural schools do not have minimum infrastructure such as water supplies, electricity, telephones, separate classrooms and basic facilities like blackboards and chairs and tables. Those schools with secondary classes have inferior laboratory facilities and science equipment and poor libraries. Instructional materials are in short supply. Office facilities are often poor with no ICT facilities or no duplicating equipment.

3) Teachers' deployment

Politicization of teacher deployment is one of the factors with difficulties in attracting and keeping teachers in rural schools. This causes the teacher appointment, transfer and replacement system to be ineffective. MOE have incentives in place for teachers taking up rural appointments but these have had only limited success. Married women teachers are not attracted to rural areas because of limited educational opportunities for their children and their husbands often have jobs in an urban area. As well, due to the lack of teacher accommodation many schools face all-round shortage of teachers in rural areas. Teachers in rural schools are also less qualified, especially in science and mathematics, and are often untrained, unqualified and in some cases are volunteers from the local community. Even in the Type 1AB rural schools, there are shortages of science and mathematics teachers. Often, rural teachers' morale is low and therefore their teaching is uninspiring. They also make little effort to overcome shortages of materials by producing their own materials. Teachers also lack support services from limited number of ISAs because many ISAs are reluctant to go to rural areas.

(2) Inequity in National and Provincial Schools

In Sri Lanka there are two categories of government schools. The majority of schools are provincial schools which are under respective Provincial Councils in accordance with the government decentralization policy endorsed in 1987. However, there are currently 323 national schools which enjoy special status and which are directly administered by MOE. Table 2.2.11 shows the number of schools, students and teachers in national and provincial schools.

Table 2.2.11 Number of Schools, Students and Teachers

Schools	No. of Students	No. of teachers	No. of school				
			Type1AB	Type 1C	Type 2	Type 3	Total
National School	688,739 (17%)	27,626 (15%)	284 (88%)	38 (12%)	1 (0%)	0 (0%)	323 (100%)
Provincial School	3,252,946 (83%)	159,069 (85%)	322 (3%)	1,715 (18%)	4,266 (45%)	3,164 (33%)	9,467 (100%)
Total	3,941,685 (100%)	186,695 (100%)	606 (6%)	1,753 (18%)	4,267 (44%)	3,164 (32%)	9,790 (100%)

Source: School Census 2003

As shown in the above, most of the provincial schools are small-scale Type 2 (45%) schools and Type 3 (33%) schools while 88% of national schools are Type 1AB schools. Though national schools are still small in number (3.3% of government schools)[7], the number of students enrolled in national schools is relatively large, as most national schools are large-scale Type 1AB schools located in urban areas. In 2003, out of 3.9 million students in government schools about 17% are enrolled in national schools. Some national schools with better facilities and better examination pass rates are becoming "popular schools" and the size of such school is further expanding, often over 3000 students. As national schools are expanding in number and in size, negative impact caused by this dual education system, especially in terms of equity, has also been recognized significant. The following are some issues concerning inequities between national and provincial schools:

1) Teacher Deployment

National schools attract more qualified teachers because of their congenial or very congenial locations and better facilities as well as higher social status that national schools emit. Teacher shortages are serious problems in rural schools, which national schools are free from. Although it is possible for teachers to be transferred from national schools to provincial schools, it dose not happen very often as such transfer needs to be approved directly by MOE. Teacher deployment in the national schools is a direct responsibility of MOE. Once teachers are posted in good schools such as national schools, they try to stay in the same school even after the maximum years stipulated by the national policy on teacher deployment.

2) Financial Resources

Financially national schools and provincial schools are managed differently, the former directly by MOE and the latter through provincial government. In addition to Quality Input Funds, which all government schools receive based on a defined formula, national schools receive extra government funds for library books, minor repairs, etc. Provincial schools do not have regular allocation of such funds. As discussed in the following section on Finance (2.2.3 (4)), per student capital expenditure funded by the government differs considerably between National Schools and Provincial Schools. It is estimated that National Schools receive about 3 times more capital fund per student than that to Provincial Schools.

However, more serious financial discrepancy comes from a different reason. As mentioned previously, many national schools are "popular schools" which attract, among others, wealthy parents who are willing to contribute to the school and some schools also receive good support from former students. For many national schools financial contribution from parents and former students is very substantial. On the other hand, small rural schools (they are

[7] According to the information from MOE, there were only 19 national schools in 1987 and over the years many provincial schools have been upgraded to national schools.

all provincial schools) have no such support. According to the School Survey conducted by JICA Study Team in February 2003, the average amount of annual fund schools generated (other than government sources) was Rs.519,000 for national schools and Rs.92,000 for provincial schools[8].

3) School Facilities

Majority of National Schools are located in urban areas and have good infrastructure and facilities. On the other hand many of the provincial schools are small-scale Type 2 and Type 3 schools located in rural areas. From the observation, in general, many schools lack necessary infrastructure such as portable water supply and toilet facilities, and school buildings are not in good condition with insufficient minimum facilities. Many provincial schools lack science and mathematics facilities such as Activity Room, Science Room and O-Level and A-Level Science Laboratory. Issues between urban and rural schools discussed above also apply here. Poor infrastructure and insufficient school facilities in provincial schools need to be addressed in order to achieve improved quality of education.

(3) Inequity in Medium of Instruction

Several Donors have made quality interventions in the North East Province conflict areas and Tamil plantations areas with building programs, teacher training, school education and assisting with trauma affected students and these are having a positive effect. However, there are still inequities between the quality of education using the Sinhala and Tamil mediums of instruction. This is not true of all Tamil schools especially the Type 1AB schools in Jaffna which are of excellent quality.

Tamil medium of instruction education has the following difficulties:

- A shortage of science and mathematics teachers island-wide particularly in the North East Province conflict areas and plantation schools. The shortages are in Type 1AB schools, Type 1C schools and Type 2 schools.
- Lower qualifications of Tamil medium teachers compared with their Sinhala medium counterparts.
- A shortage of ISAs in the North Central, Uva and Sabaragamuwa Provinces. There was a shortage in North Eastern Province, but the GTZ TIP project interventions have increased the number of ISAs in the province from 17 in 2001 to 322 in 2002.
- There is also an island-wide shortage of science and mathematics ISAs in both mediums of instruction with a deficit in science of 111 and in mathematics of 132. These deficits are concentrated in provinces with

[8] The average of 26 sample national schools and 109 sample provincial schools.

high numbers of Tamil medium schools.

- Higher Drop out rates for Tamil medium students than for Sinhala medium students. For example, in grade 10 in 2003, the Tamil student drop out rate was 10% compared with the Sinhala rate of 4.9%.
- Higher Repetition rates for Tamil medium students than for Sinhala medium students. Again in grade 10, the Tamil rate was 1.4% and the Sinhala rate 0.2%.
- There is less instructional material written in the Tamil language than in Sinhala.
- The island-wide student/teacher ratio of 26:1 for Tamil medium schools is higher than the Sinhala medium schools figure of 20:1
- Many Tamil parents, particularly those in plantation school areas have poor educational backgrounds themselves and this is a disadvantage for their children.

(4) Inequity in Gender

As a result of the policy of providing free education from grade one to university level, Sri Lanka has achieved an impressive improvement in gender equality in access to general education.[9] The following tables and figures illustrate this improvement.

Table 2.2.12 below shows the grade span participation rate for the years 2002 and 2003.

Table 2.2.12 Grade Span Participation Rate by Gender

Grade Span	2002		2003	
	Male (%)	Female (%)	Male (%)	Female (%)
1-5	51.1	48.9	50.9	49.1
6-9	50.7	49.3	50.7	49.3
10-11	49.4	50.6	49.4	50.6
12-13	43.6	56.4	43.3	56.7

Source: School Census 2002, 2003, MOE

Gender parity has been achieved at primary, junior secondary and O-Level but there are many more females than males in A-Level classes.

Table 2.2.13 shows the A-Level stream participation rates for 2003.

Table 2.2.13 A-Level Stream Participation rate by Gender

Stream	Male (%)	Female (%)
Science	52.1	47.9
Commerce	51.1	48.9
Arts	34.7	65.3
Total	43.6	56.4

Source: School Census 2003, MOE

[9] The Development of Education – National Report for UNESCO, MOE-Sri Lanka, Aug 2004, pages 11-15

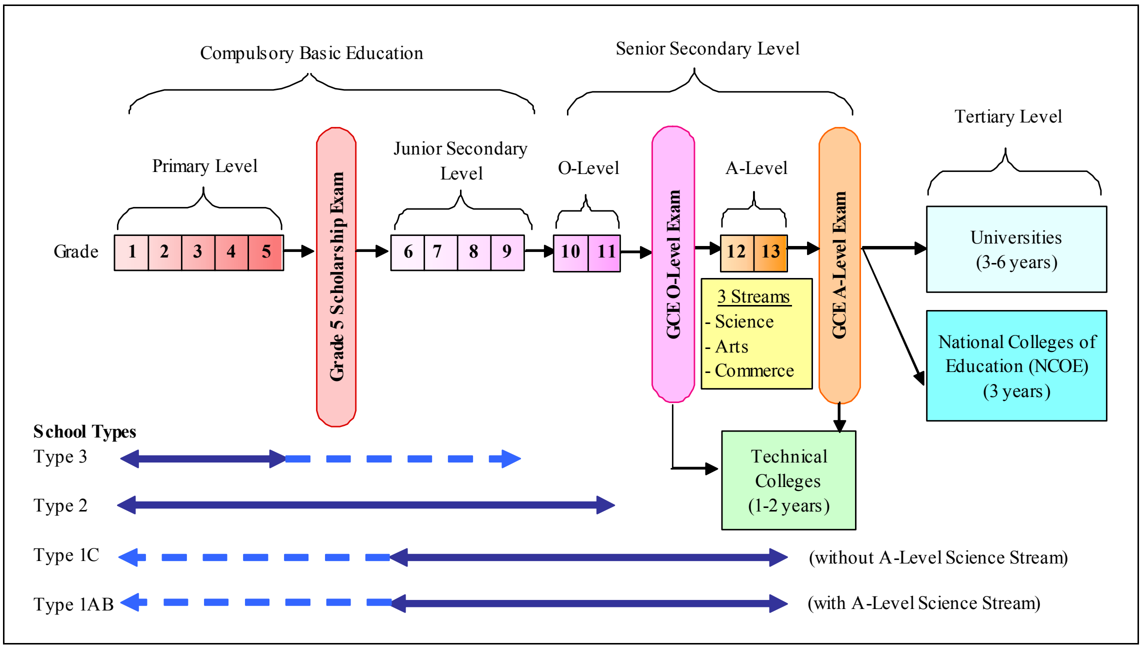
While the overall participation rate show may more females than males are in A-Level classes, the picture looking at streams is quite different. The male participation rate for the science stream is higher than for females while the female participation rate for the arts stream is higher than for males. There is parity for the commerce stream.

As 70% of the total teaching service is female teachers, the smaller number of females in the science stream affects the number of science and mathematics teachers in the system.

2.2.3 Planning and Management

(1) Education System

Sri Lanka's education system consists of 5-year primary level (grades 1 to 5), 4 year junior secondary level (grades 6 to 9), and 4-year senior secondary level (grades 10 to 11 called as O-Level and grades 12 to 13 called as A-Level), as illustrated in Figure 2.1. The first 9 years are considered as compulsory basic education. Education in Sri Lanka is predominantly implemented by the state sector, and all education in government schools, from primary to tertiary, is free of charge.



Source: MOE

Figure 2.2.2 School System of Sri Lanka

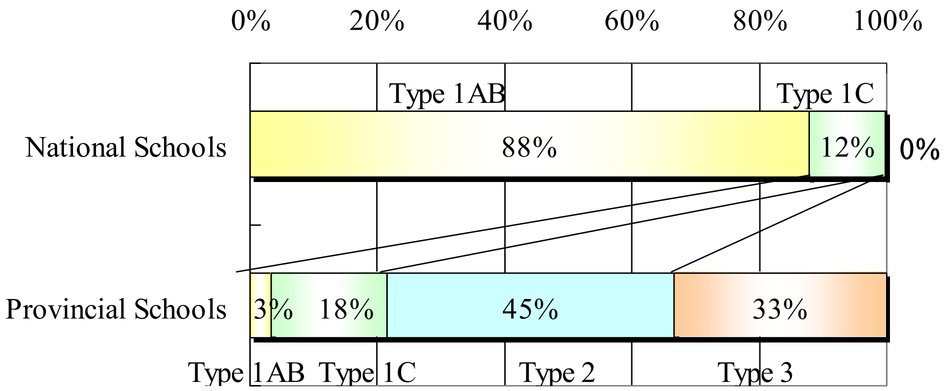
Schools are classified into 4 types: Type 1AB school with class up to grade 13 including A-Level science stream; Type 1C school with class up to grade 13 without A-Level science stream; Type 2 school with class up to grade 11; and Type 3 school with class up to grade 5 (or grade 9 in some cases).

There are 10,475 schools in Sri Lanka as of 2003, out of which 9,790 (93%) are government schools, 85 (1%) are private schools, and 600 (6%) are pirivenas, that is, schools for *bhikkus* (Buddhist monks), for which MOE pays salaries for teachers and other expenses.

Government schools can be divided into two categories: 1) 323 (3%) National Schools (including 25 Navodya schools, which were formerly called as Development of Schools by Division (DSD) schools) managed by MOE, and 2) 9,467 (97%) provincial schools (including 372 Navodya schools) managed by 8 provincial councils. While 88% of National Schools are large-scale Type 1AB schools with good facilities, most of provincial schools are small-scale Type 2 (45%) and Type 3 schools (33%), as shown in Figure 2.2.3.

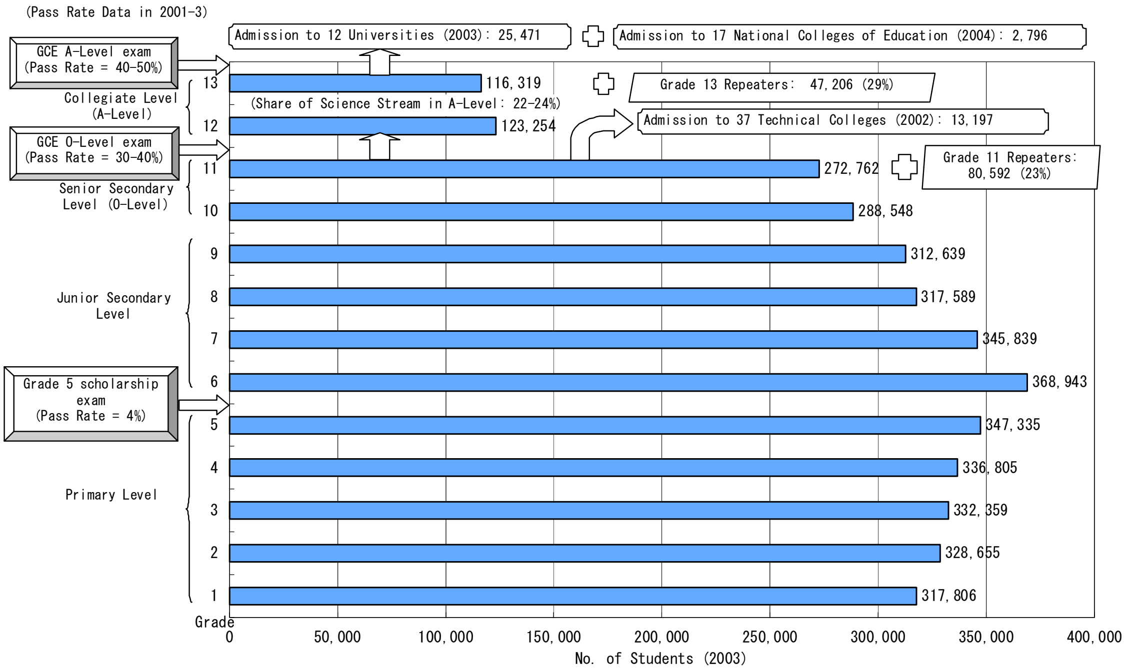
Sri Lankan education system is characterized by 3 national examinations: the grade 5 scholarship examination, GCE (General Certificate of Education) O-Level examination, and GCE A-Level examination.

Figure 2.2.4 shows the number of students in government schools by grade in 2003. There is a big gap between the number of students in grade 11 and those in grade 12. This is because the average pass rate in GCE O-Level examination is only around 30-40%. There are many repeaters in grade 11, but if they pass their O-Level examination, they easily enter A-Level classes. There are some students who go to Technical Colleges after O-Level, but due to the limited job opportunities, many students in Technical Colleges continue to study for A-Level examination.



Source: School Census 2003, MOE

Figure 2.2.3 School Types of National and Provincial Schools



Source: School Census 2003, MOE

Figure 2.2.4 Number of Students in Government Schools by Grade (2003)

There is also a gap between the number of students in grade 13 and the number of admitted students in universities. In 2003, 43.9% of grade 13 students who sat for A-Level examination passed A-Level examination and become eligible for university admissions, but only 14.1% of these eligible students were actually admitted to the universities due to the small enrollment in universities. Students who are not admitted to the universities may repeat grade 13, attend one of 17 National Colleges of Education (NCOE) to become teachers, or go abroad to study at foreign universities if their family can afford to support the foreign study.

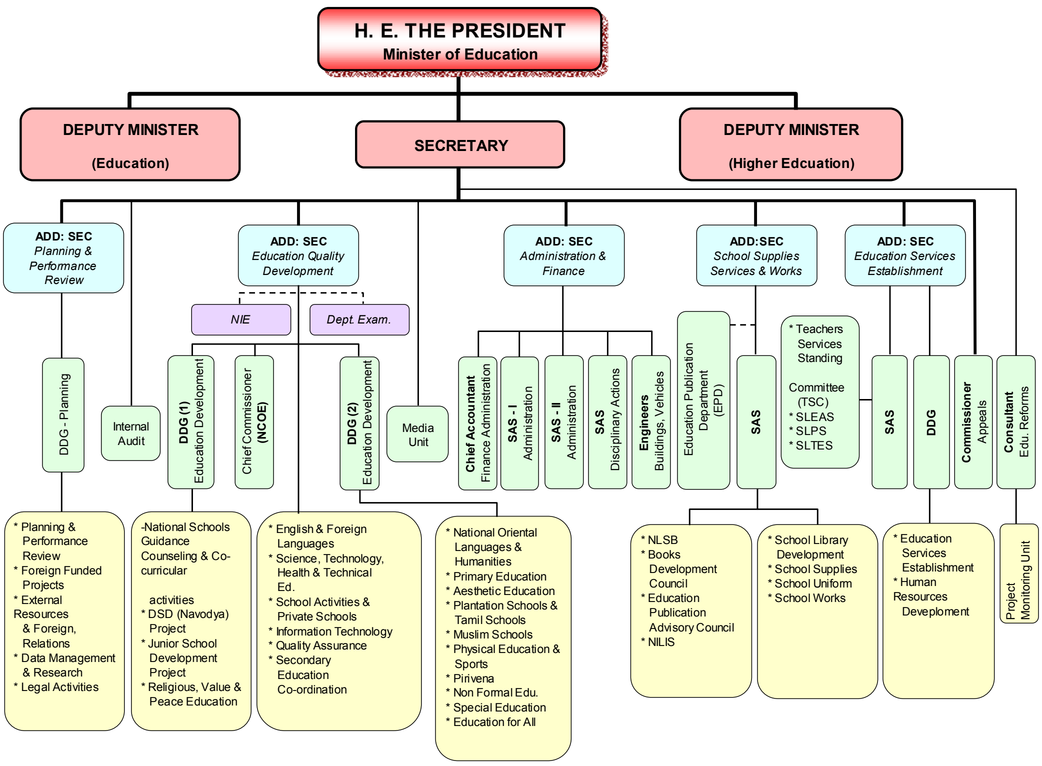
This high competition in these national examination makes education in Sri Lanka more exam-oriented, and many students, especially those in urban areas, choose to attend private tuition classes after school hours (in some cases, even during school hours). School survey conducted by JICA Study Team indicates that more than 70% of A-Level students and more than 50% of O-Level students attend tuition classes except in plantation and private schools. Some tuition classes even have facilities for science practicals. This is partly due to the fact that school hours are not long enough to complete the A-Level curriculum.

In general, schools with better facilities and better pass rates in the national examinations become popular among the students' parents and tend to receive more and more. While 76 (13%) of 606 Type 1AB schools enroll more than 3,000 students, 124 (3%) of 4,267 Type 2 and 1,313 (41%) of 3,164 Type 3 schools enroll less than 50 students. This disparity between a) big and popular Type 1AB schools mainly located in urban areas and b) small and unpopular Type 2 and Type 3 schools mainly located in rural areas seems to become wider and wider, because many wealthy or affordable parents prefer to send their children to big and popular schools even though they are far away from their home.

(2) Administrative Structure and Management

1) Organization of MOE and Administration

In April 2004 the newly elected government restructured the MOE to be wholly responsible for the education sector from primary education to tertiary education including universities, by integrating previously separate three Ministries, namely the Ministry of Human Resource Development, Education and Cultural Affairs, the Ministry of School Education and the Ministry of Tertiary Education and Training.



Note: ADDSEC: Additional Secretary, DDG: Deputy Director General, NIE: National Institute of Education, SAS: Senior Assistant Secretary, SLEAS: Sri Lanka Educational Administrative Service, SLPS: Sri Lanka Principals' Service, SLTES: Sri Lanka Teacher Educators' Service, NSLB: National School Library Board, NILIS: National Institute of Library Information System

Source: MOE

Figure 2.2.5 Organizational Structure of MOE General Education Sector

In the current devolved education administrative system, MOE's main functions are in policy, planning, programming, supervision and management. The general education sector of MOE consists of five main divisions: Policy Planning & Performance Review, Education Quality Development, Human Resources Development of Education Services, Administration and Finance, and Supplies. Under each division are several branches and units as shown in Figure 2.2.5.

Although most of the government schools are administered by the Provincial Councils, there are a small number of national schools which come directly under MOE.

2) Organization of National-level Education Institutions

a) National Education Commission (NEC)

NEC established in 1991 is a statutory body appointed by the President. NEC is responsible for the formulation of education policy for all sectors of the education system. In addition, they periodically review and analyze the national education policies and plans. In December 2003, NEC presented a set of policy proposals following a comprehensive review on General Education Reform introduced in 1997.

b) National Institute of Education (NIE)

NIE, established as a semi-autonomous institution in 1986, now has over 500 personnel. NIE has been currently restructuring under the new Director General.

NIE is responsible for the design, review and revision of the school curriculum, production of syllabuses and teacher's guides for all subjects in the curriculum and in-service training in the use of such material for the subjects. NIE is also concerned with the on-going education of principals and teachers on education management. NIE also provides academic research and library and information services for educational development, school-based initiatives and advice for the Ministry.

c) National Evaluation and Testing Service Institute (NETS)

The main function of NETS is the conduct and control of the three public examinations island-wide. These are the grade 5 Scholarship examination, GCE O-Level Examination and GCE A-Level Examination. Under the 1997 Reforms, NETS also administers SBA procedures for O-Level and is developing SBA for A-Level.

3) Provincial Education Administration Structure

In accordance with the government's decentralization policy, education responsibilities were devolved to Provincial Councils in 1987. The majority of government schools, except national schools, are administered by the

Provincial Councils. According to the School Census in 2003, there are 9,467 government schools under the 8 Provincial Councils.

Under the Provincial Ministry of Education and its Secretary, the Provincial Department of Education is responsible for the management and administration of all education programs in the province. Province is divided into several educational zones, and further into educational divisions. There are currently 92 educational zones and 302 educational divisions in the country. Each division normally covers 30-40 schools.

The organization and function of each education office is summarized below:

a) Provincial Department of Education

The Provincial Department of Education is headed by the Provincial Director of Education, who is appointed by the Secretary of MOE. He is directly answerable to the Education Secretary of the Provincial Ministry. The Provincial Director, therefore, has dual responsibilities both to MOE and to the Provincial Ministry of Education. It is reported that there are some conflicting orders from MOE and from Provincial Ministry, which has created inefficiency in the system.

The main functions of the Provincial Department include: planning and budgeting of education in the province; general administration of zonal and divisional offices; education development of schools through zonal and divisional offices.

b) Zonal Education Office

The Zonal Education Office, headed by a Zonal Director, is responsible for administrative work of the schools and teachers in the zone as well as quality improvement of teaching/learning in the schools. Personnel management within the zone such as teacher transfer and up-keeping of teacher files is a zonal responsibility. Information regarding the school census is gathered from schools by the Division Office and compiled at the Zonal Office before sending to the Provincial Department.

c) Divisional Education Office

The Divisional Education Office, headed by a Divisional Director, is responsible for: general supervision of schools; collecting information and data from schools (including data for the school census); distribution of textbooks and other materials to schools; assisting school supervision by the Zonal and Provincial Offices. In reality, Divisional Offices, without any administrative responsibilities, do not have adequate resources (both human and financial) to carry out meaningful school supervision.

ISAs are attached to the Divisional Education Office. ISAs' main functions are to carry out in-service training of the teachers in the division by conducting in-service courses and assisting them with classroom teaching in the school.

This devolved education administrative system was intended to make education system more efficient and responsive to school's needs. However, because of the multiple layers between school and MOE, which imposes lengthy bureaucratic procedures, and duplication of functions at different levels, schools are not benefiting from the system.

(3) Teacher Training and Deployment

1) Teacher Training

In 1997, MOE established the National Authority on Teacher Education (NATE) to co-ordinate and control teacher education undertaken by various institutions. NATE drafted a new National Teacher Education Policy in 2001, which describes a new qualification for teachers in primary and secondary levels, as shown in Table 2.2.14.

Table 2.2.14 Qualification for Teachers in Each Level

Level	Required qualification for teachers
Primary (grade 1 to 5)	- National Diploma in Teaching on primary education from National Colleges of Education (NCOE), or - Trained Teachers' Certificate on primary education from Teachers' (Training) Colleges (TTC)
Junior Secondary /O-Level (grade 6 to 11)	- National Diploma in Teaching on specific subjects from National Colleges of Education (NCOE), - Trained Teachers' Certificate on specific subjects from Teachers' (Training) Colleges (TTC), or - University graduates with professional teaching qualifications
A-Level (grade 12 to 13)	- University graduates with professional teaching qualifications, or - Those with accredited qualifications equivalent to university degrees from teacher education institutions such as NIE

Source: National Teacher Education Policy (National Authority on Teacher Education, MOE, 2001

Based on this policy, the new teachers for grades 1 to 11 are basically recruited from National Colleges of Education (NCOE), which offer 2-year residential program and 1-year internship at the school. Science and mathematics teachers for A-Level class are recruited from university graduates, and most of them are Science graduates. It has been observed that many of them have no professional education before they start to teach.

The actual situation of distribution of qualified teachers in government schools indicates that the teachers' qualifications in Tamil-medium schools are inferior to those in Sinhala-medium schools. This is especially true in

Type 3 schools, rural schools, and plantation schools. According to School Survey conducted by JICA Study Team, almost all A-Level science and mathematics teachers are university graduates, and most of O-Level science and mathematics teachers are teachers who were trained at Teachers' Training Colleges (TTC) or National Institute of Education (NIE). Existing teacher training institutions in Sri Lanka and their major teacher training courses are presented in Table 2.3.3 in Supporting Report.

Among them, National Colleges of Education (NCOE) now play the major role in providing initial training (pre-service training) for primary and secondary school teachers up to O-Level. A-Level teachers must be university graduates. Distance education courses, such as Bachelor of Education and Post Graduate Diploma in Education courses at NIE, also play a significant role for upgrading the qualification of many existing teachers.

While most of 17 NCOE provide training courses for primary school teachers, only 6 NCOE (Siyane, Sripada, Nilwala, Vavuniya, Batticaloa, Addalachchenai) provide courses for science and mathematics teachers for grade 6 to 11. For plantation schools, only one NCOE, Sripada NCOE in Central Province, provides pre-service training in Tamil-medium science and mathematics teachers. Recently English-medium library science and IT courses have started in 3 NCOE (Pasdunrata, Mahaweli and Jaffna) in order to supply new cadres of school librarians and IT center staff.

Admission to NCOE is basically decided by the students' mark in the A-Level examination, but 25% of the admission is allocated to students from 15 difficult districts.

More than 90% of NCOE students are female, because female students get higher marks in A-Level Examination than male students. Since already about 70% of teachers are female, the higher percentage of female NCOE students will certainly increase the share of female teachers further in near future, which may have negative implications on solving unequal distribution of teachers between urban and rural areas, because many female teachers prefer or are obliged to work in urban areas due to family reasons.

Since initial teacher education has been improved significantly in recent years, continuing teacher education is the next agenda for MOE. A total of 100 Teacher Centers have been established nationwide for short-term in-service training (mainly conducting half- to 2-day workshops during weekends), 16 of which were recently constructed under the IBRD's Teacher Education and Teacher Deployment Project (TETD). Every Teacher Center is attached to one NCOE, which dispatches lecturers for seminars and workshops in the affiliated Teacher Centers.

There is also a re-development plan to utilize Teachers' Training Colleges (TTC) for continuing education. Particularly, 5 former TTC (Maharagama, Gampola, Balapitiya, Unawatuna and Anuradhapura) are planned to be converted to Teacher Education Institutes (TEI), which will offer short-term (from 10-day to 3-month courses) residential continuing education courses for teachers.

However, the opportunities for continuing education at Teacher Centers and TEI are still limited, and the contents of continuous training needs to be developed.

Problems in teacher training are summarized below:

- *Graduate teachers without pre-service training:* Teachers for grades 12 and 13 must be university graduates, but most of them do not have any teaching training nor teaching internship in which they can learn through actual teaching practice at schools, before working as teachers.
- *Low morale and discipline of NCOE students:* It is estimated that about 10% of new graduates from NCOE refuse to work in rural and difficult schools.
- *Underutilization of NCOE facilities:* In order to provide pre-service training for teachers, 17 NCOE were established around the country, but the number of students in NCOE is small compared with the capacity of the facility.
- *Insufficient continuing education opportunities for teachers:* While there is a big need to train teachers on latest development on new curriculum and teaching and learning methods, the number of teachers who can attend continuing education is still limited.
- *Lack of continuing education programs which address actual teachers' needs in classroom:* In-service training is designed and conducted by NIE, mainly to provide teachers with information on new curriculum.
- *Lack of follow up system for in-service training:* There is no proper monitoring and evaluation of teachers after providing in-service training.

2) In-Service Advisers (ISA)

There are 2,507 subject-wise In–Service Advisers (ISAs), also called as Master Teachers in Sri Lanka, who are attached to Divisional Education Offices. ISAs have two roles: 1) to train teachers on the new curriculum introduced by NIE through seminars, and 2) to visit government schools regularly, observe the teaching and learning process in classrooms, and advise teachers (except A-Level teachers) on how to improve their teaching. Lack of ISAs for A-Level (grades 12 and 13) teachers is considered as weakness in teacher support in A-Level.

There is a very unequal distribution of ISAs among provinces as well as between Sinhala and Tamil medium schools. Out of 2,507 ISAs, 571 (23%) are Tamil-medium ISAs. ISAs for science and mathematics are generally in shortage, except Sinhala-medium ISAs in Western, Southern and Uva Provinces and Tamil-medium ISAs in North Western Province.

It is often observed that ISAs seldom visit rural schools due to transportation problems, but it is rural schools which need ISAs' service most, because rural teachers working under difficult situations need more assistance. There is also the concern over the quality of ISAs' services. ISAs were initially trained in NIE, and when NIE introduced new curriculum, ISAs were again trained by NIE on how to introduce new curriculum to teachers, but they have received no other training. Feedback on teaching problems from ISAs to NIE is poor, so in-service training provided by ISAs tends to be top-down in nature, and often does not reflect teachers' real problems and difficulties at the classroom.

The main mode of ISA's support to teachers is to observe teachers' lessons and give oral advice, but without any demonstration lessons by ISAs, many teachers cannot improve their lessons as ISAs recommend.

While Education Reform recommended more activity-based and interactive teaching and learning, it is seldom practiced in the classroom, mainly because of insufficient training of ISAs and teachers as well as lack of practical teaching materials for it. So it is important to develop suitable teaching materials for activity-based and interactive teaching and learning, and train ISAs and teachers on how to use them in the classroom.

3) Teacher Deployment

National Teacher Education Policy in 2001 specifies that teacher supply should be based on the standard student-teacher ratios (26:1 for primary level and 22:1 for secondary level). Based on this student-teacher ratio, there is large excess of teachers in Type 2 and Type 3 Sinhala-medium schools, but there is shortage of teachers in Type 1AB Sinhala-medium schools and Type 1AB, Type 1C and Type 2 Tamil-medium schools. This shortage of teachers in Type 1AB schools is caused by excessive students concentration in Type 1AB schools. Province-wise, teacher shortage is severe especially in Type 1AB Sinhala-medium schools in North Central Province, Type 1AB, Type 1C and Type 2 Tamil-medium schools in North-Western, Central, North-East and Uva Provinces.

Teacher shortage is generally more acute in Tamil-medium schools than Sinhala-medium schools. It is also well known that rural schools suffer most from shortage of teachers, because many teachers feel difficult to commute to remote rural schools without teachers' quarters, and many married teachers prefer to work in urban centers where their children can attend urban popular schools.

MOE tries to remedy the teacher excess and shortage problem by analyzing teacher demand and supply balance annually, and allocates the number of admissions to NCOE according to the teacher needs. The students who are admitted to NCOE must sign the agreement with MOE to work for difficult schools for 3 years after graduation of NCOE, but in reality, 10-15% of NCOE graduates are estimated to escape this duty mainly by using politician's influence over the provincial government[10].

Shortage of teachers in rural schools is often caused by inferior facilities of the rural schools, such as lack of staff housing and poor access to the school, so it is important to upgrade the infrastructure and facilities of rural schools such as water supply, staff housing and access road to the school, in order to attract more teachers to rural schools.

Although MOE provided some incentives for teachers working in rural schools, many teachers claim that these incentives are not attractive enough for them, because 1) they cannot believe the government actually provides these incentives to them, and 2) even if it is provided, the amount of incentives is not big enough: they can earn more money by working in private tuition classes when they work in urban schools.

Many teachers claimed that if they work in rural schools, they will be considered as inferior teachers by others. This is due to negative images of rural schools and rural teachers shared by many Sri Lankan people, so it is necessary to remedy such people's prejudices by advocating to work for rural areas through the national mass campaign to reduce urban-rural inequality in Sri Lanka.

While there are government policy and regulations to try to solve teacher shortage in rural schools, the real problem is that MOE has never implemented them strictly, so there are many cases of exceptions where teachers were able to escape from the duties to work for rural schools reportedly by using local politician's influence. As a result, many teachers claim that they cannot trust MOE's policy and regulations to provide incentives for teachers working in rural schools, because they have experienced MOE has changed its policy and regulations frequently and there have been so many unfulfilled promises by the government.

(4) Finance for Education

1) Government Expenditure on Education

In Sri Lanka, all education from primary school to university is financed by

[10] Teacher Deployment in Sri Lanka: An Audit (Planning and Performance Review Division, MOE, May 2004)

the government. Table 2.2.15 shows the trend of government expenditures and education expenditures for the last two decades.

Table 2.2.15 Government Expenditures on Education (Rs. billion)

	1980	1985	1990	1995	1996	1997	1998	1999	2000	2001	2002*
Government Total Expendirute											
Recurrent	13.46	32.65	71.77	154.16	175.15	184.75	199.65	207.27	254.28	303.36	330.27
	52.8%	60.3%	78.6%	78.7%	82.3%	80.8%	78.7%	77.5%	79.0%	81.7%	84.9%
Capital	12.03	21.53	19.53	41.72	37.64	43.98	54.16	60.34	67.77	67.90	58.59
	47.2%	39.7%	21.4%	21.3%	17.7%	19.2%	21.3%	22.5%	21.0%	18.3%	15.1%
Total	25.49	54.18	91.30	195.88	212.79	228.73	253.81	267.61	322.05	371.26	388.86
Education Expenditure											
Recurrent	1.54	3.53	8.54	16.97	18.83	20.10	22.61	22.49	26.08	32.04	35.24
	85.6%	84.4%	88.0%	83.1%	80.6%	79.6%	77.3%	74.9%	80.5%	85.3%	88.4%
Capital	0.26	0.65	1.16	3.45	4.53	5.15	6.63	7.55	6.30	5.53	4.61
	14.4%	15.6%	12.0%	16.9%	19.4%	20.4%	22.7%	25.1%	19.5%	14.7%	11.6%
Total	1.80	4.18	9.70	20.42	23.36	25.25	29.24	30.04	32.38	37.57	39.85
General Education Expenditure											
Recurrent	1.40	3.18	7.58	14.69	16.35	16.15	19.00	18.85	23.13	27.10	30.02
	92.1%	91.9%	91.2%	83.9%	82.0%	80.9%	78.8%	75.2%	82.7%	86.9%	89.5%
Capital	0.12	0.28	0.73	2.81	3.58	3.81	5.11	6.20	4.84	4.09	3.51
	7.9%	8.1%	8.8%	16.1%	18.0%	19.1%	21.2%	24.8%	17.3%	13.1%	10.5%
Total	1.52	3.46	8.31	17.50	19.93	19.96	24.11	25.05	27.97	31.19	33.53
(Higher Education Expenditure)											
Recurrent	0.14	0.35	0.96	2.28	2.47	3.96	3.61	3.64	3.95	4.94	5.21
Capital	0.14	0.38	0.42	0.63	0.96	1.33	1.52	1.35	1.46	1.44	1.10
Total	0.28	0.73	1.38	2.91	3.43	5.29	5.13	4.99	5.41	6.38	6.31
Education Expenditure as % of Total Government Expenditure											
	7.06%	7.72%	10.62%	10.42%	10.98%	11.04%	11.52%	11.23%	10.05%	10.12%	10.25%
Recurrent Education Expenditure as % of Total Government Recurrent Education Expenditure											
	11.44%	10.81%	11.90%	11.01%	10.75%	10.88%	11.32%	10.85%	10.26%	10.56%	10.67%
Capital Education Expenditure as % of Total Government Capital Expenditure											
	2.16%	3.02%	5.94%	8.27%	12.04%	11.71%	12.24%	12.51%	9.30%	8.14%	7.87%
Education Expenditure as % of GDP											
			2.20%	3.11%	3.06%	2.90%	2.98%	3.07%	2.89%	3.06%	2.81%

Source: Sri Lanka University Statistics 2003, University Grants Commission
Note: Data for 2002 is provisional

In the 1960s the government allocated around 5% of GDP and 15% of the government budget to education to achieve free primary and secondary education. Once achieved by the early 1970s, however, the government shifted budgetary priority to other sectors like agriculture and energy. In addition, high military expenditures since the mid-1980s severely constrained government investments in social services in general. In recent years, the government education expenditure has hovered at around 3% of GDP, lower than the 3.5% mean for Asia and the 3.9% mean for developing countries. Similarly, the share of education in the total expenditures was remained at around 10%, below the 14% mean for Asia and 15% for developing countries.

Another characteristic of Sri Lanka's education expenditures is the low capital expenditures. Continuous recruitment of large number of teachers in the late 1980's and early 1990's and salary hike in 2000 contributed to large increases of recurrent expenditure. In year 2002, capital expenditure accounted for only 11.5% of the total education expenditure, of which large part is sourced by external loans and grants. Decades of low spending on education, especially low capital expenditures, has affected the quality of education.

2) Education Expenditures by MOE

Table 2.2.16 shows the allocation of education expenditure at MOE by category.

Table 2.2.16 Education Expenditures of the MOE in 2002 (Rs. million)

Programs and Projects	Recurrent Exp		Capital Exp		Total	
Ministry Administration	93.33	1%	13.05	0%	106.38	1%
Planning and Programming	7.54	0%	0	0%	7.54	0%
Primary Education	926.28	14%	170.90	5%	1,097.18	11%
Secondary Education	3,229.06	48%	378.13	10%	3,607.19	35%
Special Education	581.01	9%	0	0%	581.01	6%
Teachers Colleges and Centers	85.42	1%	10.21	0%	95.63	1%
Colleges of Education	317.94	5%	17.04	0%	334.98	3%
Grants and Assistance for Education	1,274.61	19%	0	0%	1,274.61	12%
GEP2 (IBRD)	0	0%	1,328.85	36%	1,328.85	13%
TETD (IBRD)	0	0%	1,038.55	28%	1,038.55	10%
SEMP (ADB)	0	0%	640.89	17%	640.89	6%
Donor Funded Capital Projects	0	0%	36.20	1%	36.20	0%
Transfers to Public Institutions and Enterprises	231.29	3%	58.32	2%	289.61	3%
Total	6,746.48	100%	3,692.14	100%	10,438.62	100%

Source: Budget Estimates 2004, MOE

MOE directly administers 323 national schools and their expenditures are included in the category "Primary Education" and "Secondary Education" in the table. These two categories account for 46% of the MOE education expenditures. The major items under "Grants and Assistance for Education" are "transfers to households through welfare programs" such as the distribution of free textbooks, supply of uniforms and bursaries and scholarships. GEP2, TETD and SEMP are projects funded by IBRD and ADB loans. Together with other donor funded projects, capital investment by foreign loans and grants account for 81% of capital expenditure at MOE and 65% of national education capital expenditures. Currently education expenditures, especially capital expenditures, are highly dependent on foreign loans and grants.

3) Provincial Education Finance

Financially, Provincial Councils depend heavily on transfers from the central government as they cannot raise sufficient funds from devolved revenues[11]. The Ministry of Finance on the recommendation of the Finance Commission

[11] In fiscal year 2001 total provincial expenditure was Rs.43.6 billion, of which the provinces' own revenues were Rs.7.5 billion, accounting for approximately 17% of the total expenditures. In case of Western Province, however, the province's own revenue was 53% of the total expenditures as its own revenue while the rest of the provinces raised only around 10% or less.

allocates different grants to the Provinces to meet their fiscal needs.

Table 2.2.17 shows the total expenditure and education expenditure of provinces in the year 2002. Nearly 47% of provincial expenditure is allocated to education.

Table 2.2.17 Education Expenditures by Province in 2002

Province	No. of Students (2002)*	Total Provincial Expenditures			Provincial Education Expenditures			% of Ed. Expenditure	Unit Cost		
		Rec Exp (Rp.mil)	Cap Exp (Rp.mil)	Total (Rp.mil)	Rec Exp (Rp.mil)	Cap Exp (Rp.mil)	Total (Rp.mil)		Rec Exp (Rp.)	Cap Exp (Rp.)	Total (Rp.)
North Western	406,331	5,102	630	5,731	2,717	240	2,957	51.60%	6,686	591	7,277
Western	690,971	10,213	614	10,826	4,286	103	4,390	40.50%	6,203	150	6,353
Southern	397,332	4,836	929	5,765	2,599	259	2,858	49.60%	6,541	652	7,193
Sabaragamuwa	327,601	3,432	827	4,259	1,834	134	1,968	46.20%	5,598	408	6,006
Uva	241,648	2,867	585	3,452	1,520	101	1,621	47.00%	6,289	418	6,707
Central	452,524	5,219	643	5,862	2,839	74	2,913	49.70%	6,274	163	6,438
North Central	243,641	3,003	626	3,629	1,559	101	1,660	45.70%	6,400	415	6,814
North East	561,489	5,475	787	6,262	2,923	151	3,074	49.10%	5,205	269	5,474
Total	**3,321,537**	**40,146**	**5,641**	**45,787**	**20,277**	**1,163**	**21,440**	**46.80%**	**6,105**	**350**	**6,455**

Source: MOE (2002), Expenditure Estimates 2003; Calculation by JICA Study Team.
* Only in provincial schools
Note: The above figures are based on the 2002 provisional expenditures, as breakdown of actual provincial expenditures were not published when writing the report (Oct. 2004).

As shown above, unit education cost per student varies among provinces. This disparity mainly derives from inadequate fund allocation method, which is not based on per capita basis, but on the previous year's allocation, thus long going disparity remains. More equitable allocation of limited resources is necessary.

4) Budget for National School and Provincial School

Table 2.2.18 is an estimated unit cost of national and provincial schools. The estimate is based on two assumptions. The first one is that MOE expenditures under Primary Education and Secondary Education (from Table 2.2.17) are wholly allocated to national schools, though some capital expenditures under these categories might be allocated to some provincial schools. The second assumption is that other categories of MOE expenditures, especially donor or loan funded projects, are allocated proportionately to the number of students to all government schools, thus the exclusion of these expenditures does not affect the comparison[12].

Table 2.2.18 Estimated Education Expenditure per Student

School	No. of Students (2002)	Recurrent Exp.		Capital Exp.		Total Exp.	
		Amount (Rs.mil)	per student	Amount (Rs.mil)	Per student	Amount (Rs.mil)	Per student
National Schools	705,538	4,155	5,889	549	778	4,704	6,667
Provincial Schools	3,321,537	21,282	6,407	764	230	22,046	6,637

[12] The caution is needed here as some of the donor or loan funded projects sometimes use National Schools as target schools of their pilot projects, thus more expenditure maybe allocated to National Schools.

Source: Sri Lanka University Statistics 2003, Budget Estimates 2004
Note: Calculation by JICA Study Team

From the above table, the estimated government expenditure per student is Rs.6,667 for national schools and Rs.6,637 for provincial schools, only slightly higher for national schools. Per student capital expenditure is Rs.778 for national schools and Rs.230 for provincial schools. Even though understanding that most national schools are Type 1AB and require extra facilities, it seems inequitable to continue such an allocation pattern with unclear criteria of allocation from MOE.

(5) School Management

1) Internal Management of School

School-Based Management (SBM) being recognized as a key strategy to improve schools in General Education Reform was introduced in 1997 and a need of introduction of SBM was further reiterated in the Proposals for National Policy Framework on General Education (2003). However, until recently no clear policy decision was taken to accelerate the move towards SBM. Therefore, although a number of measures were introduced to schools either as a pilot or on a regular basis, which have supported move towards more autonomy at school level, management system and school culture still remained top-down and bureaucratic.

Since July/August 2004, MOE has been initiating a number of discussions on the issue of SBM with various stakeholders. The government now has a pilot plan of implementing SBM in 16 zones[13] starting from early 2005. From 2006 some financial responsibilities will be transferred to schools island-wide under Education Sector Development Program (2006-2010) under SWAp. However, details of devolution to schools under SBM are not yet determined.

Current situation of school management in personnel, curriculum, and financial management are explained below.

[13] In addition to schools in 16 selected Zones, all National Schools and Navodya Schools will take part in the project.

Box 2.2.1 SBM Workshop held in MOE

SBM Workshop, organized by MOE with the assistance of JICA, was held on 31st August 2004, inviting relevant government officers and development partners active in education sector. Mr. P.D. Amarasinghe (Additional Secretary, MOE) opened the workshop by explaining the objective of the workshop of sharing SBM related experiences accumulated in recent year in Sri Lanka. Mr. W. Perera (Assistant Director General, NIE) presented main issues concerning SBM in Sri Lanka and its future direction. To share recent SBM related activities there were presentations on Pilot Project under JICA Master Plan Study, ADB funded SEMP and UNICEF's Child Friendly School, followed by lively discussions on different issues pertinent to SBM development in Sri Lanka. This timely workshop was highly appreciated among participants and holding further meetings in near future was agreed.

a) Leadership of Principals and Personnel Management

Principals play a very important role in improving quality and efficiency of education in school and NIE conducts management training for principals, both full-time and part-time basis.

Through the implementation of JICA Pilot Project it is also identified that the facilitative leadership is one of the most important qualities to succeed in school-based activities. Though some principals were excellent in bringing consented decision and building team work among teachers and parents, others lacked leadership or resorted to dictatorial command system. Capacity building of principals and senior teachers in management skills, including leadership training, should be further emphasized.

Teacher appraisal was introduced to all schools in 2002. Using a standardized format, the principal (or a senior manager) assesses teachers on teaching/learning and other activities. It is a useful tool, if used properly, to find out strengths and weaknesses of each staff. However, after the appraisal, few schools organize activities to develop teacher capacity based on the findings.

b) Curriculum Development

All government schools follow the national curriculum, and text books are centrally managed and distributed to schools. However, due to 1997 General Education Reform and introduction of quality inputs funds schools have more opportunities to enrich teaching and learning process by providing relevant teaching/learning materials and introducing more conducive teaching methods. In reality, however, apart from primary level, it is rare to find innovative teaching methods in school situation. Teachers rigidly follow teacher's guides and little initiative is taken to make the class more interesting and meaningful. This is also partly due to the fact that secondary level education focuses too narrowly on national exams.

c) Financial Management

At school level the main source of funding is from the government. Teachers' salaries are sent to the school account by the government. Utility costs, such as electricity, water and telephone, are paid partly by the government and partly by the school.

In addition to government funds, school collects Facility Fee from each student. Facility fee is normally around Rs.30 per year for primary and Rs.60 for secondary school student. Contributions from School Development Society (SDS) and Past Pupils' Association (PPA) constitute important funds for some schools. The amount the school can generate from SDS and PPA varies considerably from school to school.

Until the introduction of Quality Input Funds, most schools had little freedom to obtain what they needed for their schools. In the year 2000 under the IBRD funded GEP2, Quality Inputs Fund was introduced to schools, which allows schools to purchase quality input items within the prescribed regulations. Fund allocation to school is based on Norm-Based Unit Cost Resource Allocation Mechanism (NBUCRAM), which considers such factors as number of students, classes and the school category. This funding system has been widely appreciated by the principals and teachers as schools are able to obtain what they need for the school in accordance with their own priorities. This scheme has been carried over by the government after the fund allocation under GEP2 ended in 2003.

Although schools have been managing Quality Input Funds for the past 4 years, it is identified from the experience of JICA Pilot Project that many schools are not yet conversant with financial management. For further SBM schools need to understand and improve their financial transparency and accountability in the use of allocated funds.

2) Community Participation

There are different support groups at school level such as SDS, PPA, and local businesses in some cases. Most schools have SDS and it is the only support group for many of the smaller schools. Activities of the SDS vary from school to school, though most SDSs support their schools by organizing and hosting school events, attending to cleaning and repair works of the school. Most of the SDSs collect a yearly membership fee of Rs.3-15 per person, though some collect no fees and others collect much higher amounts as donations. These funds are often used for school activities such as sport meetings and school trips. Larger and more prestigious schools often have strong and resourceful PPAs, which contribute significantly to the development of schools.

Some schools have good connections with nearby organizations, industries, and businesses, which sometimes give contribution to the schools in different ways. A school the JICA Study Team visited had toilets built by a textile company in the area and another had a school project funded by a nearby food company. At one school officers from nearby Air Force were contributing manpower to build school fences and clearing the school premises.

One of the components of JICA Pilot Project was improvement of basic infrastructure and school facilities in cooperation with parents and students. Schools constructed teachers' quarter, science laboratories, mathematics rooms, libraries, science gardens, etc. As the plan was prepared by the school, teachers, parents and even students took initiatives to find human and material resources for the project. Some parents contributed their skills and others gave their time and labor, which reduced the cost by 30-50%. Further, due to the sense of ownership to the facility, which grew during the project implementation, it will probably help maintain the facilities better by the community.

CHAPTER III

THE PILOT PROJECT

3.1 Design of the Pilot Project

3.1.1 Background and Objectives

(1) Background

In reviewing the government strategy and programs in the education sector, it was revealed that the education sector in Sri Lanka has been operating in a bureaucratic and top-down administrative structure for many years. Accordingly, schools have been following the instructions given by MOE for the development of school management, education and basic infrastructure and facilities.

In order to analyze the accomplishment in the education sector, particularly in science and mathematics education, achieved by intervention of the government, a considerable number of school visits and interviews to principals was conducted and various problems were identified including low motivation of teachers, limited cooperation with parents and community, and little progress in teaching and learning method. Consequently, schools have not been a pleasant place for students and they have become less interested in learning, particularly science and mathematics.

In addition, the school survey was conducted to further understand the current situation in the education sector. The survey clarified a wide range of constraints in school management, quality education and basic infrastructure and facilities at schools, in particular, a disparity in educational conditions between urban and rural areas. However, it was also identified that some schools are trying to improve quality of education and school management through active participation of parents and community and these schools tend to have high academic achievement. This survey showed that the school-based approach would be quite effective in improving the quality of education and should be further developed.

Taking this survey results into account, the Pilot Project was formulated by applying the school-based approach or Educational Kaizen activities to the 25 pilot schools. The challenge focused on changing school culture as a prerequisite for the development of school management, science and mathematics education and basic infrastructure and facilities.

(2) Objectives

The objectives for implementing the Pilot Project were:

- To identify and apply the school-based activities for improvement to the selected schools;
- To assess outcomes and their sustainability; and
- To incorporate results of the Pilot Project into the Master Plan.

3.1.2 Concept and Approach

(1) Concept

The basic concept of the Pilot Project was to apply school-based approach or Educational Kaizen activities to the education sector. The Kaizen strategy is the most important concept in Japanese management, and is well known as one of the key factors for successful competitiveness in Japanese companies. Kaizen means continuous improvement involving everyone; top management, managers and workers. It was originally developed in the manufacturing sector, but now is applied in many sectors and in many countries. Kaizen activities include various methodologies of participatory approach such as 5S[14], suggestion system and Quality Control (QC) circle.

The Pilot Project utilized the Educational Kaizen concept in order for schools to improve school management, quality of science and mathematics education and basic infrastructure/facilities.

(2) Approach

The Pilot Project was planned, implemented, monitored and evaluated on a school basis. Each pilot school formed several QE circles[15], depending on their needs. Each QE circle had individual tasks to be assigned by the school management. Educational Kaizen activities were implemented based on the initiative of QE circles, since members of QE circle know best what activities are most needed at their school. A QE circle consisted of teachers, parents and students of the pilot school as well as teachers and local government officers from outside the school community.

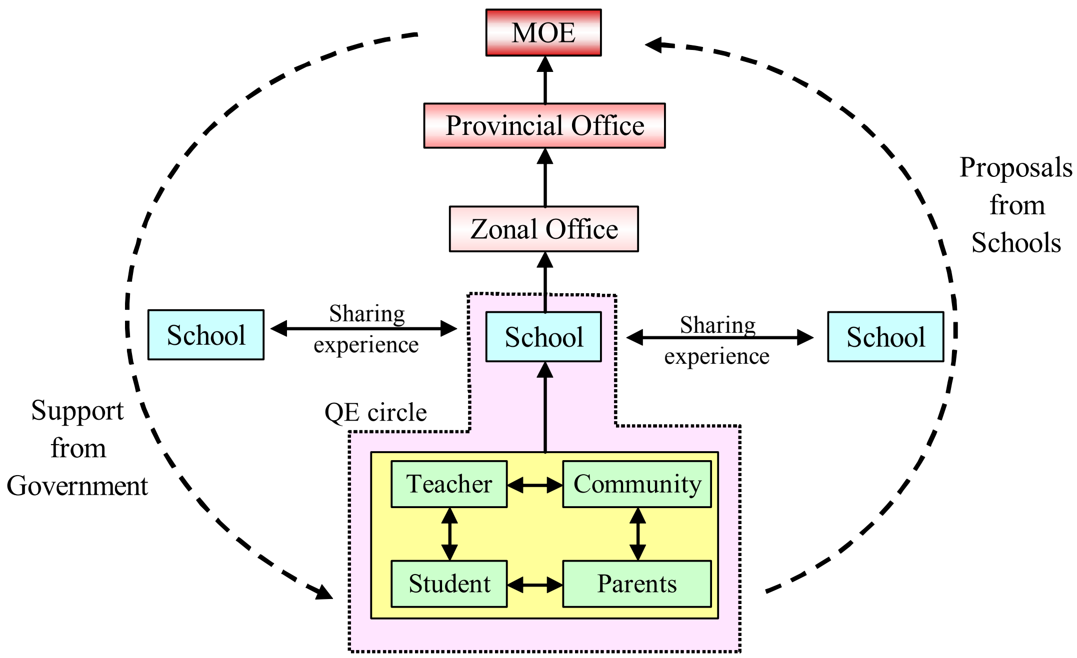
It is widely observed that facilities supplied by the Government are not always well matched to what is needed at school level. This unfavorable situation would be eliminated by a school-based Educational Kaizen approach. It is also broadly perceived that the education provided by schools does not exactly meet what the

[14] 5S originated in Japan and stands for five systematic steps of the process, that are SEIRI (Classify), SEITON (Clear), SEISOU (Clean), SEIKETSU (Continue), and SHITSUKE (Commitment). 5S aims to create a highly productive working environment.

[15] QE circle stands for Quality Education circle, which is identical with Quality Control (QC) circle usually used in the industrial sector. Considering that Kaizen activities in the Pilot Project are implemented in the education sector, a word of QE circle is used in this report.

society expects. Such a mismatch should be minimized through joint activities of teachers and communities in QE circles.

Taking these situations into account, it was proposed that the high level decisions by MOE should be made based on lessons learned from Educational Kaizen activities initiated by QE circles. The budget should be allocated based on requirements from individual schools. The school-based Pilot Project was an attempt to introduce a bottom-up scheme in the education sector, as illustrated in Figure 3.1.1.



Source: JICA Study Team

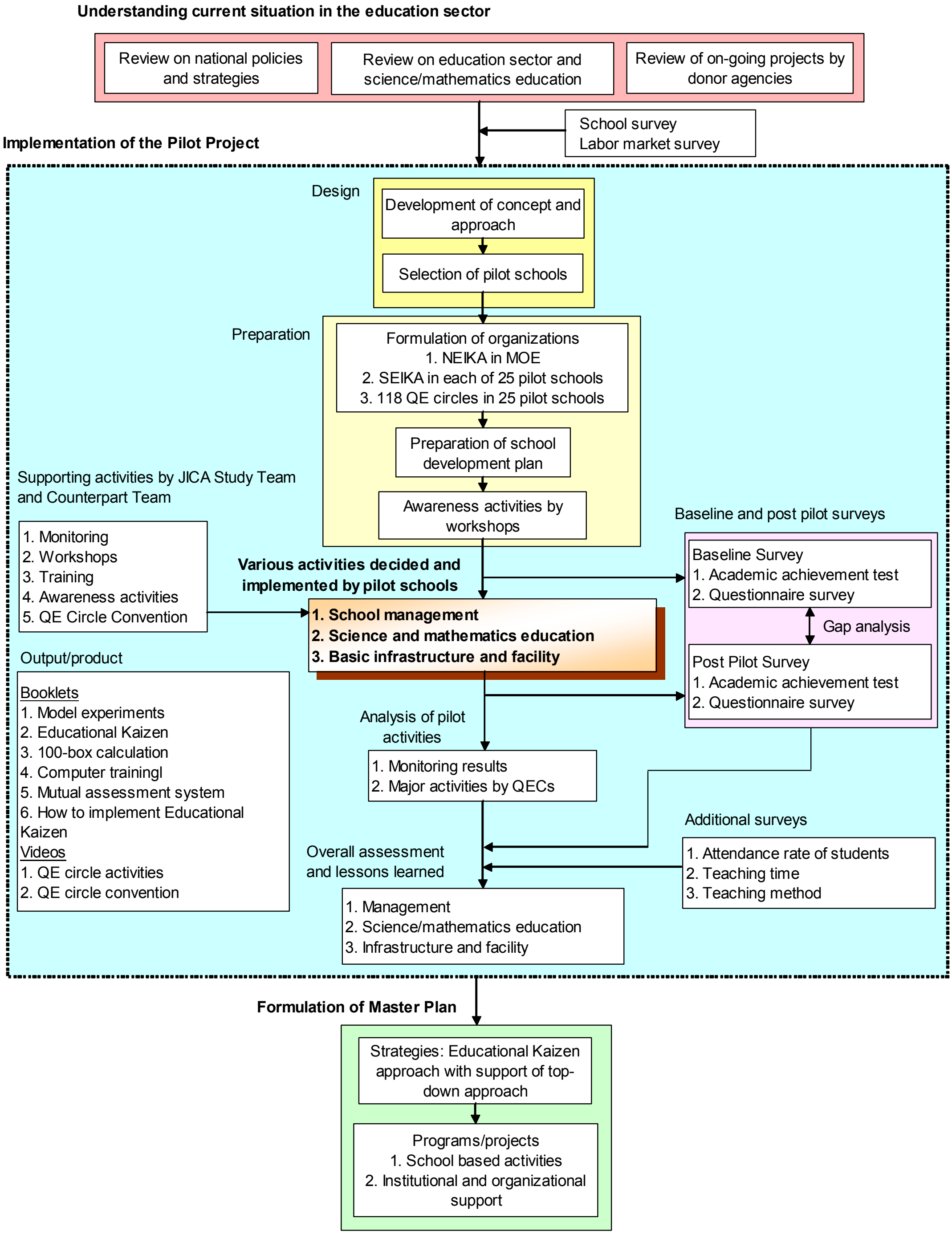
Figure 3.1.1 School-based Approach

3.1.3 Flow of the Pilot Project Implementation

The overall flow in implementing the Pilot Project is illustrated in Figure 3.1.2.

Following a review of the current situation, national policies and strategies and ongoing donor projects, the Pilot Project was designed to prove that a school-based approach strategy will improve the quality of science and mathematics.

In order to assess the impact of the Pilot Project, the Baseline Survey and Post Pilot Survey were conducted before and after the Pilot Project respectively. Through implementation of the Pilot Project, various outputs in the forms of booklets and video films were developed for the dissemination of Educational Kaizen activities to all schools. The outcomes from the Pilot Project were incorporated in the Master Plan, based on an overall assessment of the Pilot Project and lessons learned.



Source: JICA Study Team

Figure 3.1.2 Overall Flow of the Pilot Project Implementation

3.1.4 Selection of Pilot Schools

(1) Selection Process and Criteria

The 25 pilot schools were selected based on the evaluation of proposals submitted by the 49 long-listed schools, which were originally chosen from: 1) schools in the School Survey conducted in January 2003; 2) schools visited by the JICA Study Team and the Counterpart Team; 3) schools recommended by MOE and NIE; and 4) schools selected for the School Productivity Award 2002. Evaluation criteria for those proposals were: 1) impact on quality of education in science and mathematics; 2) impact on school management; 3) past efforts using a participatory approach; 4) proper selection of Educational Kaizen topics; 5) clear plan of proposed Educational Kaizen activities; and 6) the extent of community participation.

(2) Selected Pilot Schools

Location of the 25 selected pilot schools is shown in the Location Map. The distribution of these schools by type and location is shown in Table 3.1.1.

Table 3.1.1 Distribution of the Pilot Schools

Location	Type				Total
	1AB	1C	2	3	
Urban	6	0	0	0	**6**
Semi-urban	4	3	0	0	**7**
Rural	1	1	5	2	**9**
Plantation	0	1	1	1	**3**
Total	**11**	**5**	**6**	**3**	**25**

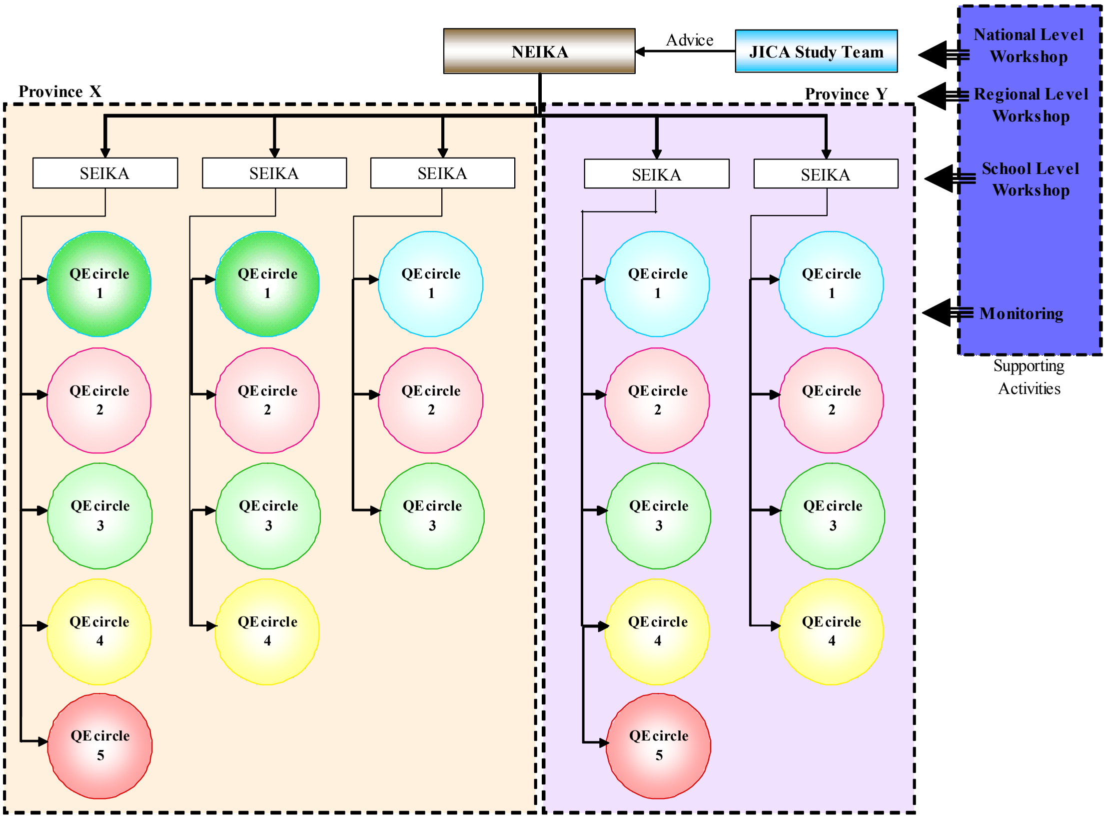
Source: JICA Study Team

3.2 Implementation of the Pilot Project

(1) Overall Implementation Structure

Proposed overall implementation structure for the Pilot Project is as illustrated in Figure 3.2.1. The National Educational Initiative of Kaizen Activities (NEIKA) was established as a supervisory body in implementing the Pilot Project. The objectives of NEIKA are to plan, to implement, to monitor and to evaluate the Pilot Project at the national level. In implementing the Pilot Project, a joint team consisting of NEIKA and the JICA Study Team was responsible for the selection of pilot schools and approval of the Educational Kaizen topics. The members consisted of 1) Additional Secretary of MOE, 2) Director General of NIE, 3) representatives of provincial offices, pilot schools and the Counterpart Team, and 4) representatives of the private sector. NEIKA meetings were held monthly.

Under NEIKA, each pilot school formed a School Educational Initiative of Kaizen Activities (SEIKA) with the objectives of planning, implementing, monitoring and evaluating the Educational Kaizen activities at the school level. SEIKA was responsible for selection of Educational Kaizen topics, formation of QE circles, budget proposal, procurement, preparation of progress reports and financial reports. Members of SEIKA consisted of 1) the principal, 2) director of education in science and mathematics in zonal education office, 3) In-Service Advisors in science and mathematics, 4) head teachers in science and mathematics, 5) representatives of SDS, 6) representatives of parents and so on. In order to maintain transparency in implementing the Pilot Project, involvement of representatives from outside the school was mandatory. SEIKA meetings were held about twice a month.



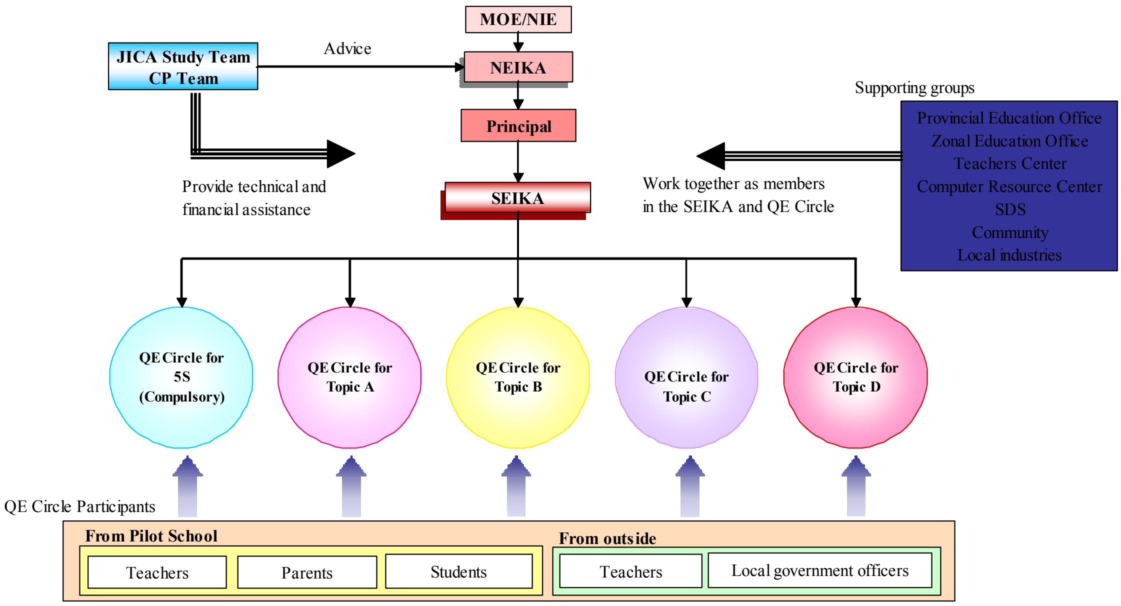
Source: JICA Study Team

Figure 3.2.1 Overall Implementation Structure

(2) School Level Implementation Organization

The school level organization to implement the Pilot Project is illustrated in Figure 3.2.2. The JICA Study Team and the Counterpart Team provided technical and financial assistance to SEIKA. The JICA Study Team included national experts for Educational Kaizen activities and monitoring activities. SEIKA was also supported by zonal education office and neighboring schools.

QE circle consisted of teachers, parents and students, as well as teachers and local government officers from outside. QE circles had weekly meeting for 15 to 30 minutes after school.



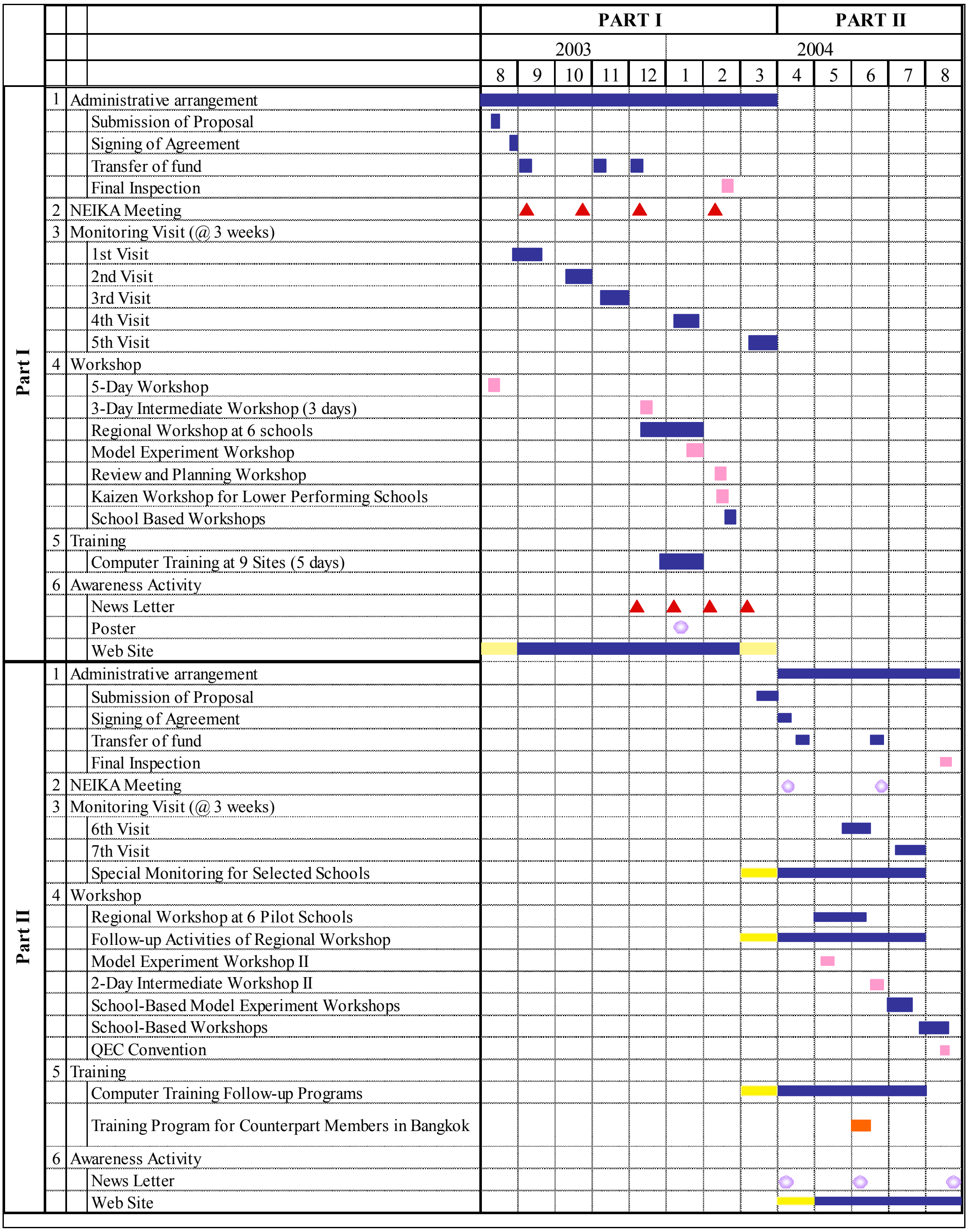
Source: JICA Study Team

Figure 3.2.2 School Level Implementation Organization

3.3 Activities Implemented by the Pilot Schools

3.3.1 Overall Review on Activities

All activities implemented in the Pilot Project are as listed in Figure 3.3.1. Implementation of the Pilot Project was divided into two parts, Part I from August 2003 to March 2004 and Part II from April to August 2004. The total estimated number of participants was around 20,000 person-days.



Source: JICA Study Team

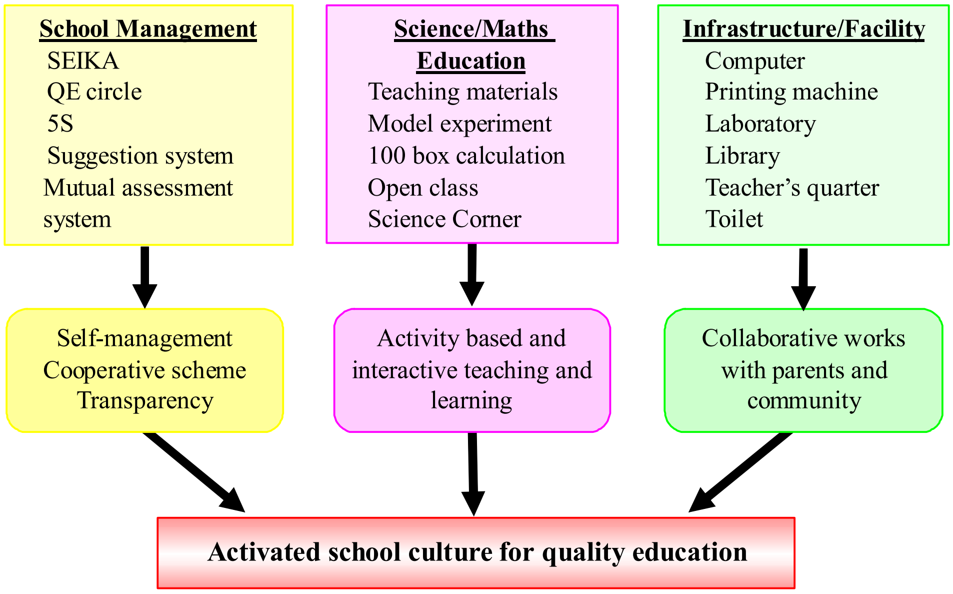
Figure 3.3.1 Overall Program Implemented in the Pilot Project

3.3.2 Major Activities by QE Circles

(1) QE Circle Activities

118 QE circles were formed at 25 pilot schools. The number of activities

implemented by the 118 QE circles was 944.[16] On average, each QE circle executed around eight activities for the one-year project period. These activities were classified into three major groups, namely (i) improvement of school management, (ii) improvement of science and mathematics education, and (iii) improvement of basic infrastructure and facility. The overview of QE circle activities is illustrated in Figure 3.3.2. The detailed information of the 944 activities is included in the attached CD-ROM.



Source: JICA Study Team

Figure 3.3.2 Overview of QE Circle Activities

(2) School Management

1) Promotion of 5S

5S is a systematic method to achieve managerial and operational efficiency through continuous improvement by everyone's participation[17]. 5S can be considered as one of the powerful tools to change the school culture. The efficient management and operation system at schools is also a necessary condition to upgrade the quality of science and mathematics education.

a) Booklet for 5S promotion and awareness campaign

Many schools prepared their original booklets for 5S promotion and distributed them to parents, neighboring schools and zonal officers. In addition, the pilot schools organized workshops and meetings to disseminate ideas of 5S, through which many parents started 5S activities with their children at home.

[16] Actual number of activities is larger than the figure mentioned here, since this indicates only major activities selected by the pilot schools.
[17] "School culture" in the report is defined as an overall school environment, which consists of managerial efficiency, quality of teaching services, working condition, participation of all parties concerned and so on.

b) Suggestion system

The suggestion system is one of the practical methods in 5S, where anybody can submit suggestions to decision makers in a standard format. Most of the pilot schools introduced the suggestion system, which encouraged people to think and propose their own ideas to the principal and SEIKA. Teachers, students and parents were pleased when their ideas were implemented. This enhanced their motivation to improve their school with a sense of ownership for the school.

c) Patrol system

Many pilot schools established patrol teams consisting of teachers, parents and students to monitor 5S activities with a check list. Since the patrol team's monitoring results were used for 5S competition, students were motivated to keep everything in order according to the 5S principle.

d) Garbage management system

Many schools developed efficient and effective garbage collecting system such as by installation of dustbins, polythene collection system, garbage recycling system for fertilizer, etc.

e) Shramadana

Shramadana is the custom in Sri Lanka, typically seen in villages, to offer voluntary (unpaid) expenditure of labor. Many schools periodically organized a Shramadana to clean the surroundings with the voluntary help of parents and the community.

2) Development of Information Management System

Some pilot schools introduced information management system by developing database and filing system for attendance record, personnel data, examination mark, library books and lending, and inventory. Some schools implemented this activity on a paper-basis while several schools adopted a computer-based system after having computer training through the Pilot Project. These activities made managerial and administrative works of the school easy, prompt, accurate and efficient.

3) Introduction of Mutual Assessment System

The mutual assessment system consists of principal's assessment by teachers, assessment among teachers and teachers' assessment by students. Due to a lack of real communication, school staff did not know their own shortcomings and therefore did not know how to improve themselves, which was a bottleneck in changing school culture. The mutual assessment system was an effective tool to bring a change to the school culture. It made the principals and teachers confident when their assessment results improved each time. It also made school culture open and school staff activated in most of the pilot schools. A guidebook for introducing the mutual assessment system, with sample questions, is available in attached CD-ROM.

Box 3.3.1 Effect of Mutual Assessment

"75 suggestions were given to me through the principal's assessment done by teachers, most of which are very useful and I recognized a lot of my shortcomings that I must improve. I have a lot to learn. I hope to have a better result at the next assessment three months later." (Principal)

During the initial stage of the Pilot Project, the school had faced difficulties in management, as it has more than 130 people on the staff. Some were deliberately uncooperative with the activities, while some were simply indifferent. Some even distanced themselves from the principal for the fear they felt toward him.

The principal decided to try the mutual assessment system, as was introduced and recommended at the Regional Workshop. The questionnaire was developed by a committee of teachers. Some of the questions asked whether the principal is accessible and listens to anyone, is a good decision maker, or acts impartially. The response was quite positive, almost unexpectedly. 95 out of 118 questionnaires were returned. The results were analyzed and displayed in the staff room, with the number of responses each shown in graphs. The suggestions that came with the assessment concerned both the principal's personal weaknesses and those of the school's on the whole. Having realized various shortcomings, the principal was quite happy to recognize the room for improvement. He came to listen more to the opinions of his staff.

For example, there were several suggestions to improve the communication between the principal and the staff. The principal admits now that earlier he did not think his staff wanted more opportunity to talk with him in person. Now, he tries to make more of his time available for discussion with the staff, and hold meetings regularly with the teachers according to the subjects, grades and other activities.

(3) Science and Mathematics Education

1) Development of Teaching Materials by Teachers

Although the government supplies textbooks and teachers' guides, there is a strong need for teachers to develop teaching materials such as handouts, workbooks, question papers, experiment manuals, observation manuals and project work manuals. Hence, all pilot schools formed QE circles to develop teaching materials through group work among teachers and/or with assistance of external resource persons such as ISAs and university lecturers.

This activity provided teachers with opportunities for self-learning and group-learning. It made teachers confident in teaching, since they used teaching materials that they developed by themselves. These teaching materials certainly help satisfy local needs for education at the school level. Most of the materials have been computerized and therefore can be easily modified and used every year.

2) Promotion of Experiment and Project Works

Students have to acquire knowledge and skills to solve actual problems, applying what they learned in school and this requires activity-based education and work with projects. Some examples include a survey on commodity prices, survey on environmental deterioration, drawing of charts that show weights and heights of students, measurements of classrooms, school buildings and campus, estimations of water volume in a pond, estimation of weight of objects, estimation of construction cost, drawing of maps of campus and the neighboring area. Activity-based education enhances various competency skills such as abilities of report writing, presentation, measuring, drawing graphs, experimentation, observation, record keeping and data analysis.

The role of teachers in such activity-based education is to identify appropriate topics and to provide proper guidance from time to time. Topics should be carefully selected based on students' interests. Then, teachers design plans, prepare materials, develop instruction manuals and conduct the activities.

Based on this recognition, all of the pilot schools formed QE circles to develop and promote experiment and project work. At the same time, a series of model experiments were developed by the joint effort of the Counterpart Team, JICA study Team and several teachers selected from the pilot schools, in order to promote activity-based and interactive teaching and learning process and to apply Science and Mathematics to daily life.

Furthermore, the Counterpart members participated in a 2-week training program for promotion of activity-based and interactive teaching and learning in science and mathematics in June 2004, provided by the Institute for Promotion of Teaching Science and Technology (IPST) in Thailand. Following the program, the participants visited the 25 pilot schools and conducted school-based model experiment workshops to disseminate experimental topics learned at IPST. After learning the content and methods for the model experiments, teachers introduced them in their class by using the equipments supplied by the Pilot Project. The instruction manual for the model experiments was developed by the Counterpart members by carefully selecting the topics and providing necessary instructions, can be found in the attached CD-ROM.

3) Promotion of 100-box Calculation

100-box calculation, developed by Japanese teachers, is aimed to enhance the ability to concentrate and to strengthen basic calculation skills in the four fundamental rules of arithmetic. At the same time, it contributes to eliminating students' fear of studying mathematics, as they can gain confidence through improving the time and accuracy with calculations. Improvement of basic calculation skills facilitates understanding of advanced science and mathematics in higher grades. Furthermore, students, as well as teachers, become more punctual, being aware of the importance of time, increase concentration power, learn to organize class operations efficiently and recognize the importance of analysis. The instruction manual for 100-box calculation is available in the attached CD-ROM.

All pilot schools conducted 100-box calculation as one of the QE circle activities. Using materials supplied by the JICA Study Team, the pilot schools prepared calculation sheets and record sheets and started from addition, then to subtraction, multiplication and division. The target grades differed among the pilot schools. In some schools, higher grade students helped in implementing 100-box calculation for lower grade classes.

4) Promotion of the Open Class System

The open class system is aimed at improving teaching skills through observing teaching and learning process in a peer teacher's classroom and giving feedback. Teachers observed by other teachers became confident in their own teaching skills after learning constructive comments and suggestions from the observers.

5) Establishment of a Science Corner

The science corner was established with health measuring instruments to be used for height, weight, eyesight and blood pressure etc. The measuring equipment was supplied by the Pilot Project. The science corner was effective for students to learn how to use scientific instruments and be familiar with them. They also learned to input data in tables and figures, and these provided practical lessons on the use of mathematics in their daily life.

(4) Basic Infrastructure and Facilities

In order to develop, repair and maintain school facilities, it was essential for the pilot schools to have continuous support and cooperation from parents, community, OB/OGs, well-wishers and so on. These supporting groups have to be involved in all aspects of the development process of basic infrastructure and facilities from planning, procurement, construction and inspection. In particular, cooperation of community includes supplying of locally available materials and labor at a concessionary rate.

Box 3.3.2 Examples of Activities for Infrastructure/Facility Development

Vijaya National College installed movable partitions between classrooms in the hall. As a result, disturbance from the neighbouring classroom have reduced, and teachers can give lessons more effectively and students can concentrate better.

In Maliyadeva B.V., teachers and students bound valuable books in the library to protect them from damage.

Gonulla K.V. developed an industrial unit, where a lot of miniature model equipments and facilities, such as an irrigation system, dam and generator, casting, ceramic furnace and wood processing were installed. This provided students with opportunities to understand basic industrial works.

Galpaya Vidyalaya constructed teachers' quarters in cooperation with parents and community. They provided labor and locally available materials in a much lower price, which reduced the overall construction cost. Students also helped.

Dutugemunu Central College rehabilitated a science laboratory with students, who learned skills for electric wiring and connection. The school could save money and it became a tool of their self-employment.

Golinda Tamil K.V. constructed a science laboratory with the help of parents and community. They provided labor and locally available materials. This reduced a construction costs by 40%.

3.3.3 Expenditure for Educational Kaizen Activities

(1) Budget Allocation

The amount of the budget allocated to the 25 pilot schools is shown in Table 3.3.1. The allocation was made in consideration of the size of student population and the location of the school as well as their performance in Educational Kaizen activities.

Table 3.3.1 Budget Allocation

Ownership	Province	Type	Location	No.	School Name	Budget (Rs. 1,000)		
						Part I	**Part II**	**Total**
P	CP	1	S	1	CP/Hindagala Maha Vidyalaya	910	163	1,073
P	CP	2	R	2	CP/GP/Rambukpitiya Maha Vidyalaya	1,010	177	1,187
P	CP	3	P	3	CP/N/St Andrews T.V.	700	149	849
P	CP	1	S	4	Mahaweli Maha Vidyalaya	800	223	1,023
N	NC	0	S	5	Ananda Balika National School	1,640	209	1,849
P	NC	2	R	6	A/Thammennapura Vidyalaya	860	317	1,177
P	NC	1	S	7	A/Mihintale Pathiraja Tennekoon K.V.	1,160	303	1,463
N	NE	0	U	8	St. Mary's College	1,560	330	1,890
N	NE	0	U	9	J/Vembadi Girls' High School	1,410	377	1,787
P	NE	0	S	10	J/Canagaratnam Madhya Maha Vidyalayam	1,170	209	1,379
P	NW	0	S	11	NW/CH/Wen/Girls College-Dankotuwa	1,600	317	1,917
P	NW	3	R	12	KU/Giri/Gonulla Kanishta Vidyalaya	900	377	1,277
N	NW	0	U	13	Maliyadeva Balika Vidyalaya	1,860	242	2,102
P	SB	2	R	14	R/Maduwanwela Sri Sarananda Vidyalaya	1,260	209	1,469
P	SB	2	R	15	R/Bala/Weli/Galpaya Vidyalaya	800	149	949
P	SB	2	P	16	KG/Golinda Tamil Kanista Vidyalayam	890	177	1,067
N	SP	0	R	17	H/Vijaya National College -Getamanna	1,080	284	1,364
N	SP	0	S	18	H/Rajapaksha Central College -Weeraketiya	2,450	270	2,720
P	SP	2	R	19	Muruthawela Kanishta Vidyalaya	730	237	967
P	UV	1	P	20	Poonagalla Tamil Maha Vidyalayam	1,120	196	1,316
N	UV	0	U	21	MO/Dutugemunu Central College	1,680	284	1,964
P	WP	3	R	22	WP/GM/Imbulgoda Sunethradevi K.V.	1,010	330	1,340
N	WP	0	U	23	Isipathana College	2,800	182	2,982
P	WP	1	R	24	Minu/Katuwellegama Maha Vidyalaya	870	270	1,140
N	WP	0	U	25	Devi Balika Vidyalaya	1,720	270	1,990
					Total	**31,990**	**6,251**	**38,241**
					Per School Average	1,280	250	1,530

Source: JICA Study Team

(2) Expenditure by Cost Category

The pilot schools were requested to account for all the money spent according to the categories of cost items, i.e. A) equipments, B) consumables, and C) construction. Table 3.3.2 shows the major cost items for each category.

Table 3.3.2 Major Cost Items

A) Equipments

Furniture	Computer & Printer	Computer Software	School Equipment	Teaching/Learning Material	Other
A-1	**A-2**	**A-3**	**A-4**	**A-5**	**A-6**
Cupboards	Computer	CD	Photocopier / Ronio	Library books	Film roll
Bookshelves	Printer	Cartridge	OHP	Workbooks	Herbal plant
Desks / Chairs	UPS	Floppy disk	Multimedia projector	Educational tools	Fertilizer

B) Consumables

Stationery	Photocopy & Printing	Fee	Laboratory Material	Transport Cost	Other
B-1	**B-2**	**B-3**	**B-4**	**B-5**	**B-6**
Paper	Printing	Labor fee	Chemicals	Transport fee	Letter posting fee
Pens / Files	Laminating	Drawing fee	Experiment materials	Educational Trip fee	Telephone connection
Bristle board	Book binding	Lecturer fee	Laboratory materials	Diesel	Bank charges

C) Construction

Construction	Rehabilitation
C-1	**C-2**
Cement / Sand	Cement / Sand
Paint	Paint
Tools	Tools

Source: JICA Study Team

Based on the above, the expenditure of the pilot schools for the implementation of Educational Kaizen activities is summarized in Table 3.3.3.

- Approximately 50% of the budget was spent for equipments, and 25% each for consumables and construction.
- Expenditure for educational equipments including computer equipments (A-2) and other school equipments (A-4) comes to nearly 30%.
- Considering the construction-related labor fee, such as those for designers, carpenters and masons in the fee category (B-3), infrastructure development accounts for about 30% of the total expenditure.

Table 3.3.3 Expenditure by Cost Item Category

(Rs. 1,000)

	Total	Furniture	Computer & Printer	Computer Software	School Equipment	Teaching/ Learning Materials	Other	Stationery	Photocopy & Printing	Fee	Laboratory Materials	Transport Cost	Other	Construction	Rehabilitation
		A-1	A-2	A-3	A-4	A-5	A-6	B-1	B-2	B-3	B-4	B-5	B-6	C-1	C-2
All Pilot Schools	**37,696**	2,984	2,584	691	8,445	2,628	496	2,757	2,628	2,554	938	468	952	6,463	3,108
Per School Average	1,508	119	103	28	338	105	20	110	105	102	38	19	38	259	124
Percentage	100%	8%	7%	2%	22%	7%	1%	7%	7%	7%	2%	1%	3%	17%	8%
		47%						27%						25%	

Source: JICA Study Team

(3) Average Cost of Items

Table 3.3.4 shows some of the cost as a sample. Average was taken of the prices paid by several pilot schools for a particular cost item.

Table 3.3.4 Samples of Average Cost

(Rs.)

Furniture		Computer & Printer		School Equipment		Fee		Construction	
A-1		A-2		A-4		B-3		C-1	
Cupboard	6,000	Computer	55,000	Photocopier	114,000	Skilled labour fee (per day)	500	Movable partitions (11 partitions for 2 halls)	92,000
Computer table	5,000	Printer	19,000	OHP	26,000	Painting/drawing fee (per day)	300	Toilets (Male-4; Female-2)	152,000
Visitors chair	600	UPS	5,000	Multimedia projector	193,000	Lecturer fee (per day)	1,000	Teachers' quarters (2 bedrooms & kitchen)	454,000

Source: JICA Study Team

3.4 Supporting Activities for the Pilot Schools

3.4.1 Monitoring

The monitoring team, consisting of members from the JICA Study Team and the Counterpart Team visited all pilot schools for seven times during the period of the Pilot Project.

The objectives of the monitoring activities are:

- To evaluate progresses of activities of QE circles
- To assist SEIKA and QE circle members in solving problems and constraints in implementing Educational Kaizen activities
- To assist in preparing monthly reports
- To monitor expenditure of SEIKA and QE circles for the Pilot Project

The monitoring team evaluated performance of the pilot schools through discussions with members of SEIKA and QE circles, interviews with teachers, students and parents as well as observation of classrooms. Although it was not easy to measure the level of performance of Educational Kaizen activities, the team tried to quantify it and, use this as a tool to motivate the pilot schools. The criteria to evaluate the performance of SEIKA and QE circles included 1) leadership of the principal and QE circle leaders, 2) level of participation of teachers, students and parents, 3) involvement of provincial/zonal officers and neighboring schools, and 4) outputs of Educational Kaizen activities in the area of school management and/or science and mathematics. The overall performance of the pilot schools was shown as an average of marks given to SEIKA and QE circles, which was then given to the pilot schools.

The pilot schools prepared and submitted monthly reports by using a form supplied by the JICA Study Team.

The inspection program was conducted twice at the end of Part I and II, inviting representatives of the 25 pilot schools. The objectives of the inspection program are:

- To review all monthly reports submitted by the 25 pilot schools
- To assess progress of QE circles in comparison to the original plan described in the proposals
- To check final activity reports summarizing all activities in each Part
- To examine all expenditure and to settle the accounts of the Pilot Project

3.4.2 Workshop, Training, Awareness Activities and QE Circle Convention

The various workshops, training and awareness activities were conducted to support and encourage Educational Kaizen activities of QE circles. Those are Intermediate Workshops, Model experiment workshops, Regional Workshops, School-based Workshops, Computer Training Program, Website, Newsletter and Poster.

As the final event of the Pilot Project, a QE Circle Convention was held for three days in August 2004, inviting representatives of the 25 pilot schools, provincial and zonal offices and MOE/NIE officials. All 118 QE circles made presentations in seven parallel sessions. Also there was an exhibition, where the pilot schools demonstrated their outputs developed through the Pilot Project.

3.4.3 Model Experiments

In order to accelerate promotion of activity-based and interactive teaching and learning methods, 36 model experiments were developed by JICA Study Team, Counterpart Team and teachers of the pilot schools. Trainings in implementing these model experiments were conducted for selected teachers of the pilot schools at NIE, followed by the school-based model experiment workshops at each pilot school. The instruction manuals of 36 topics were revised through these trainings and workshops and finalized as in the attached CD-ROM. The titles of the selected model experiments are listed in Table 3.4.1.

Table 3.4.1 List of Model Experiments

	No	Title	Grade
ERA	1	Can we forecast out future growth rate by using present data?	1-5
	2	Friends we meet in our environment	2
	3	How rockets operate? - understanding the principle behind rocket movements	3
	4	Let's build a model to show lighting	3
	5	Observing the behavioral pattern of an insect	3-5
	6	Observe How a Volcano Erupts	4
	7	How we identify our body parts?	4
	8	Desires of an earthworm towards light	4-5
	9	How a Tornado occurs?	4-5
	10	Fruits & vegetables also can be used as electric cells	5
	11	Which bridge type is stronger?	5
Primary Mathematics	1	Measurement of the human body	2
	2	Let us count from 1 to 50	2
	3	Let us draw our school map	4
	4	Number bonds using dominos	4
	5	Space management in the Classroom	4
	6	Estimating the height of objects which cannot be easily measured	5
	7	Drawing the path to my school from home	5
	8	Pattern in changing height	5
	9	Estimate the number of letters in a book	5
	10	Let's keep our school environment clean	5
Junior Secondary Science	1	Magnetic lines of force made visible	6
	2	Let's learn to make electricity circuits	7
	3	Reflection and refraction in reality	7
	4	Can heat make a balloon move?	8
	5	Does a generator suffer fatigue?	8
	6	A motor made within five minutes	9
	7	Can we use water to burn a paper?	10-11
	8	Can floating objects exert weight?	13

	No	Title	Grade
Junior Secondary Mathematics	1	Let's find a place for the lamp stand	8
	2	Can you locate the treasure?	8
	3	Let's estimate construction cost for a school building	8
	4	How to reduce your consumption of scarce water in order to save the earth	9-11
	5	Profitability of transportation industries	10-11
	6	Getting ready for inter house sports meet	10-11
	7	The shortest path: science giving solutions to mathematical problems	10-11

Source: JICA Study Team

3.5 Analysis of the Pilot Project

After one year operation of the Pilot Project, evaluation and analysis were carried out through the monitoring survey and post pilot survey.

3.5.1 Analysis of Monitoring Results

Based on the performance evaluation obtained through the monitoring activities, the pilot schools were divided into three groups according to the overall performances and processes of improvement, that is, 1) stable performance, 2) rising performance and 3) stagnant performance, as shown in Figures 3.5.1. A brief case study on selected schools from each group is given in Table 3.5.1.

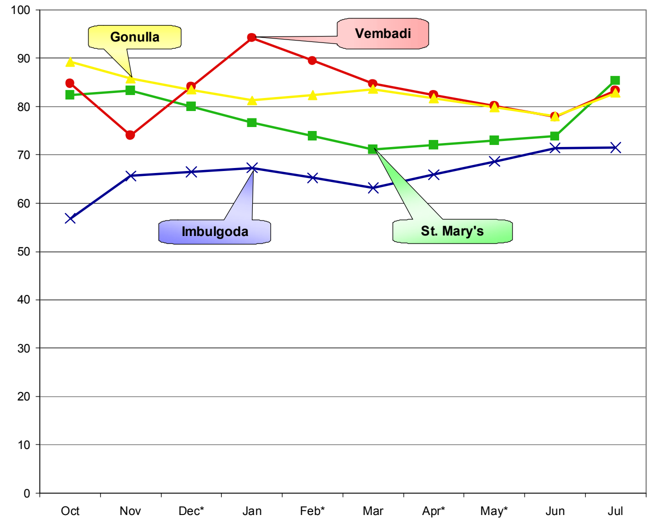
(1) Overall Analysis

Most of the pilot schools successfully implemented the Pilot Project, based on the school development plan that they themselves had prepared. This proves that Educational Kaizen approach can be applied to various schools including small and poorly-equipped rural schools[18].

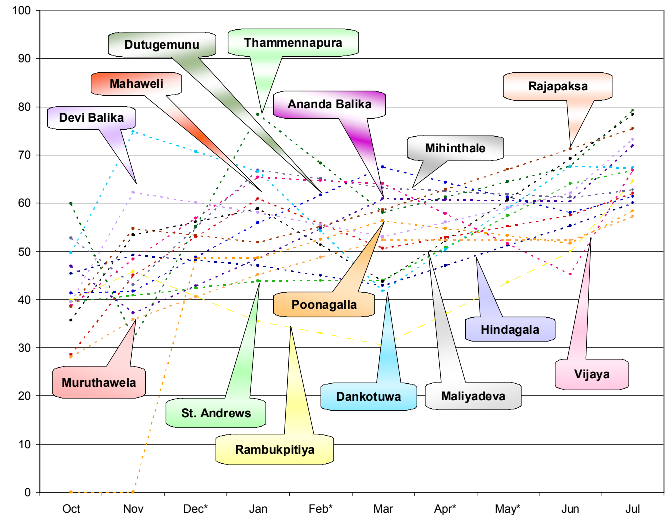
Improvement of Educational Kaizen activities varied among the pilot schools, but it did not depend on academic level, school type, location and size.

The key success factor was the facilitative leadership of the principal. Where the principal was authoritative, the schools faced difficulties in achieving an improvement through Educational Kaizen approach due to the limited and inadequate communication between the principal, teachers, parents and the community.

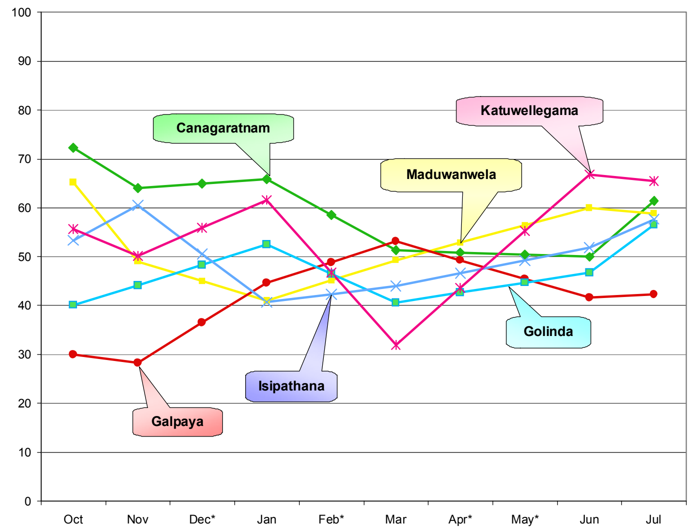
[18] The best school awarded at QEC Convention was given to Gonulla Kanishta Vidyalaya, a small rural school without sufficient facilities.



(1) Stable Performance



(2) Rising Performance



(3) Stagnant Performance

Note: Y-axis is an evaluation scale of monitoring results (max=100 point). X-axis is a time scale in 2003 to 2004.
Source: JICA Study Team

Figure 3.5.1 Progress of Educational Kaizen Activities at the Pilot Schools

Table 3.5.1 Case Study of the Three Different Groups

Group	School Name	*at the Early Stage*	*at the Final Stage*
1	Vembadi Girls' High School	Educational environment has been favorable with sufficient human and physical resources as well as strong OG society. Academnic standard was also one of the highest in the area. Under the principal's facilitative leadership, the school was quick to grasp the concept of Educational Kaizen activities.	With a high level of participatioin, a steady improvement was achieved in both school management and educational activities. The school also took an initiative to introduce Educational Kaizen activities to the neighboring schools and share the knowledge and facilities with them.
1	Gonulla Kanishta Vidyalaya	Though this small school, located in a rural area, was with poor physical facility, enthusiasm was evident among principal, teachers and parents from the beginning. Principal's leadership and commitment to quality education won a wide participation from the community.	Participation of teachers, students, parents and the community was at a high level. Investment in facility development helped in bringing up the educational standard as well as changing the school culture. The school has become a focal point in sharing their resources with neighboring schools and expanding the Educational Kaizen activities.
2	Wen/Girls College - Dankotuwa	Already with a few years of experience in 5S, the school was known for solid management. However, the project revealed their weak point in that activities were dependent on only a few members and not all. When the principal was away from school for several months, activities fell stagnant.	The crucial stagnation during the principal's absense prompted the school staff to rebuild team work by strengthening information-sharing among themselves. Principal's facilitative role in promoting active participation of teachers was the key contributor in recovering the right path. Introduction of open class system also helped to improve teachers' culture as well as teaching skills.
2	Hindagala Maha Vidyalaya	Principal's absence at the initial stage of the project resulted in ineffective leadership at a later stage when he returned. There was only limited support from teachers and parents. Team work was insufficient among teachers, who felt the project brought unwanted extra burden to them.	The relationship between principal and teachers improved after they participated in the regional workshop, where they learned to openly exchange opinions and to change attitudes. Through the monitoring visits and mutual assessment, they further improved their communication and removed the misunderstanding among themselves. The school culture has changed completely over the course of the project.
2	Maliyadeva Balika Vidyalaya	This school has had sufficient physical and human resources. However, lack of awareness among staff members about the project hindered wider cooperation and participation within the school and community. There was no leadership to direct and facilitate activities.	Change in the membership of SEIKA and QECs affected positively in changing the overall school culture. With the assistance provided by the key members of staff, particularly by the newly appointed project coordinator, principal came to understand the Educational Kaizen concept and the leadership that was lacking at the beginning. Close communication and team spirit was built among teachers.

Group	School Name	*at the Early Stage*	*at the Final Stage*
3	Katuwellegama Maha Vidyalaya	Principal's leadership was lacking, as was his awareness about Educational Kaizen concept. Though a few teachers tried to change the situation, most teachers were skeptical about improving the school management and educational standard through Educational Kaizen approach. They faced a struggle in building team work and sharing information among teachers.	Through the discussion with monitoring team and the interaction with other pilot schools, teachers of this school realized that their activities were not as well accomplished as the others'. However, the stimulus was not so big to change the entire staff and keep things moving forward. The pervasive mood was often one of inertia. Communication among the staff needed to be improved.
3	Isipathana College	After the former principal was transferred during the project, the school faced a difficult managerial situation. In absence of principal for several months, staff morale declined and Educational Kaizen activities stagnated.	The new principal, who joined the school in the middle of the project, tried to grasp the Educational Kaizen concept and get the school back on track. However, it took some time for them to recover from the managerial problem arisen in the vacuum period. Also the principal himself was struggling to adjust to the new environment in a big school. Though some changes started to occur in teachers' understanding and motivation, improvement was too slow to be evident within the pilot project period.
3	Galpaya Vidyalaya	Principal's leadership and understanding was next to non-existent in carrying out the Educational Kaizen activities. Only a few dedicated teachers were involved in various aspects of the project, facing serious managerial problems.	In spite of the management problem of the school, substantial support and cooperation was given by the community to the activities, including construction of teachers' quarters. Teachers' attitudes changed progressively, from one that is passive and dull to the one that is driven by motivation and commitment. However, the crucial deficit in managerial capacities and leadership of principal hindered the school from attaining a noticeable improvement in performance.

Source: JICA Study Team

When the principal was activated and facilitative, various constraints such as lack of communication, team spirit and transparency were eliminated and participation of parents and community gradually increased.

In case when the capability of the principal was deemed not suitable for managing the Educational Kaizen activities, an activated teacher should be assigned the role of project coordinator to enhance the school management. However, when the principal was totally authoritative and/or not activated, even the efforts of capable coordinator and activated teachers could not lead to the expected results.

Quality of education could not be improved without an activated school culture. Having successfully achieved a change in the school culture, the pilot schools further strengthened their Educational Kaizen activities.

Teachers who have been working at the same school for many years sometimes hindered changes to the school culture.

(2) Stable Performance Group

The reasons why these pilot schools could achieve the stable performance level during the Pilot Project can be summarizes below:

- The principal understood the concept of Educational Kaizen activities well from the beginning and recognized the benefits.
- The principal was a good facilitative leader.
- Because of the proper understanding of the concept, the most suitable teachers were assigned as the project coordinator and QEC leaders.
- St. Mary's College and Vembadi Girls' High School are among the leading schools in the area and had capable and motivated teachers. As the collaborative working culture was introduced through the Pilot Project, their performance was further enhanced.
- Gonulla K.V. and Imbulgoda Sunethradevi K.V. are small Type 3 schools located in rural areas and have limited human resources. However, the principals of these schools were activated and had clear visions to improve the school. Because of the small size of schools, it was relatively easy to make teachers understand the concept and benefits. In addition, the schools' close relationship with the community enabled a high level of parent participation.

Box 3.4.1 Expansion of Activities to Non-Pilot Schools

The initiative taken by St. Mary's College, a national Type 1AB Tamil-medium national school located in Trincomalee, in introducing the activities and transferring the knowledge to non-pilot schools in the area is praiseworthy. The school, by the decision of SEIKA, established a unit called "Mobile JICA" – to disseminate Educational Kaizen activities and provide necessary guidance to other schools, just as the JICA Study Team has done to St. Mary's College.

The principal, through the JICA Study Team's monitoring activities, recognized the importance of on-site consultation. She herself took the lead in establishing and facilitating the Mobile JICA. She knew some of the neighboring schools were clearly less privileged and in need of assistance. The Mobile JICA, comprising the principal and teachers involved in QE circle activities, diligently visited the four neighboring schools, including a Sinhala-medium school, several times each to introduce Educational Kaizen activities such as 5S and 100-box calculation. For example, the Mobile JICA team conducted 100-box calculation and guided the teachers in its effective and efficient implementation. Having printing facilities installed through the Pilot Project, Mobile JICA also provided materials such as answer sheets to the students of neighboring schools.

During the SEIKA meeting with JICA Study Team, the principal of one of the four schools expressed his appreciation and reported the change in his school.

"Our school is very different from St. Mary's College in the sense that most of our children are from poor fishing families and their parents are not educated. After grade 6, parents take their children for fishing, so the opportunity for education is often lost. But after we started 100-box calculation, students' absenteeism and dropout rates decreased very much. Because we are starting the exercise sharply at 8:10am, students don't want to miss it so they come early and regularly."

(3) Rising Performance Group

The reasons why these pilot schools could raise their performance through the Pilot Project can be summarized below:

- It took time for the principal to properly understand the concept of Educational Kaizen and recognize its benefits.
- In most cases, the school culture gradually changed through various interventions of the Pilot Project. Some of the contributing factors includes: 1) Problems were solved on site through discussion with the monitoring team; 2) Real communication was brought about through mutual assessment system; 3) Collaborative relationship grew up among teachers through open class system; and 4) Opportunities were given to exchange ideas and information among the pilot schools through a number of workshops as well as visits to other pilot schools.

- Most of these schools became confident especially after the school-based workshops, by seeing appreciation and satisfaction of participants from neighboring schools.
- Hindagala M.V. completely changed their culture after the regional workshop, where the principal discovered the importance of communication and how to improve it by introducing mutual assessment system. Similar change was seen at Rajapaksa Central College, Muruthawela K.V. Dutugemunu Central College and Devi Balika Vidyalaya.
- St. Andrews TV dramatically improved its performance after getting the active involvement of the zonal office, because transparency increased.
- After receiving low marks in the monitoring evaluation, Thammennapura V. was stimulated and changed their culture.
- Mihinthale P.T. K.V. had a capable and committed project coordinator. With her initiative, they have disseminated their outputs and methods to other teachers, including those in the neighboring pilot and non-pilot schools.

Box 3.4.2 Inter-School Cooperation among Pilot Schools

Three pilot schools located in the North Western Province collaborated to achieve a remarkable result through the Pilot Project. Dankotuwa Girls' College, having a fully-equipped computer room as well as teachers with strong computer skills, provided assistance to Gonulla K.V., a small rural Type 3 school, in preparing presentation materials for their school-based workshops and QEC Convention. In return, Gonulla's experience and creative ideas in developing activities for student-centered education was shared when Dankotuwa was preparing a Science Corner in the Activity Room. Maliyadeva B.V., being a prestigious national school in the Kurunegala town, offered a great resource to the other two in uplifting the students' academic standard with high quality teaching materials.

Teachers of the three schools participated in the school-based workshops, where they also contributed to and learned from the presentations and discussions. They carried out the Provincial Action Plan developed at the Intermediate Workshop in the presence of associated provincial/zonal officers. Finally they all partook in the joy that came with Gonulla's winning of the Best Pilot School award at the QEC Convention, as well as Dankotuwa's and Maliyadeva's awards for QECs.

It shows that schools that differ significantly in size, location and type can collaborate for a common cause – to enhance the quality of education provided to students. All three schools now are well capable of expanding the activities to other schools in their respective areas.

(4) Stagnant Performance Group

The reasons why these pilot schools could not accomplish success the results can be summarized below:

- Some of the principals in this group could not fully understand the concept and benefit of Educational Kaizen approach until the end.
- They thought that 5S was just cleaning and improving the physical appearance. They tried to "entertain" the monitoring team by showing the improvement in the environment, but it did not go beyond that.
- In Isipathana College, the large school size made it difficult for the newly appointed principal to change school culture, since quite a number of the older teachers showed resistance against a change.

3.5.2 Analysis of QE Circle Activities

(1) School Management

Principal and teachers tend to work individually in schools. Communication practice is rather limited and information is shared only among a small number of staff members. No critical issues are discussed at staff meetings and no decisions are made. Consequently, there is no school culture to make them activated and cooperate with each other. Although a considerable amount of inputs such as training, equipment supply, infrastructure development have been undertaken for schools through various projects in the past, outcome could not be at a satisfactory level under this situation. This was a real situation in most of the pilot schools.

The Pilot Project challenged this most fundamental but complicated task, applying Educational Kaizen approach. In all pilot schools, the school culture started to change, through which (i) teachers became activated, (ii) teachers started to work together, (iii) teachers started to pay more attention to students, (iv) teachers started to think and act by themselves, and (v) parents started to participate in school activities. Although it was a time consuming and difficult process, the pilot schools started to move forward. Eventually, teachers noticed that they can solve most of their problems through team work, and their experience of problem solving made them confident, activated and happy.

Based on the overall experience of the Pilot Project, it can be said that schools should start with 5S activities and mutual assessment system in order to develop the foundation for Educational Kaizen activities.

1) Promotion of 5S

Most of the pilot schools successfully introduced 5S. 5S activities gave positive impacts on the school culture. As such, these activities were effectively expanded to students' homes and neighboring schools. Such a movement certainly was a positive influence on the quality of education provided at schools.

However, it seems that some of the schools still do not fully understand the concept of 5S correctly. Some people misunderstand that 5S is just a method of housekeeping. 5S is a systematic approach to eliminate waste of time, money and materials by everyone's involvement. 5S covers all aspects of our life such as communication practice, information management, data integration and filing system. Everybody has to have the spirit to improve every activity around us in a systematic way.

Without everyone's involvement, 5S activities cannot be sustainable. Continuous effort of the pilot schools has to be maintained together with internal and external monitoring activities.

2) Development of information management system

Many pilot schools developed an information management system. Most of them are still in paper-based system, while several schools, where human resources were available, developed computerized information management system.

However, it was observed that data collection was not accurate in some pilot schools. Moreover, many pilot schools did not analyze data to identify problems and find countermeasures. Despite this, teachers have gained computer skills at the computer training provided by the Pilot Project, but many pilot schools did not start using these skills to computerize their paper-based information management system.

3) Introduction of a mutual assessment system

The mutual assessment system is well introduced at all pilot schools and had favorable responses from the majority of school staff, although there was some resistance at the beginning. The introduction of the system made significant impact on school staffs. Constructive comments and suggestions led them to improve their shortcomings, and motivated them to get better results in the next assessment.

The introduction of the mutual assessment system accelerated changing school culture toward a full implementation of Educational Kaizen activities through everyone's involvement in most of the pilot schools. This system has to be maintained to encourage school staff to make individual progress and to improve school culture.

(2) Science and Mathematics Education

Teachers heavily depend on the teachers' guide supplied by MOE and expect to gain new ideas only by participating in training and seminars that the principal assign them to attend. They seldom study on their own to collect the latest information related to science and mathematics and rarely develop their original teaching method and teaching materials. Activity-based and interactive teaching and learning is not a very popular method among teachers, since they are not so confident in its practice. As a result, their teaching method remains conventional and students lose interest in science and mathematics. Moreover, teachers do not find it joyful to teach, and leave school to go home at 2 p.m. sharp. This was the typical working attitude of many teachers in the pilot schools.

Recognizing that improvement in the quality of education in science and mathematics is not possible without changing teachers' attitudes, the Pilot Project challenged them to promote self-learning activities through Educational Kaizen approach. Through QE circle activities, teachers learned to think, plan and develop teaching materials and activity-based and interactive teaching and learning. The open class system made teachers more confident in their teaching skills. 100-box calculation proved to be an effective tool to strengthen the basic calculation skills.

As a result, teachers understood that they could improve their teaching skills by self-learning to a large extent, when they worked together and taught each other. In addition, they recognized that teaching is a joyful work. Although it will take more time to ensure changes, things started moving forward.

Having achieved a change in school culture, schools should start with the open class system, which makes teachers' communication effective and, as a result, makes them confident. This should be followed by the development of teaching materials and promotion of experiments and projects.

1) Development of teaching materials by teachers

Enormous amounts of teaching materials were developed by teachers, which gave significant benefits to students. These teaching materials certainly helped teachers to teach effectively and efficiently and made it easy for students to understand subjects.

However, there are areas to be improved. For example, many of teaching materials were rather exam-oriented and were far from activity-based and encouraging interactive teaching and learning. Also, still some of the teachers were reluctant to develop their own teaching materials.

The next step will be to upgrade the quality of teaching materials so as to stimulate students' interests in science and mathematics and to develop their creative thinking.

2) Promotion of experiments and projects

A number of activities related to experiment and projects were undertaken. These activities enhanced activity-based and interactive teaching and learning methods and successfully increased students' interest in learning science and mathematics.

However, some parents, particularly in popular urban schools, rather prefer theory-oriented education to experiment and projects. They request teachers to focus more on the preparation for the national examinations. Due to this pressure from parents, some teachers in these schools hesitated to expand experiments and projects in teaching. The teachers should persuade parents to understand the importance of experiments and projects, as this increases students' interest in science and mathematics, helps students to understand theories easily and in the end improves their examination results.

Moreover, many of activities developed by teachers of the pilot schools were rather non-scientific or only demonstrations of scientific magic and selected topics were mostly outdated. In science in particular, they should use the contemporary world topics. Experiments should be linked with theories, while project work should provide students with opportunities to think about the design, approach, data collection, analysis and presentation.

In this connection, a series of model experiments were developed through the Pilot Project and were introduced in the pilot schools. This impacted upon teachers and students and brought out their innovative ideas and approaches. These model experiments should be implemented more extensively and modified by the teachers of the pilot schools.

3) Promotion of 100-box calculation

All pilot schools introduced 100-box calculation to improve the four basic operation of arithmetic. Most of the students showed remarkable results. They enjoyed the exercise, became confident and eliminated the fear of mathematics. In addition, students, as well as teachers, knowing the importance of time, became punctual, and showed increased concentration power. 100-box calculation is proved to be a powerful tool with little cost.

However, in some schools, it took a long time to make teachers understand the concept and correct method. For instance, some teachers just let students repeat the 100-box calculation everyday without teaching any skills, while some others just conducted the exercise every day without doing any analysis of results. Consequently, students could not complete the division part within one year and the students did not gain the full benefit of the program.

4) Promotion of open class

Many pilot schools introduced the open class system and became aware of its usefulness. The open class system is effective in improving teaching skills of teachers while no cost is required. Teachers became confident in their own teaching after having comments and suggestions from the colleagues who observed their lessons. Observer teachers also gained benefit, learning new skills from colleagues.

However, as the open class system was introduced in the pilot school only in the Part II, this system is still in an experimental stage and therefore the benefit has not yet fully come to students. The pilot schools should continue this activity to upgrade their teachers' teaching skills, develop their own methods to teach each other, and these will enhance communication among teachers.

5) Establishment of a science corner

Some of pilot schools established a science corner and allowed for students and parents to use health measuring instruments freely. They became familiar with the use of the instrument.

However, in many schools these instruments were not frequently used. Moreover, they did not utilize them to make tables and figures of the data, which are good practical lessons to use mathematics for daily life.

(3) Basic infrastructure and facilities

Most of the pilot schools improved basic infrastructure and facilities with the support from parents and community. Since the pilot schools prepared their school development plan together with parents and community, a strong sense of ownership arose, enabling the fullest cooperation from parents and community. As a result, the pilot schools constructed facilities such as teachers' quarters, science laboratories, and libraries at around 50% to 70% of the normal cost. Many pilot schools invited neighboring schools to use their facilities on a regular basis, through which inter-school collaboration was initiated.

However, since this was the first experience for the pilot schools to make a plan and design, procure materials, and monitor a construction work, they had difficulties in managing such a process, and an inefficient use of budget was observed in some schools.

Some pilot schools had difficulties with purchasing expensive equipment such as printing machine, multi-media projector and computers and printers, since they did not have up-to-date information on the equipments as well as on suppliers.

3.5.3 Impact Assessment

To assess the impact of the Pilot Project, the Baseline Survey (BS) and the Post Pilot Survey (PPS) were conducted before and after the implementation of the Pilot Project. Both surveys consisted of Academic Ability Test (AAT) and Questionnaire Survey (QS). BS was conducted in July 2003 and PPS in July – August 2004. In addition, a survey on students' attendance rate was conducted in September 2004.

(1) Academic Ability Test (AAT)

The AAT comprised of sets of multiple-choice questions in the subjects of science and mathematics. It is to measure the impact of the Pilot Project on the students' ability in solving questions[19] in science and mathematics. The same question papers were used for the BS and PPS. The AAT was conducted at 8 pilot schools and 8 control schools.

The means of increments[20] of samples are calculated for the comparison between pilot and control schools. To test the significance level of differences of mean of increments, a t-Test is used. The results are summarized in Table 3.5.2.

Table 3.5.2 Analysis of Academic Ability Test Results

		Pilot schools								Control schools								Number of sample		Mean of increment		Comparison of means	Significance level
Subject		Science				Mathematics				Science				Mathematics									
Grade		4/5	8/9	10/11	12/13	4/5	8/9	10/11	12/13	4/5	8/9	10/11	12/13	4/5	8/9	10/11	12/13	Pilot	Control	Pilot	Control		
Overall Comparison		○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	○	1198	1202	2.19	1.51	P>C	**
Comparison by Subject	Science	○	○	○	○					○	○	○	○					586	602	2.13	1.54	P>C	*
	Mathematics					○	○	○	○					○	○	○	○	612	600	2.25	1.49	P>C	**
Comparison by Grade	4/5	○				○				○				○				284	266	2.35	2.33	P>C	ns
	8/9		○				○				○				○			350	360	2.59	1.87	P>C	*
	10/11			○				○				○				○		327	372	2.16	0.68	P>C	**
	12/13				○				○				○				○	237	204	1.46	1.36	P>C	ns

Note ** Significant at 1% level; * Significant at 5% level; ns Not significant
Source: JICA Study Team

1) Overall Comparison

Means of the increments in individual students' marks are calculated. Mean of pilot schools (2.19) is larger than that of control schools (1.51), with the difference being extremely significant by t-Test. This indicates that there was a certain impact on the students' overall academic ability by the Pilot Project.

2) Comparison by Subject

Means of the increments in individual students' marks in each subject are calculated. In both science and mathematics, means of pilot schools are larger

[19] Questions were designed to test abilities of routine procedures, complex procedures, theorizing, and analysing as well as knowledge on mathematics and science.
[20] Definition of increment of each individual student for a test is: Increment = (Mark in PPS) – (Mark in BS).

than those of control schools, both at a statistically significant level. This result indicates that an impact on academic ability was observed in both subjects.

3) Comparison by Grade

Means of the increments in individual students' marks in each grade are calculated. In all four grades, means of pilot schools are larger than those of control schools. The differences are statistically significant at 0.01 level in grades 8/9 and 10/11, while not significant in grades 4/5 and 12/13. (Refer to the Supporting Report Part 3 for more information.)

(2) Questionnaire Survey (QS)

The QS consisted of a series of quantitative and qualitative questions leading to various indicators of input, process and output to measure the quality of education at the school level. The QS was conducted in all 25 pilot schools and the 8 control schools which were selected for the AAT.

Table 3.5.3 shows the indicators that had statistically significant (at 1% or 5% level) difference of the increments in comparison of pilot schools and control schools. It contains the data source and the difference of the means of the increments from BS to PPS in pilot schools and control schools.

The following are the summary of findings from the above results. (Refer to the Supporting Report Part 2 for more information.)

1) Improvement in School Management

When compared between pilot and control schools the improvement was larger in pilot schools in all the indicators related to school culture and school management. The improvement in pilot schools was significantly larger in the indicators of *School Climate* (students' rating), *Parents' Satisfaction with School* (both students' and parents' rating), and *Parents' Support* (students' rating).

Although it is not possible to determine which activity in the Pilot Project has brought such improvements, it is probably reasonable to assume that the Pilot Project as a whole has benefited in improving school culture and parents' support and satisfaction with school.

In the comparison among pilot schools, the increment was much greater in non-Type 1AB schools and schools in rural/ plantation areas than Type 1AB schools and urban schools. Small rural schools, which are in general poorly equipped and with less attention to education, seemed to have been benefited from the Project more than the schools in urban areas.

Table 3.5.3 Summary of Questionnaire Survey Results

Indicators		Data source	PPS – BS		P /C	t-Test
			P	C		
1	Infrastructure	Pr	3.72	-0.38	>	**
2	Teaching Facilities	Pr	10.22	2.57	>	*
3	Parents' Support	S	0.22	0.14	>	*
4	School Climate	S	0.19	0.06	>	**
5	Teaching Method	T	0.14	-0.10	>	**
6	Use of Teaching Aids in Maths	S	0.31	0.15	>	**
7	Use of Teaching Aids	T	0.34	-0.02	>	**
8	Evaluation of Maths Class	S	0.12	0.01	>	**
9	Evaluation of Science Class	S	0.13	0.05	>	*
10	Parents' Satisfaction with School	S	0.15	0.00	>	**
11	Parents' Satisfaction with School	Pa	0.21	0.09	>	**
12	Parents' Satisfaction with Math Education	Pa	+11.1%	-3.1%	>	**
13	Parents' Satisfaction with Science Education	Pa	+9.2%	-10.1%	>	**
14	Students' Interest in Maths	S	+4.7%	+1.9%	>	**
15	Students' Interest in Science	S	+2.4%	-1.1%	>	**
16	Students' Interest in Science and Maths	T	0.40	0.12	>	**
17	Students' Education Goal	S	+3.6%	-0.1%	>	**

Note: Data Source: Respondents (Pr for Principal, T for teachers, S for students, Pa for parents)
PPS – BS: Mean difference between PPS result and Baseline Survey
P for Pilot Schools, C for Control Schools
P>C: If the mean (or rate) from Pilot Schools is greater than that from Control Schools, X is noted.
t-Test: ** significant at 1% level, * significant at 5% level

Source: JICA Study Team

2) Improvement in Science and Mathematics Teaching and Learning

Improvement was greater in pilot schools in all but one indicator related to the category of science and mathematics teaching and learning[21]. There was a significantly greater improvement in pilot schools for *Science/Maths Teaching Method* (teachers' rating), *Use of Teaching Aids in Maths* (students' rating), *Use of Teaching Aids* (teachers' rating), *Evaluation of Science and Maths Class* (students' rating), and *Parents' Satisfaction with Science and Maths Education in School* (parents' rating).

It can be inferred from the above that the Pilot Project has succeeded in improving teaching and learning process in science and mathematics. Significant improvement in *Teachers' General Teaching Ability* may be interpreted that the impact of the Project was not limited to science and

[21] The improvement was slightly greater in control schools only for Use of Teaching Aids in Science.

mathematics but it has contributed to improvement in other subjects.

3) Improvement in Basic Infrastructure and School Facilities

Improvement in *School Facilities*, *Infrastructure*, *Teaching Facilities*, and *Science Lab, Maths and PC Room* was greater in pilot schools than control schools. Improvement in pilot schools was significant in the case of *Infrastructure* and *Teaching Facilities*. The question was included only in Principal's Questionnaire, thus the sample number is too small to further analyze the results.

(3) Survey on Attendance Rates of Students

This survey was conducted by collecting the attendance rates[22] of students in the 25 pilot schools. The grades for this survey are 2, 4, 8, and 10 and the months are March and July[23] in 2003 and 2004. The results are summarized in Table 3.5.4.

Table 3.5.4 Analysis of Attendance Rates by Grades

Grade	Number of Sample		Average of Attendance Rates							
			March				July			
	2003 (class)	2004 (class)	2003 (%)	2004 (%)	Difference (%)	t-Test	2003 (%)	2004 (%)	Difference (%)	t-Test
2	46	49	87.10	87.40	0.30	ns	84.67	87.04	2.38	ns
4	46	51	86.71	87.13	0.42	ns	85.70	87.71	2.01	ns
8	68	75	86.33	87.74	1.41	ns	86.26	88.21	1.95	ns
10	68	74	87.23	85.63	-1.59	ns	85.89	85.51	-0.38	ns
2, 4, 8, 10	228	249	86.83	86.92	0.09	ns	85.72	87.08	1.36	*

Note *: Significant at the 5% level; ns: Not significant
Source: JICA Study Team

An increase can be seen in all grades except for grade 10 in both March and July comparisons. Though the difference in each grade is not statistically significant, the average attendance rate shows a statistically significant increase (at 5% level) in the July comparison when all the grades are combined.

In order to look further into the impact of the Pilot Project on students' attendance, the attendance rates of grades 2, 4, 8 were analyzed based on the location of the schools (urban, semi-urban, rural, and plantation), as shown in Table 3.5.5. All schools except plantation schools show an increase in attendance rates in both months. Among them, the increase in semi-urban and rural schools is statistically significant at 1% and 5% levels respectively in July 2004 over 2003.

[22] The attendance rates were expressed as a percentage of the actual student days to the expected student days for the month.

[23] These grades and months were selected in due consideration of minimizing the influence of school activities and vacation periods as well as of national examinations.

Table 3.5.5 Analysis of Attendance Rates by Location

Grade	School loation	Number of Sample		Average of Attendant Rates							
				March				July			
		2003 (class)	2004 (class)	2003 (%)	2004 (%)	Difference (%)	t-Test	2003 (%)	2004 (%)	Difference (%)	t-Test
2, 4, 8	Urban	61	72	89.45	90.16	0.71	ns	89.81	90.40	0.59	ns
2, 4, 8	Semi-urban	52	54	87.43	88.08	0.65	ns	85.65	88.19	2.54	**
2, 4, 8	Rural	35	37	82.15	83.81	1.66	ns	80.15	84.80	4.65	*
2, 4, 8	Plantation	12	12	82.28	79.80	-2.48	ns	80.44	78.82	-1.62	ns

Note **: Significant at the 1% level; *: Significant at the 5% level; ns: Not significant
Source: JICA Study Team

This shows that the Educational Kaizen activities of the Pilot Project were effective in improving the attendance of the typically most disadvantaged schools, namely those located in a rural area. On the other hand, urban schools that had already achieved and maintained relatively high rates of attendance show a smaller increase. Plantation schools showed negative change, which indicates that other factors, such as parents' level of awareness, serious shortage of teachers, etc., might have affected the attendance of students more than the activities of the Pilot Project did. (Refer to the Supporting Report Part 2 for more information.)

Box 3.5.1 Impact of the Project

A girl of grade 10 (suppose her name is Neelika) in one of the pilot schools described the change in her school in a conversation with a national consultant from the JICA Study Team.

Consultant: So, is your school different from last year?
Neelika: Yes, very much different.
Consultant: Do you like it more now or less?
Neelika: Much more now.
Consultant: Why?
Neelika: The boys don't bully me now like they used to.
Consultant: What did they do earlier?
Neelika: They pushed me around, and made a funny name for me.
Consultant: Why don't they do that now?
Neelika: Now the teachers pay attention so they find it difficult to do that.
Consultant: That's good.
Maybe the teachers were trying to stop this kind of thing earlier too.
Neelika: No, earlier they didn't bother to care.
Consultant: How do we know that the teachers are different?
Neelika: Well… they come to class as soon as the period is due to start.
Consultant: How was it earlier?
Neelika: Sometimes they came long after the period began.
Consultant: Why do they come on time now?
Neelika: Why? There is a thing called the JICA Project.
Consultant: So the JICA Project told the teachers to come on time?
Neelika: Um… I don't know.

Box 3.5.1 continued…

During the conversation, her face is lit up with a smile, so genuine that everything she says was confirmed. She is happy to come to school because she is no longer subject to harassment at school. She doesn't quite know how the Project has led to greater joy in her life, but she knows that something in it has made her school better.

Consultant:	You seem to have a cold.
Neelika:	Yes, a little bit.
Consultant:	Didn't you want to stay at home?
Neelika:	No, I want to come to school. I don't like to miss school.
Consultant:	You may infect others though.
Neelika:	No, it should be okay, because I am sitting a little bit away from others.

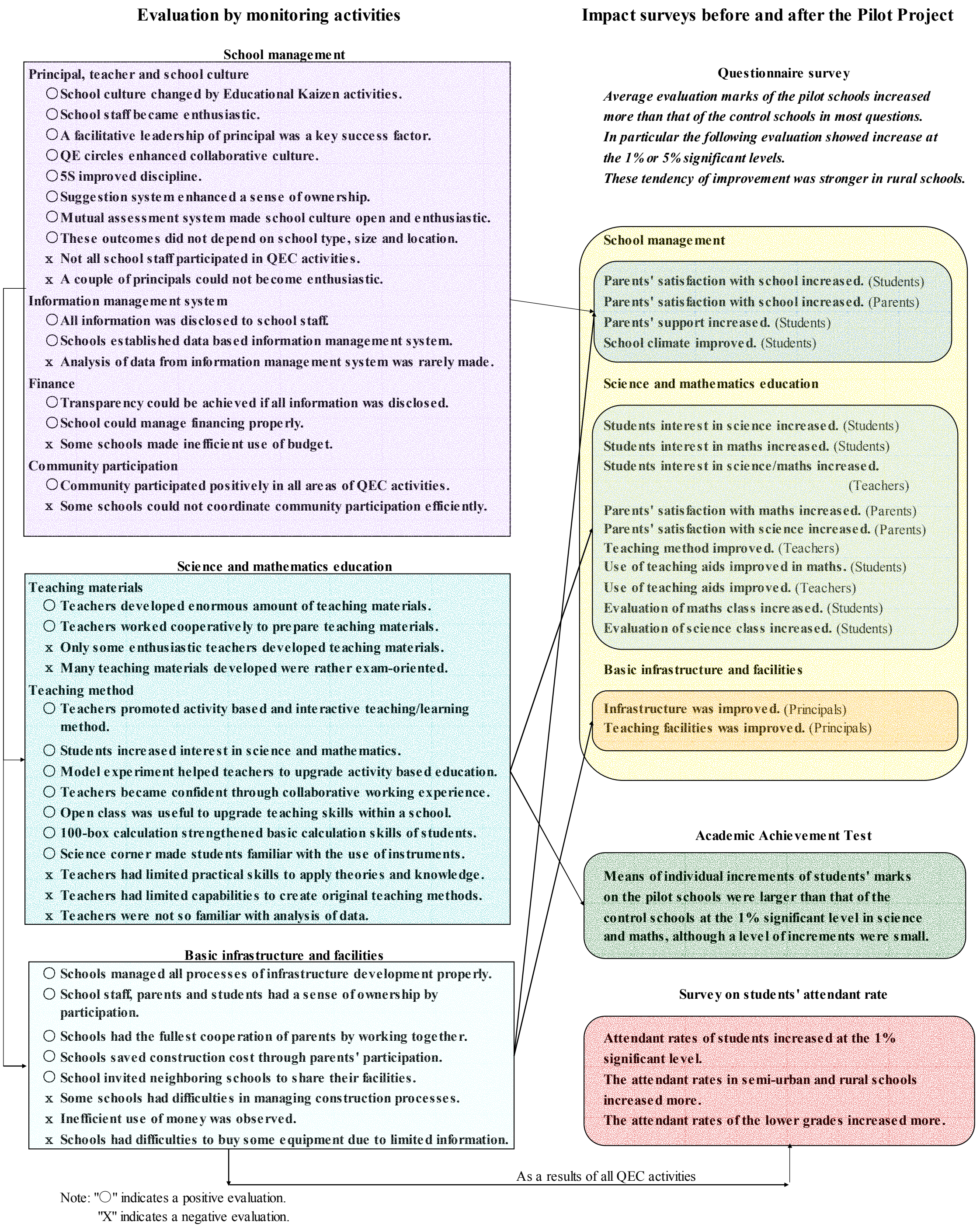
From this conversation, it can be learned that the level of teachers' attention to students influenced bullying in school, and a change in the school culture led a change in the students' behavior and their keenness to come to school. The often unnoticed by-product of the Pilot Project, but indeed its real depth and impact, can be seen in the joy that filled Neelika's face.

(4) Overall Impact Assessment

Through the analyses of three impact assessment surveys presented above, it was shown at a statistically significant level that the intervention by the Pilot Project contributed to an improvement in school management, science and mathematics education and basic infrastructure and facilities. However, a one-year period is rather too short to bring a significant improvement in such various aspects at school, and thus the increments were at a fairly minimal level. The relationship between evaluation by monitoring activities and results of these impact surveys is illustrated in Figure 3.5.2. The overall impact assessment can be summarized below:

a) The Educational Kaizen approach functioned quite well and the school management improved, which was proved by the indicators in the Questionnaire Survey related to school management. This indicates that Educational Kaizen activities could help the pilot schools improve their managerial capability.

b) Having activated school culture as the foundation for improvement, a number of interventions by the Pilot Project started to take effect on improving the quality of education in science and mathematics, such as development of teaching materials by teachers, training for model experiments, introduction of open class, and implementation of 100-box calculation. This improvement was proved by the indicators related to science and mathematics education in QS and the results of AAT. It implies that Educational Kaizen activities contributed toward the improvement of quality and efficiency.



Source: JICA Study Team

Figure 3.5.2 Results of Monitoring and Impact Surveys

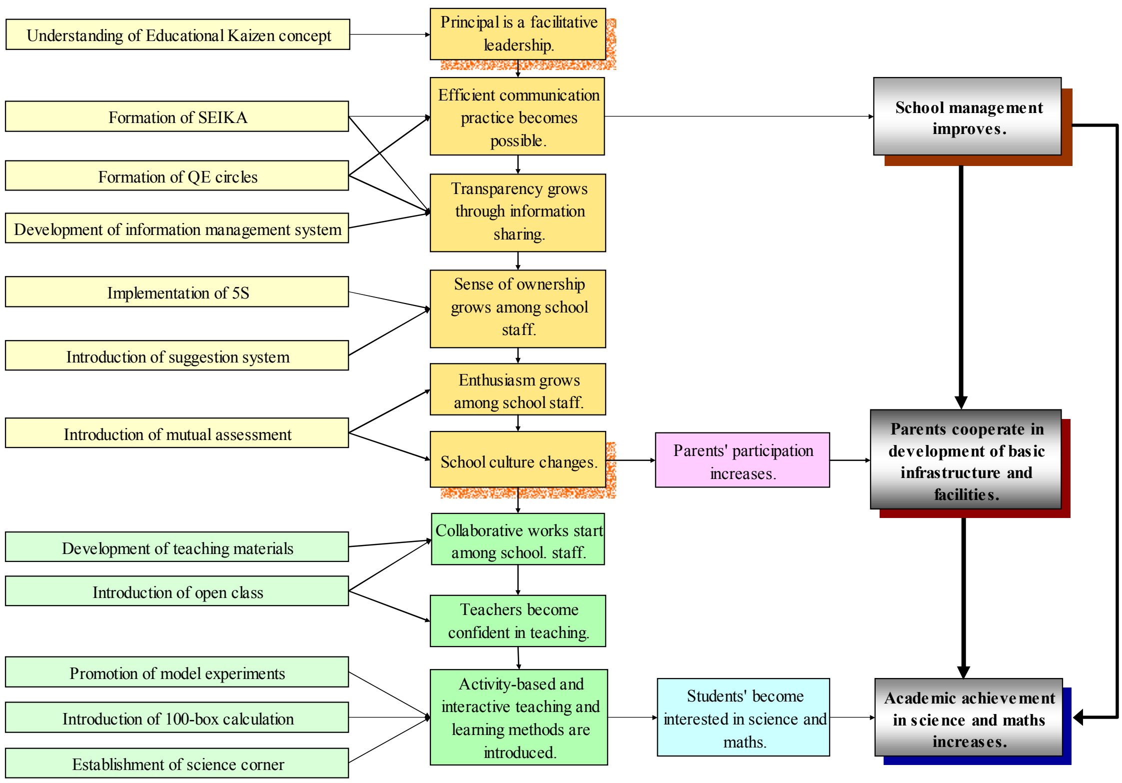
c) Activated school culture encouraged participation of parents and community in developing basic infrastructure and facilities. It was proved by the indicators related to school management and basic infrastructure and facilities in QS.

d) As a combined effect of these interventions mentioned above, the pilot schools became a valuable and attractive place for students to go everyday.

Consequently, the students' attendance rates increased. It implies that Educational Kaizen activities contributed toward the improvement of access and equity.

e) In addition, these surveys discovered that the Pilot Project provided a bigger impact on non-urban schools than on urban schools and likewise bigger on non-Type 1AB schools than Type 1AB schools. It indicates that Educational Kaizen approach could contribute to minimizing inequity among schools.

f) However, the Educational Kaizen approach at school level is not all-round in improving school management, science and mathematics education and basic infrastructure and facility. Without proper guidance from MOE and NIE, the schools cannot accomplish remarkable progress, particularly in quality improvement of science and mathematics education. Necessary instruction manuals, equipment and materials for experiment should be supplied by NIE, since many schools are not capable enough to develop experiments for the latest topics. Expensive machines such as computer, printer and duplication machine should be supplied by MOE, since the schools have difficulties to collect and evaluate necessary information of these machines.



Source: JICA Study Team

Figure 3.5.3 Development Process and the Outcome of the Pilot Schools

Figure 3.5.3 illustrates a model development process of the pilot schools in relation to various interventions by the Pilot Project. Based on the experience with the 25 pilot schools, it was found that an open and activated school culture is a prerequisite to improve science and mathematics education and basic infrastructure and facilities. And to develop such school culture, facilitative leadership of the principal is a necessary condition.

3.6 Lessons Learned

Lessons learned through QE circle activities during the Pilot Project were summarized as shown in Table 3.6.1 and lessons learned through activities to support QE circles were summarized as shown in Table 3.6.2.

Table 3.6.1 Lessons Learned from the Pilot Project (1)

– Through QE Circle Activities –

Results	Lessons Learned
I. School management	
School culture changed and school staff became activated in most of pilot schools through Educational Kaizen activities. Also, school management was strengthened and became more efficient in those schools.	• Educational Kaizen activities can be applied to the education sector to strengthen management, education and infrastructure/facility. • Schools could change their culture through a combination of Kaizen methods such as QE circle activities, 5S, suggestion system, and raise the motivation of teachers and cooperation of parents. • Key factor in improving school culture was the good communication practice. • The success factors of SEIKA were: 1) facilitative leadership of the principal; 2) open discussion among representatives of different groups in the school/community; 3) transparency in decision-making process including financial matter; 4) regular meetings; and 5) maintenance of minutes of meeting. • Transparency can be maintained if members from outside the school are involved. Particularly involvement of zonal officers was essential. • However, it is not easy for all QE circle members to understand the benefit of and commit themselves to the activities. QE circle leader should share the results with them and try to make family-like culture. Through this process, many QE circle members experienced the feeling that they suddenly became one family. • There are a few principals identified who could not understand a concept and benefit of Educational Kaizen activities, in spite of cooperation provided by teachers and parents. A quality-based deployment system for principals should be introduced based on the proper evaluation.
II. Science and mathematics education	
Many teachers started to think of the ways to improve the quality of science and mathematics education.	• Quality education is not possible without teachers' motivation. • Through Educational Kaizen activities, teachers learned to work cooperatively to improve quality of education. • Teachers could make various efforts to improve quality of education such as developing teaching materials, upgrading laboratory facilities, introducing practical lessons and interactive teaching and learning, conducting extra classes. They

	realized that teaching is not just a job but a service to students. • One of the constraints for teachers to think of new and original teaching and learning method was that they misunderstood that they had to follow exactly what is said in the teachers' guides and syllabus. There was the same misunderstanding in some of the zonal officers too. • It takes time to change teachers' attitudes and it takes even more time for students to really benefit from the changed teachers' attitudes and teaching methods. A continuous effort by school is a must with necessary assistance from MOE/NIE as well as provincial/zonal offices. • There are some limitations for teacher to develop and prepare model experiments for the latest science and mathematics topics. This cutting-edge model experiment should be developed by NIE and all necessary teaching guides, equipments and materials should also be supplied by MOE/NIE.
III. Basic infrastructure and facilities	
Most of the pilot schools improved basic infrastructure and educational facilities with the support from parents.	• When pilot schools were allowed to prepare their development plan based on their needs and priority, they could improve basic infrastructure and educational facilities with a strong sense of ownership. • Because of this ownership, many pilot schools received the fullest cooperation of parents. • A cooperative culture was developed among school, parents and community. • With the support from parents, the pilot schools constructed such facilities as teachers' quarters, science laboratory, mathematics room, library, science garden at around 50 to 70% of ordinary cost. • Many pilot schools invited neighboring schools to use their facilities on a regular basis.

Table 3.6.2 Lessons Learned from the Pilot Project (2)

– Through Activities to Support QE Circles –

Results	Lessons learned
I. Preparation	
During the 5-month preparation, 25 pilot schools were selected and provided with orientation and guidance on school development plan and financial management.	• It was not easy to make school staff understand the concept, objective, approach and implementation scheme of the Project, since the nature of the Project was completely new to them. • Transparency can be maintained under a rule that every receipt required signatures of majority of SEIKA members for approval. Financial report should be open to everybody. • Since all pilot activities were designed and implemented through discussions between JICA Study Team and Counterpart Team, know-how and experience of the Project were shared. However, since Counterpart members could not be involved on a full-time basis, some administrative and financial skills could not be transferred well. These skills are critical for government officials, when SBM is introduced. • Participation of provincial/zonal officers in school-based activities made the pilot schools more active and transparent. The Project should have involved them more from the beginning, although this might have caused a slow and time consuming implementation.
II. Workshop and convention	
A range of workshops were held, in Colombo and at the pilot schools, to facilitate the Educational Kaizen activities. A total of over 7,000 person-days were involved.	• Inter-school network gradually developed among nearby pilot schools and they started exchanging resources such as teaching materials. Some schools held joint workshops. • Teachers became confident through conducting model experiments jointly with other teachers, Counterpart Team and JICA Study Team at the workshops. It was the first experience for most of teachers to do these kinds of experiments in an interactive teaching and learning manner. They realized how it can attract the interests of students.

III. Support and supervision	
JICA Study Team, together with the Counterpart Team, provided support and guidance to the pilot schools through monitoring activities and training, both in Colombo and on-site.	• On-site consultation was the most and only effective way for pilot schools to gain a full understanding among all members. Even if they have a lot of questions and unclear points, they rarely raise questions at workshops and never call and ask questions to clarify or confirm. Therefore, regular monitoring visit is a necessary and powerful tool to ensure information transfer to school. It was not enough to transfer information only by workshops and documents. • Regular financial inspection is critical, such as verifying purchased items, receipts, amount of money spent, bank statement, etc., since pilot schools were not so much familiar with financial management. • Inspection program provided pilot school with practical and efficient on-the-job training to prepare summarized report of pilot activities and financial report. Such skills are extremely important when implementing SBM.

CHAPTER IV

MASTER PLAN TO IMPROVE SCIENCE AND MATHEMATICS EDUCATION

4.1 Rationale and Methodology

4.1.1 Rationale for Development of Science and Mathematics Education

In July 2004, the new administration issued a development policy paper, "Creating Our Future, Building Our Nation". It calls for the annual GDP growth rate of 6-8%, balanced regional development and the reduction of poverty. In the development strategy, the education sector is expected to play a central role to attain the targets of economic growth and poverty reduction.

The country began its concerted effort to strengthen education with the introduction of an Education Reform in 1997. After issuing Reforms in General Education in 1997, the National Education Commission (NEC) developed a new set of reform policy proposals in 2003. The proposed Reform aims to improve the education system by expanding opportunities for all school-age children and youth to access quality education. The Reform states the strengthening of science and mathematics education including IT education as a strategic priority in education. Specifically, the Reform requires teaching of science and mathematics to stress more practical aspects and activity-based methods.

Implementation of the Reform has helped improve access and efficiency. The completion rates of primary and junior secondary education rose to 98% and 83%, respectively, and the repetition rate fell to 1% at G5 (School Census 2003). However, the quality of education, particularly that of science and mathematics has remained unsatisfactory with the pass rates at O-Level and A-Level lower than the corresponding rates in other subjects.

In due consideration of the importance of science and mathematics that form foundation of the succeeding subjects, improvement of these seems prerequisite for the quality improvement. Comprehensive and integrated improvement of science and mathematics at the primary and secondary levels is essential as a key foundation to move up to a higher level of the education ladder. It is also necessary to produce the quality labor force in response to the technologically advancing world of industry.

Further, the Government has recently adopted an approach to examine and address issues of the education sector as a whole, i.e., sector-wide approach being supported by international donors. A comprehensive plan for the sub-sector of science and mathematics to be prepared in this study will, therefore, constitute an important part of the sector-wide approach.

Meanwhile, the Government of Japan has been implementing various cooperation projects through JICA for the development of science and mathematics in primary and secondary levels not only in Asia but also in South America and Africa. In implementing these projects, experience and know-how focusing on its quality improvement in this sub-sector are accumulated through curriculum improvement and training of teachers. JICA is well positioned to cooperate for preparation of this master plan for science and mathematics education through these experiences.

4.1.2 Methodology

Introduction and implementation of the Pilot Project is a specific characteristic for the plan formulation in this study. The Pilot Project aimed to strengthen science and mathematics at the school level has provided numerous insights to progress made by primary and secondary schools as well as problems they are facing. It has also provided valuable lessons and directions of future plans and programs for science and mathematics development.

In addition to the Pilot Project, the Master Plan has been prepared on the basis of reviews of a number of previous studies and related documents, surveys of selected schools and the labor market, and extensive consultation with and participation by MOE, NIE and various other organizations concerned.

(1) Review Work

Prior to formulating design and implementation of the Pilot Project, various review works were conducted including the following:

- Review on the economic policy and policy on education
- Review on education sector, and science and mathematics education
- Review on the external assistance on education

Through this review work, direction of the national policy on economy and education sector was confirmed. Then, problems and constraints of the education sector and sub-sector on science and mathematics were identified, and the relation of the external assistance with the national policy was confirmed.

(2) Supplemental Surveys

For getting the supplemental information of the sector and projecting labor market situation in the future, the following surveys were carried out in parallel to the above review works:

- School survey covering 144 schools island-wide
- Labor market survey

(3) Pilot Project

Results of the above surveys were integrated into the analysis of the current situation. Following to the sector analysis, analysis was also carried out on the school activities, based on which design of the Pilot Project was prepared. Problems at school level are actually reflection of the problems of the education sector, against which improvement plans were formulated at school level in the Pilot Project.

The Pilot Project was planned to be implemented for the period of 8 months initially, but later extended to about one year. For evaluating the effects and impacts, Baseline Survey and Post Pilot Survey were conducted at the initial stage and closing stage of the Pilot Project. Through the comparison of these surveys, key factors of the success and failure were identified as well as impacts of the Pilot Project.

(4) Master Plan

Formulation of the Master Plan was made by applying this experience and lessons learned through the Pilot Project to the improvement plan for Educational Kaizen activities. The School-based improvement plans were firstly prepared to be implemented at school level. Then, institutional and organizational plans for supporting the School-based activities were formulated at central and local levels of the implementing agencies.

For the preparation of the Master Plan, goals or targets were firstly selected and set out as well as formulation of the strategies. Then, programs and projects for the development of science and mathematics education were prepared both at school level and institutional levels.

Action plan was prepared selecting the early implementation projects from the proposed plan. Implementing arrangement including setting up of organizations, staff arrangement and scheduling for implementation was also planned in order to facilitate the implementation of the action plan.

The approach to the Master Plan is summarized and presented in the Figure 4.1.1.

The Counterpart personnel assigned to JICA Study Team have been involved in the Study from the stage of the review on the current situation and problem identification, design of the Pilot Project, monitoring and evaluation of the Pilot Project, and up to the stage of improvement plan formulation. Various kinds of workshops and seminars were held inviting stakeholders almost every month in addition to weekly meetings with the Counterpart personnel. Intensive participation of the implementing agencies in the Study and sharing the common understanding among them is one of the specific methodologies applied to this study for the Master Plan.

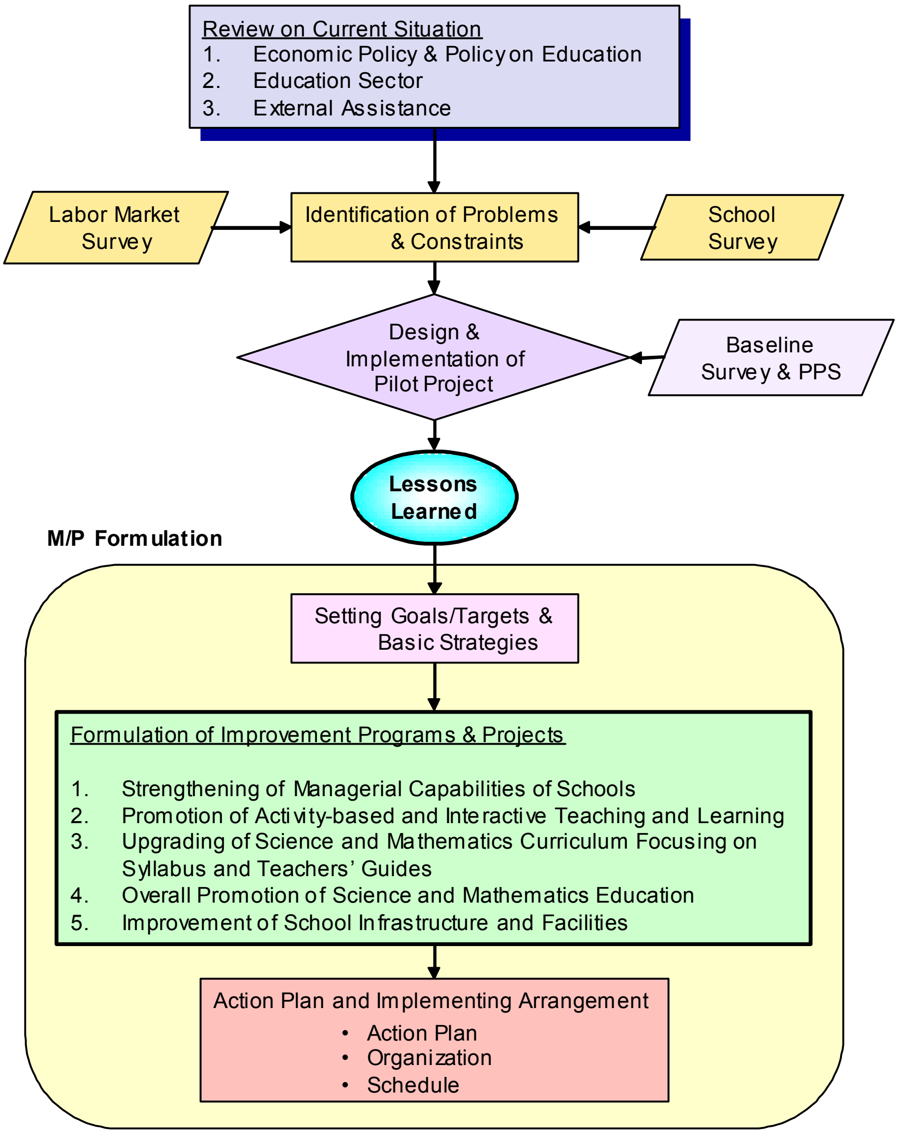


Figure 4.1.1 Approach to the Master Plan

4.2 Plan Period, Goals and Strategy

4.2.1 Plan Period and Goals

The Master Plan which extends over the period between 2005 and 2012 will be implemented in two phases consisting of short term (2005-2007) and long-term (2008-2012).

As explained later, one of the most important strategies for the improvement of science and mathematics education is to apply and commence the Educational Kaizen activities at school level. It is, therefore, planned that the goal of this plan is to expand the number of school implementing the Educational Kaizen activities to around 500[24] schools in the short- term, and to all the government schools in the long-term, and to attain the improvement of the sub-sector. Through this, the following indicators concerned with efficiency, quality, sub-sector expansion, and equity are planned to be realized at the target year (2012).

- Efficiency - reduction of the drop-out rate in primary schools to less than 3% at grade 5;
- Quality - increase in the pass rates of science and mathematics in O-Level by 30% (based on the past 3 years average);
- Expansion of the science and mathematics sub-sector - increase number of students qualifying for universities in science/mathematics stream by 25%;
- Equity - improvement in equity between rural and urban schools by recruiting 100% graduate teachers for science and mathematics, and by upgrading science facilities in Type 1AB and 1C schools particularly in rural area.

4.2.2 Strategies

Strategies for the Master Plan have been set out following the reviews of the national policy on education presented in the Education Reform and the Education Development Plan for primary and secondary education. The reviews have led to the following findings:

- Science (included in the Environment Related Activities) and mathematics are designated as key subjects among the four taught in primary school and more learning time will be allocated to these subjects;
- To improve science and mathematics education, activity-based and student-centered teaching is to be introduced with the provision of adequate laboratory and other related facilities;
- School-based management (SBM) will be encouraged by devolving greater authority to schools and increasing community participation; and
- These policies have also been supported by international aid agencies such as the IBRD, ADB, DFID, GTZ and UNICEF. Recently, the Government agreed with the IBRD to implement Sector Wide Approach (SWAp) for education development. SWAp calls for schools to formulate their own development plans.

The above in-depth reviews and analyses of current education issues have provided the background to the development of strategies for the Master Plan as summarized below.

[24] The Program targets around 5% of all schools by 2007 and all government schools (9,790) by 2012 through the cascade system.

a) A School-based Approach or Educational Kaizen activities applied to the Pilot Project are used as the key strategy for formulating the Master Plan.

So far, various projects have been implemented mainly from top-down for the improvement of primary and secondary education as explained in the preceding chapters. However, it is very difficult to make them effective and produce the expected results for improvement. This is because the school community is not involved and they have no positive participation in the process.

The Pilot Project focused on this school-based activity and took up the Educational Kaizen activities as a key to improvement. Through the implementation of the Pilot Project, it was found that:

- Motivation of principals and teachers is increased and management capability of school is substantially improved through intensive participation of students and parents.
- Students' interest in science and mathematics is increased through the introduction of activity-based teaching and interactive teaching and learning method at schools.
- School infrastructure and facilities are improved through community participation that contributes to a better school environment and enhancing their ownership.
- Finally, the school culture is changed into more active and progressive one through the above.

Confirming the above results, the experience and lessons gained through the implementation of the Pilot Project are fully applied to the plan formulation.

b) For the improvement of quality in science and mathematics, the following strategic approaches are applied:

- Students' interest in science and mathematics is to be enhanced at the primary and junior secondary levels and their basic capability is to be strengthened through introduction of model experiments, project/research, 100 box calculation, etc.
- Activity-based teaching and interactive teaching and learning method are to be intensively introduced for science and mathematics education.
- Modification of syllabus and teachers' guide in science and mathematics is to be made corresponding to the introduction of above.

c) In the plan formulation, establishing the school framework for Educational Kaizen activities and strengthening of school management system are given first priority, together with strengthening activity-based teaching and learning at school level.

d) Then, institutional and organizational support is planned as a top-down approach for facilitating the school-based approach. This approach contains institutional and organizational development and capacity building of central and local offices of the implementing agencies.

Upgrading the curriculum of science and mathematics is also planned as well as improvement of science facilities as another Top-down Approach.

The plans using top-down approaches have to be implemented simultaneously to achieve a smooth introduction of Educational Kaizen activities at the school level.

e) Finally, overall improvement for science and mathematics education through enhancement of the awareness is taken up as a strategy for the plan formulation in due consideration of the fact that importance of the two subjects is not well recognized among students and parents and further promotion is indispensable for the society as a whole.

f) Practical and implementable plan formulation is another key strategy for the plan formulation.

Development of science and mathematics education requires a wide range of improvements including basic education framework in the country. The proposed plan focuses on expansion of School-based activity and also related institutional improvement. This focus leads to the preparation of a more practical plan. Intensive involvement of the stakeholders and Counterpart Personnel from the stage of the preparation up to the plan formulation also contributes to formulation of an implementable plan through in-depth sharing of current problems and constraints.

4.3 Plan Formulation

4.3.1 Plan Structure

Process of the Master Plan formulation is briefly explained below.

a) Problems of the education sector are clarified from the view points of "Planning and Management", "Quality of Education" and "Access to Quality Education" through the policy and the sector analysis.

b) Then, problems at school are clarified in more detail under the categories of "School Management", "Science and Mathematics Education" and "Basic Infrastructure and Facilities," which correspond the problems of the above education sector.

c) For solving the school-based problems, the Pilot Project was implemented at the 25 pilot schools island wide.

d) The experience and lessons gained through the Pilot Project are fully utilized for the plan formulation.

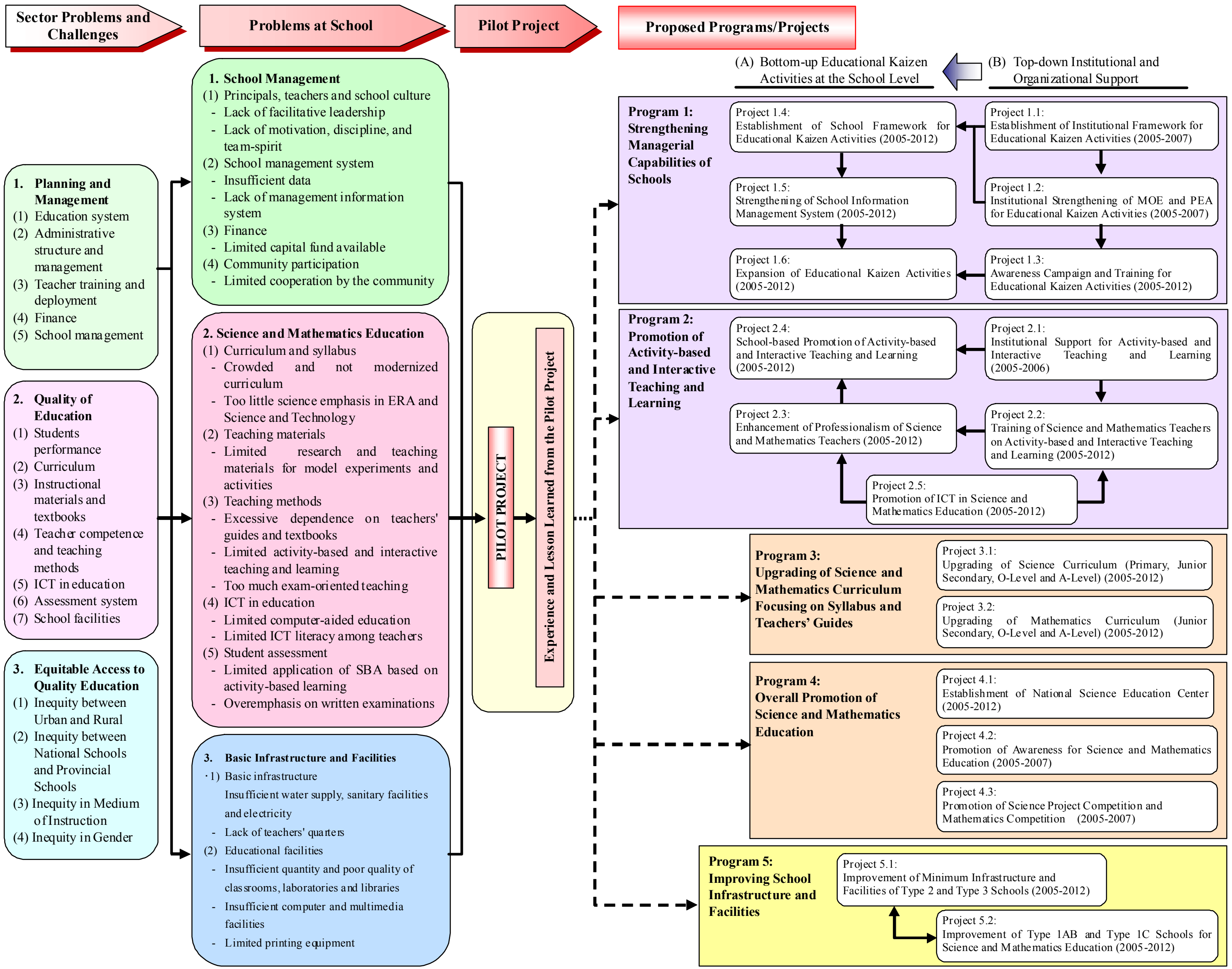


Figure 4.3.1 Planning Process and Plan Structure of the Proposed Programs

The structure of the proposed plan formulated through the above process is summarized in Figure 4.3.1 and explained below.

The proposed plans consist of school-based approach and top-down approach. As for school-based approach, promotion of Educational Kaizen activities at the school level is planned and as for top-down approach the institutional setup at MOE/PEA and NIE is planned. The proposed plans are finally integrated into the following five programs in due consideration of the function of the implementing organization and efficient implementation.

Program 1 is centered on “School Management”, while Program 2, 3, and 4 focus on the “Science and Mathematics Education” at school level. Program 5 is proposed against identified problem at school in “Basic Infrastructure and Facilities”. Various projects are formulated for attaining the goals of each Program.

4.3.2 Formulation of Programs

Problems and rationale, and main contents of each program are explained below.

(1) Program 1: Strengthening of Managerial Capabilities of Schools

1) Problems and Rationale

Schools have been following the instructions given by MOE for the development of school management, education and basic infrastructure and facilities and are not used to initiating school-based activities to improve quality of education at school level. Under this situation, many schools have been suffering from stagnation in non-active school culture. This causes low motivation of teachers and poor results; (i) limited collaborative works among teachers; (ii) limited cooperation with parents and community; (iii) considerable amount of teaching time lost by teachers’ leave and delay to class; and (iv) an outdated theory-oriented teaching method. Consequently, schools are not joyful places for students. This is one of the reasons of student’s absenteeism, more priority given to private tuition classes for teachers and less interest in learning, particularly of science and mathematics.

However, 25 pilot schools tried various school-based activities with the support of the JICA Study Team, which proved the educational Kaizen approach was effective to improve school management, education and basic infrastructure/facilities development. It also improved teachers’ motivation and raise students’ interest in science and mathematics. It proved that schools can change its culture by introducing Educational Kaizen methods such as QE circle activities, 5S and suggestion system. This contributes to improvement of teachers’ motivation and enthusiasm as well as active community participation.

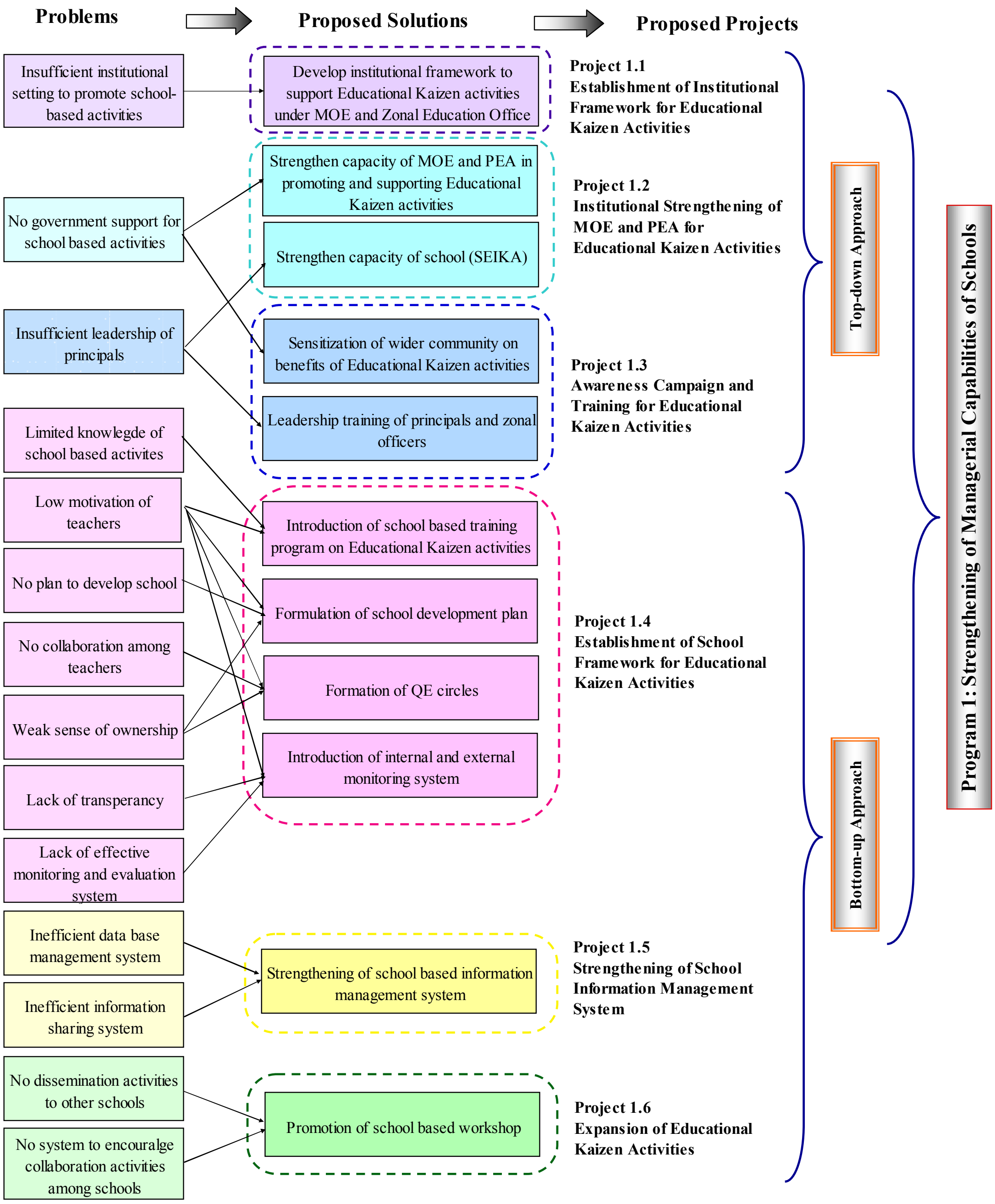


Figure 4.3.2 Plan Formulation for Program 1

In order to expand Educational Kaizen activities, it is important to strengthen managerial capabilities at the school level (bottom-up) and institutional and organizational support by MOE and PEA (top-down).

Figure 4.3.2 shows how these problems can be addressed by proposed solutions, and how these solutions are organized into the six projects under Program 1.

Rationale for each project is described below:

Project 1.1 Establishment of Institutional Framework for Educational Kaizen Activities

Current education administrative setting does not encourage schools to initiate innovative school-based activities. Instead, schools are sometimes restricted by norms set by the government. In this situation, for schools to initiate school-based activities to improve quality of education, it is important to develop institutional setting which encourages and supports school-based activities. This project will develop institutional framework to support Educational Kaizen activities by setting up a national level committee to provide strong policy backing to promote Educational Kaizen activities at school-level. The project also covers the zonal level institutional setting.

Project 1.2 Institutional Strengthening of MOE and PEA for Educational Kaizen Activities

Following Project 1.1, it is necessary to strengthen MOE and PEA in order for these organizations to take effective supporting roles in implementing Educational Kaizen activities at school level. Under this project a Unit promoting Educational Kaizen activities will be formed under Planning Division of MOE and various training will be designed and implemented by the Unit for capacity building of MOE and PEA, using cascade system.

Project 1.3 Awareness Campaign and Training for Educational Kaizen Activities

The concept of Educational Kaizen is not well spread in Sri Lanka. Therefore, it is important to organize campaign to make wider community to understand the concept and benefit of this approach. Different means of sending the message across will be utilized including media and workshops. The project will make use of materials accumulated by JICA Pilot Project.

For schools to implement Educational Kaizen activities, facilitative leadership of principals and senior teachers is very important. It is also expected that the role of zonal officers will become more important. Therefore, the project will organize leadership training for principals and zonal officers focusing on practical skills and know-how to introduce Educational Kaizen activities.

Project 1.4 Establishment of School Framework for Educational Kaizen Activities

It is not effective to improve school management, quality education and basic infrastructure and facilities only by a top-down approach due to difficulties of MOE and PEA in taking measures to meet with various needs from different kinds of school environment. However, there is no system to promote a bottom-up approach or school-based activities at present. The project establishes a framework for Educational Kaizen activities, in which the school prepares a school development plan and form QE circles. The project encourages participation of all parties concerned in the development process of the school, through which they are motivated. By collaborative works among principal, teachers, parents and students, many managerial problems at school can be solved, quality of education can be improved and basic infrastructure and facilities can be developed and maintained well. No substantial cost is required for these school-based activities and the development and maintenance costs for basic infrastructure and facilities might become lower with a support of parents and community.

Project 1.5 Strengthening of School Information Management System

In promoting Educational Kaizen activities, it is essential for the school to develop efficient information management system. However, most of the schools do not have proper information management system for data collection, filing and analysis. Under this situation these schools will face difficulties to manage documents, budget, and inventory in implementing Educational Kaizen activities. Some schools have computer facilities and human resources with computer literacy, but most of these schools are not fully utilizing these facilities. The project develops document basis information management system which is transformed to computer basis later. The information includes attendance rates, examination marks, personal data, budget, inventory, and time table of lessons. Teachers' absence will be monitored and exchange of lessons among teachers will be organized in order to execute annual lesson plan formed in accordance with national curriculum. With the project, all information has to be shared among all parties concerned to maintain transparency, administrative works associated with Educational Kaizen activities have to be managed by computer, scientific data analysis helps the school identify problems and progress and results of analysis provide the school with evaluation indicators of Educational Kaizen activities. Since this system is the school-based information management system, only a computer is required at each school, as well as computer training for school staff. Therefore, no significant investment is necessary.

Project 1.6 Expansion of Educational Kaizen Activities

It is effective for the schools, if they can learn know-how, skills and experiences for school improvement among themselves. However, these activities are very limited at present. Hence, the schools are isolated each other from managerial and educational information. The project promotes school-based workshop, focusing on dissemination of outcome developed by Educational Kaizen activities. The school-based workshop motivates all parties concerned and encourages collaborative works among the schools. Those may include joint research works for activity-based and interactive teaching and learning and joint development of teaching materials. Since a required cost is only for school-based workshop, no substantial budget is needed for the project.

2) Overall Goal

The following are the goals of the Program:

- To strengthen managerial capabilities of schools by introducing Educational Kaizen activities in 500[25] schools by 2007 and all (9,790) government schools by 2012
- To develop institutional framework within MOE and PEA to support Educational Kaizen activities

3) Concept of Program and Contents

The concept of the Program is to strengthen managerial capabilities of schools by introducing Educational Kaizen activities in combination with establishment of institutional and organizational support from MOE and PEA.

The Program consists of six projects, three for institutional and organizational support for school-based Educational Kaizen activities and other three for school-based Educational Kaizen activities.

4) Process of Implementation

The following two top-down projects will be initiated:

- Preparation of Institutional Framework for Educational Kaizen Activities
- Institutional Strengthening of MOE and PEA for Educational Kaizen Activities

To follow the above, school-based activities stated below will be implemented:

- Establishment of School Framework for Educational Kaizen Activities
- Strengthening of School Information Management System

The implementation on Awareness Campaign and Training and Expansion of Educational Kaizen Activities will follow after the implementation of the above.

(2) Program 2: Promotion of Activity-based and Interactive Teaching and Learning

1) Problems and Rationale

First of all, there are still many rural schools which lack the necessary number

[25] As explained in Sub-section 4.2.1, the Program targets around 5% of all government schools in the short term. IBRD is planning to commence a pilot project with a very similar approach as this Program at 16 zones (2 zones in each province) in 2006 and expand all schools in 2010.

of primary school teachers and science and mathematics teachers, because many teachers prefer to work in urban popular schools. Lack of qualified primary school teachers and science and mathematics teachers in rural schools hinders rural children's access to quality science and mathematics education in these schools and worsen urban-rural inequality.

MOE's Education Reform in 1997 and NEC's recommendations in 2003 advocated more use of activity-based and interactive teaching and learning in the classroom, in order to make learning at school more joyful, practical and relevant to students. While primary education has progressed in training teachers on activity-based and interactive teaching and learning ("Joyful Learning") and implementing it in the classrooms, secondary education is still dominated with lecture-type lessons and written examinations.

Reasons why most of teachers (especially for grade 6-13 teachers) have rarely practiced activity-based and interactive teaching and learning in their lessons are:

- teachers are afraid of practicing new approaches;
- there is no practical support to teachers from ISAs and their teacher colleagues, such as demonstrating activity-based and interactive teaching and learning in the classroom;
- there is no effective performance monitoring and evaluation system of teachers, in order to check whether they are actually using activity-based and interactive teaching and learning in their lessons after training;
- teachers are too busy in teaching all contents of the overcrowded curriculum especially for grade 6-13, and no time to spend for practicals, and;
- teachers are pressured by the parents to provide more exercises for students to better prepare for O-Level and A-Level examinations which are still traditional written examinations.

In order to improve this situation, subject experts such as NIE officers need to strengthen their support for teachers especially in developing teaching materials and methods for activity-based and interactive teaching and learning, since teachers at schools are limited in such capacity. For enhancement of dissemination and utilization of the developed resources of teaching materials and methods, Educational Kaizen Activities will be effective. System such as teachers' society for sharing the educational resources among teachers needs to be established as well.

Figure 4.3.3 shows how the problems can be addressed by proposed solutions, and how these solutions are organized into the following five projects under Program 2:

Project 2.1: Institutional Support for Activity-based and Interactive Teaching and Learning

Project 2.2: Training of Science and Mathematics Teachers on Activity-based and Interactive Teaching and Learning

Project 2.3: Enhancement of Professionalism of Science and Mathematics Teachers

Project 2.4: School-based Promotion of Activity-based and Interactive Teaching and Learning

Project 2.5: Promotion of ICT in Science and Mathematics Education

Rationale for each project is described below:

Project 2.1: Institutional Support for Activity-based and Interactive Teaching and Learning

It is not effective to train teachers in methods of activity-based and interactive teaching and learning without using suitable materials. Therefore it is important to develop subject-based activity manuals to utilize activity-based and interactive teaching and learning methods. This project will develop a range of subject-based practical activities using interactive methods (real-world activities, where possible) which will increase the students' knowledge and understanding as well as their interest and motivation in the subject. The combination of new teaching methods and new materials is a powerful motivator for teachers to change their approach from teaching only knowledge, skills and techniques to teaching for understanding of concepts in practical situations.

Project 2.2: Training Science and Mathematics Teachers on Activity-based and Interactive Teaching and Learning

While many science and mathematics teachers for grade 6 to 13 hear about or have been trained on activity-based and interactive teaching and learning, most of teachers have never practiced them, because they are afraid of new ways, there is no practical support to teachers from ISAs at the classroom level, and there is no effective performance monitoring and evaluation system for ISAs and teachers. So it is important to improve the teaching practices of existing science and mathematics teachers, through a) the cascade system of in-service training in which first NIE staff trains science and mathematics ISAs, then ISAs visit schools and train science and mathematics teachers in the school (in-school training), b) regular school visits and demonstration lessons by ISAs, and c) performance monitoring and evaluation system of science and mathematics ISAs and teachers. System of ISA for A-Level will be also established.

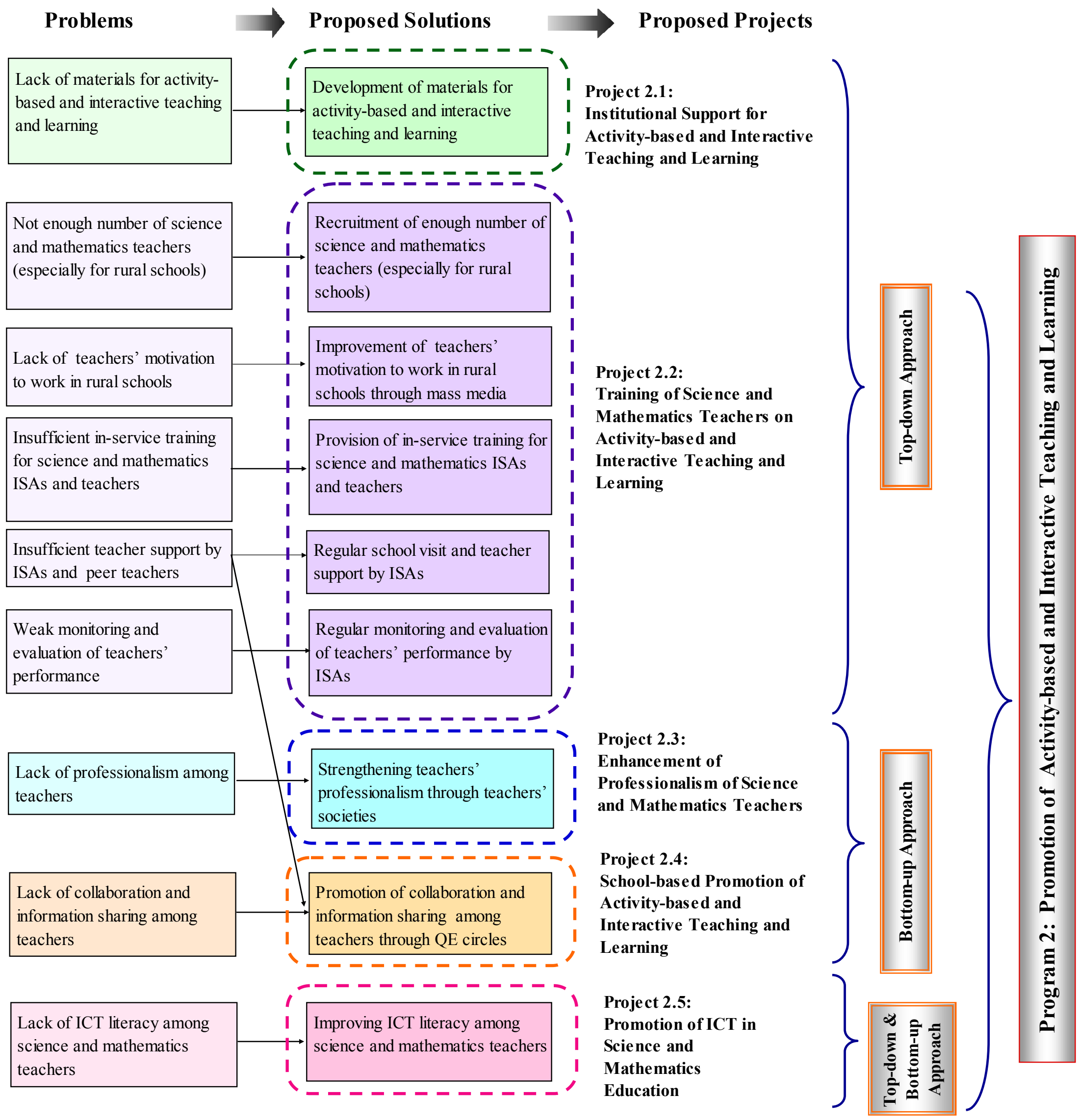


Figure 4.3.3 Plan Formulation for Program 2

Project 2.3: Enhancement of Professionalism of Science and Mathematics Teachers

Teachers often feel isolated from each other particularly in rural schools. To be effective in the classroom, they need to meet with teachers from other schools in a formal way to discuss new ideas, new teaching methods, share problems and hear the latest from experts in their subject. They will be able to communicate their own experiences through meetings, conferences and the newsletters. It will be the great benefit if subject teacher-based professional societies are established as distinct from general in-service teacher training courses. The societies also act as an excellent form of self-development and continuing education for teachers. It is important that the societies should not be made compulsory for all teachers, but experience overseas[26] has shown that the initial members through their enthusiasm and interests encourage other teachers to take part. There is a need for grade 6-11 teachers and A-Level teachers to meet together so that they can discuss the bigger picture of science and mathematics teaching and learning at all grades in the secondary education. Even though primary school teachers teach all subjects in the curriculum, they will benefit by meeting to look at ideas for teaching and learning ERA and mathematics with a particular emphasis on integration of the subjects.

Project 2.4: School-based Promotion of Activity-based and Interactive Teaching and Learning

The Pilot Project found that a lack of basic calculation skills is one of the most significant constraints hindering students from proceeding to further study in mathematics in Sri Lanka. 100-box calculation is a proven, effective and low-cost method to improve the skills of all students. The Pilot Project also discovered that there is a strong need for teachers to develop their own teaching materials which meet their own school needs. Also, teachers are willing to develop these materials, if facilities are available for them. JICA Pilot Project showed that teachers are prepared to use activity-based and interactive teaching and learning to increase their students' motivation and interest in science and mathematics. However, many teachers lack the ideas, skills, facilities and, most importantly, confidence to prepare practical lessons by themselves and teach these lessons using interactive methods. In order to build up their confidence and skills, a joint development of practical lessons using interactive teaching and learning by a group of teachers is a good method.

Project 2.5: Promotion of ICT in Science and Mathematics Education

ICT literacy among teachers is generally very low in Sri Lanka. For efficient and developed use of ICT in education, the general ICT skills of teachers and their understanding of the educational use of ICT should be strengthened. Helping teachers to produce teaching materials locally using ICT is a good tool for improving science and mathematics education. At present, there is not enough use of ICT for school-based production of teaching materials. Apart from few exceptions, schools have no access to the Internet. There is a need of Internet access to enhance communication between schools and individual teachers. Internet access is also necessary for introducing modern technology and sources of new information in science and mathematics education. Computer Resource Centers (CRCs) are important hubs in both teacher

[26] For instance In Japan, Society of Elementary Mathematics Education has been established in 1971 by some voluntary teachers and now expanded to 87 branches all over in Japan.

training and maintenance of ICT equipment. To be able to fulfill their tasks, they should be provided with modern computers and peripherals.

2) Overall Goal

The overall goal of Program2 is to improve students' interests and achievements in science and mathematics through promotion of activity-based and interactive teaching and learning in the classroom.

3) Concept of Program and Contents

Five projects in Program2 aim at addressing problems of teachers in the comprehensive manner, that is, a combination of top-down and bottom-up approaches, in order to achieve the above overall goal.

The core objective of Program2 is to improve science and mathematics teachers' competence, and Figure 4.3.4 illustrates how this objective can be achieved by the combination of top-down approach and bottom-up approaches: a) cascade training and follow-up system in Project 2.2, b) promotion of teachers' professional societies in the zone in Project 2.3, and c) promotion of teachers' QE circle in the school in Project 2.4.

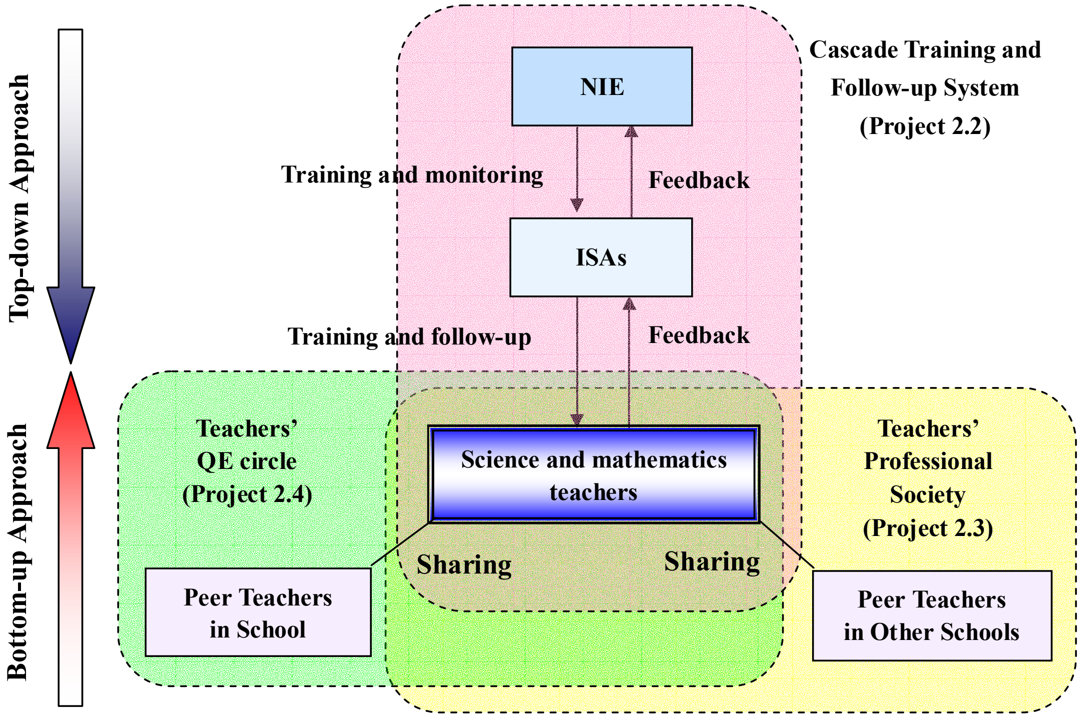


Figure 4.3.4 Top-down and Bottom-up Approaches for Teacher Empowerment

It is also important to emphasize that the design of these projects are based on successful approaches (such as teachers' QE circles, hand-made teaching materials, in-school training, regular follow-up visits after training [see the Box below]) and products (such as 100-box calculation handbook, model experiment handbooks) from JICA Pilot Project.

Box 4.3.1 Lessons Learned from JICA Pilot Project: Importance of Follow-up Visits and Monitoring

JICA Pilot Project showed that teacher training is not enough to change teachers' classroom practice, and it is necessary to conduct monthly follow-up school visits to monitor teachers' progress and constantly encourage teachers to practice what they have learned in the training. Likewise, in order to make the cascade training system work down to the school level, it is important for NIE to monitor the work of ISAs in collaboration with Zonal Offices.

4) Process of Implementation

Program 2 will be implemented in the following two phases:

(Phase 1) Program 2 will be implemented in the 500 pilot schools, where Educational Kaizen Activities are introduced through implementation of program 1, as the Pilot Phase from 2005 to 2007.

(Phase 2) After analyzing experiences and learning lessons from the Pilot Phase, Program 2 will be re-designed and expanded to all (9,790) government schools from 2008 to 2012.

As for the implementation order of the five projects, Project 2.1 is the foundation to start Project 2.2 and Project 2.4, because NIE's new unit for activity-based and interactive teaching and learning will play a key role in implementing Project 2.2 and 2.4. The detailed implementation schedule of five projects is shown in the Program Profile.

(3) Program 3: Upgrading Science and Mathematics Curriculum Focusing on Syllabus and Teachers' Guides

1) Problems and Rationale

Pass rates in O-Level *'science and technology'* and *mathematics*, A-Level physical sciences and *'combined mathematics'* are low. One of the contributing factors to this poor performance is the present curriculum. There are too many topics in most of the syllabuses and many teachers struggle to complete the syllabus. Therefore, they teach only what they think necessary for the written GCE A-Level and GCE O-Level examinations.

Some topics are also outdated and need upgrading or deletion from the various syllabuses. The present syllabuses and teachers guides were also prepared before the implementation of SBA and teachers' guides lack information on activities, practicals, projects, assignments etc. and activity-based teaching methods.

For ERA, the present curriculum is arranged in themes and requires more structure and amplification for teachers. As well, both ERA and '*science and* *technology*' topics need to be linked more closely to science topics.

The problems above form the rationale for curriculum change and that change is to produce a curriculum that will motivate students to both enjoy their studies and improve their performance in science and mathematics.

The curriculum at O-Level and A-Level has reached the end of its present cycle and a review and an upgrade is required for the following reasons:

- The low pass rates in all science subjects except A-Level *biology*
- The low pass rates in both mathematics subjects
- The need to have vertical integration of science and mathematics (grades1-13)
- The need to build a bridge between the O-Level and A-Level curricula
- The overcrowding of the present curriculum
- Scientific and mathematical knowledge is changing at a rapid rate
- ICT applications need to be included
- Activity-based interactive teaching and learning needs to be implemented widely at primary and secondary level
- A range of practicals, projects, assignments have to be prepared for effective implementation of SBA

2) Overall Goals

The following are the goals of the curriculum upgrade:

a) Relevant less-crowded curricula with both concepts and activities included reflecting modern '*science and technology'* and *mathematics* knowledge and real-life situations.
b) To enable teachers to teach the curriculum using modern teaching-learning methods without loss of academic standards
c) To enable students to enjoy learning science and mathematics in an interactive way and to improve their performance
d) An improvement to SBA by allowing more time for practicals, projects, assignments and other activity-based tasks

3) Concept of Program and Contents

The concept of the program is to improve science and mathematics in Sri Lankan schools by upgrading the present curricula.

The program consists of the two curriculum projects listed below:

<u>Upgrading of Science Curriculum (Primary, Junior Secondary, O-Level and A-Level)</u>

The ERA curriculum will contain more detail than it does at present. The thematic format will have linkages to science concepts within each theme.

More linkages to science will also be made for the present junior secondary and O-Level *'science and technology'* (grade 6 '*environmental studies*' will be called grade 6 *'science and technology'* for purposes of this document) and the length of the syllabus reduced to allow (a) more time for the students to understand key concepts in a topic and (b) more time for SBA activities such as experiments, projects, field trips etc. Teachers' guides will have more information on syllabus-based activities and activity-based methods related to SBA. Core science topics for students to obtain deeper understanding spending more time will be selected based on the model experiments and activities developed through the Pilot Project.

The emphasis for A-Level science subjects will be on reducing the content of the curriculum to allow more time for understanding of abstract concepts and for completing practicals, assignments and field trips for SBA. Topics will also be modified in line with contemporary knowledge in the subjects.

Upgrading of Mathematics Curriculum (Junior Secondary, O-Level and A-Level)

The current mathematics curriculum in primary level has been prepared through the DFID project (1998-2004) and does not require upgrading. MOE has decided that the curriculum is to remain unchanged and be taught for another cycle.

The O-Level curriculum will be reduced and appropriate topics will emphasize practical approaches and activity-based teaching methods. Teachers' guides will have more information on syllabus-based activities and activity-based methods related to SBA. Core mathematics topics for students to obtain deeper understanding spending more time will be selected based on the model experiments and activities developed through the Pilot Project.

As with the A-Level science subjects, the emphasis for A-Level *'combined mathematics'* will be on reducing the content of the curriculum to allow more time for understanding of abstract concepts and for completing projects, assignments for SBA. Topics will also be modified in line with contemporary knowledge in the subject.

The above two projects are not intended to produce new curricula but rather to revise and upgrade the existing curricula taking into account four issues identified by MOE and our study as being important for improving science and mathematics.

These issues are:

- Too many topics and some outdated topics in syllabuses
- Insufficient science emphasis in ERA and O-Level *'science and technology'*

- Present Teachers' Guides give insufficient guidance to teachers on activity-based interactive teaching and learning methods particularly for mathematics
- Present Teachers' Guides give too few syllabus linked practical and activity based examples for teachers

These four issues are the backbone to the revision of the syllabuses and the upgraded curricula should reflect them as the key to improved teaching and learning in science and mathematics.

Even though program 3 is concerned with curriculum, successful implementation of the upgraded curricula in science and mathematics will mean changes to the assessment system to reflect the outputs of the upgrading. This will necessitate change to both the written examination component and SBA component. The written examinations will need to be reframed to allow for content change and more interactive teaching methods and SBA will need to include consideration of new instructional material and methodologies which are part of the outputs for both Program 2 and Program 3. NIE and NETS will need to collaborate on this issue.

4) Process of Implementation

Project implementation will take place in the following priority order:

- Curriculum Upgrading of ERA, Junior Secondary and O-Level '*science and technology*'
- Curriculum Upgrading of junior secondary and O-Level mathematics
- Curriculum Upgrading of A-Level *biology*, *chemistry* and *physics*
- Curriculum Revision of A-Level '*combined mathematics'*

For maximum effect, it is important that the upgraded curricula be implemented at primary, junior secondary and O-Level before A-Level implementation. This is so because the new emphases in content and method will reach much larger number of students and at an earlier stage of their education and therefore have more impact.

Following is the implementation process for each of the two projects:

<u>Preparation of curricula, syllabuses and teachers' guides</u>

- Formation of curriculum committees - NIE
- Review and upgrade of present curricula - NIE
- Preparation of upgraded curricula - NIE
- Preparation of upgraded syllabuses – grade-by-grade NIE
- Preparation of upgraded teachers guides – grade-by-grade NIE

<u>Training of personnel by the cascade method</u>

- ISAs, master teachers at NIE – by NIE

- Selected teachers at Teachers Centers – by ISAs, master teachers
- General teachers in schools – by selected teachers
- Using upgraded material
- Implementation in schools

(4) Program 4: Overall Promotion of Science and Mathematics Education

1) Problems and Rationale

The issue of too much emphasis on GCE written examinations has been identified for many years as a major problem in the Sri Lanka education system. Most students, teachers, and parents see secondary education as a means of obtaining high enough marks in A-Level examinations to enter university, while taking little notice of the broader objectives of education. Due to this focus on examinations, their awareness of real-world applications and observations in science and mathematics is very limited. Teachers are not equipped with a practical knowledge of the science and mathematics applications in modern technology and of every day observations of the natural environment. Therefore, students are deprived of deeper understanding of science and mathematics. Since there are few major sources of information, many persons in the general public also have little idea of the important roles of '*science and technology*' and *mathematics* in the world around them. Therefore, there needs to be positive steps taken to rectify this lack of awareness of science and mathematics among parents, teachers, students and the general public.

The problems above form the rationale for awakening interest in and understanding of science and mathematics among parents, teachers, students and the general public. Accordingly, the following issues need to be addressed.

- Lack of opportunities to publicize the importance of science literacy and numeracy at the national level.
- Lack of understanding among parents of the aims of science and mathematics education as intended by MOE
- Lack of publicity material for the general public including teachers to learn of the latest information on science and mathematics.
- Lack of organized activities at the national level for students to participate in and to gain interest in science and mathematics.

All countries are unable to do away with using examination results for selection for university, further training or employment. However, it still is one of important duties of public education to disseminate the richness and logic of science and mathematics accumulated through human history in observing and explaining man's struggle with nature and the environment.

2) Overall Goal

The following are the goal for the promotion of science and mathematics:

- To have teachers, students, parents, and the general public gain an interest in science and mathematics.
- To have teachers, students, parents and the general public understand the importance and usefulness of science and mathematics education besides just being examination subjects.
- To have parents encourage their children to take part in activities relating to science and mathematics.

3) Concept of Program and Contents

The concept of the program is to improve science literacy and numeracy for all people in Sri Lanka. The program consists of the three projects listed below:

a) Establishment of National Science Education Center

This newly established center will provide students as well as the general public with opportunities to *experience science*. In addition to pure science, seeing modern technology with their own eyes will enhance understanding of science applied in their everyday lives. It is very important for the center to have steady sources of revenue raising otherwise this type of institution may easily become a heavy burden on national finances. For this reason, private sector involvement is important. Centers established in other countries will be thoroughly studied to find suitable model for Sri Lanka.

b) Promotion of Awareness for Mathematics and Science Education

In this project, MOE will develop a strategy for a public awareness campaign of direction of science and mathematics education for today and future. Previous media campaigns will be reviewed and the total concept will be developed as well as most effective use of the various media and awareness material. The attitudes of society to science and mathematics developed through decades need to be changed.

c) Promotion of Science Project Competition and Mathematics Competition

In this project, a mathematics competition and a science project competition will be implemented annually. Although these are organized in the form of competitions, neither selection nor awarding of prizes is the main objective. The main objective is to give school students ideas on how interesting science and mathematics can be apart from just acquiring knowledge and learning skills to gain higher marks in O-Level and A-Level examinations.

4) Process of Implementation

Three projects will be implemented individually, but needs careful coordination of the timing.

a) Establishment of National Science Education Center

Since the National Science Education Center requires construction work, it will be a long-term project. Before and during the construction work, operation management plan will be developed. In addition to plan for general administration, system of financial management will need to be addressed for sustainable financial management. In this process, discussion with private sectors is expected to develop plan for collaboration between public and private sectors. This plan is crucially important since the Center will need to operate continuously once it is established.

Other two activity components, issue of science and mathematics journals and science and mathematics directory, will also be organized by the Steering Committee of the Center. The process of these components will be coordinated in parallel with the process of the National Science Education Center.

b) Promotion of Awareness for Science and Mathematics Education

Without appropriate awareness among general public, education will not direct students in expected manner. Therefore, this project needs to be implemented as soon as possible to bring about the most positive effects upon all other projects and upon permanent education services.

c) Promotion of Science Project Competition and Mathematics Competition

This project will be implemented in three steps, i.e. 1) pilot implementation in selected 16 zones, 2) Nation-wide implementation up to Provincial final, 3) nation-wide implementation up to national final. Training for Zonal Officers and school teachers will be organized to provide correct information on the competitions. It is very important procedure that Zonal Officers and school teachers understand the objective of the project before the implementation of competition.

(5) Program 5: Improvement of School Infrastructure and Facilities

1) Problems and Rationale

Sri Lanka has attained high enrollment rates and literacy rates in the education system. However, there are still problems with equity in access to quality education. One of the reasons for this lack of equity is the vast difference between schools in regard to infrastructure, facilities and equipment. This is particularly evident in rural and plantation schools and in conflict areas but also many urban schools share the same disadvantage. Type 2 and Type 3 schools, especially those in rural areas, have very limited basic infrastructure and facilities so that students cannot receive quality education.

Educational facilities and equipment are often lacking with minimum essential classroom furniture, such as desks, chairs, and blackboards etc. as well as shortages of equipment for science and mathematics. Type 1C and Type 2 schools often have poor O-Level laboratories or no laboratories at all even though national standards state that they should have these facilities. Even some 1AB schools are not equipped with appropriate laboratory facilities for science especially for completing the A-Level practical requirements.

The problems above form the rationale for improving minimum infrastructure, facilities and equipment in schools to enhance science and mathematics education. These problems need to be addressed for the following reasons:

- Schools without basic infrastructure i.e. many Type 2 and Type 3 schools provide inferior environment for the students attending them.
- The lack of basic infrastructure not only affects teaching and learning but school management as well. Teacher and student morale and performance is affected by poor infrastructure, facilities and equipment.
- Type 1C, Type 2 and Type 3 schools with poor laboratory and library facilities are greatly disadvantaged compared with other schools having these facilities.
- Poor laboratory facilities in 1AB schools disadvantage A-Level science students.

2) Overall Goal

The following are the goal of improvements to national standards level of minimum infrastructure, and facilities in schools:

- The provision of quality basic infrastructure in needy Type 2 and Type 3 schools
- The provision of O-Level science laboratories with minimum equipment and library facilities for Type 1C and Type 2 schools without them and to upgrade their existing laboratories
- The upgrading of A-Level science laboratories in Type 1AB schools

3) Concept of Program and Contents

The concept of the program is to improve infrastructure, and facilities in schools on a priority basis. The program is to be implemented by means of the two projects outlined below:

a) Improvement of Minimum Infrastructure and Facilities of Type 2 and Type 3 Schools

Improving minimum infrastructure and facilities will be a major factor in improving the quality of science and mathematics education. The improvement activity will be implemented through community Educational Kaizen activity promoted with the assistance of Zonal Offices. Good community participation will maximize the project inputs at the school level and minimize the cost of the work.

b) Improvement of Type 1AB and Type1C Schools for Science and Mathematics Education

SEMP is upgrading selected Type 1C schools to Type 1AB schools by upgrading and building science laboratories. However, many Type 1C schools and some existing Type 1AB still require this upgrading. To enable students attending these schools equal access to the same quality of science and mathematics education as students obtain at the well-equipped Type 1AB schools this upgrading is an urgent matter.

4) Process of Implementation

The two projects will be implemented in parallel. Both projects have short-term and long-term plans. Short-term plans will target schools with urgent needs for improvement. Lists of improvements will be prioritized, planned and costed for both projects. For the minimum infrastructure project, extensive community consultation will take place through the formation of QE circles for facility development before implementation and will also involve Zonal Office cooperation. The works for Type 1AB and Type 1C improvement project will be put for tender to the private sector.

a) Improvement of Minimum Infrastructure and Facilities for Type 2 and Type 3 Schools

Short term improvement plan (2005 – 2007)

- Target schools: 1,000 schools
- Criteria: Type 2 and 3 schools that require urgent improvement.

These 750 schools will be supplemented by 250 schools (SIRUP II) making 1,000 schools altogether.

Long term improvement plan (2008 – 2012)

- Target schools: 2,700 schools
- Criteria: Type 2 and 3 schools that require improvement.

b) Improvement of Type 1AB and Type1C Schools for Science and Mathematics Education

Short term improvement plan (2005 – 2007)

- Target 1AB schools: 150 schools
- Criteria: Type 1AB schools with poor A-Level science laboratories
- Target 1C schools: 300 schools
- Criteria: Type 1C schools with urgent needs for science laboratories and libraries

Long term improvement plan (2008 – 2012)

- Target 1AB schools: 250 schools
- Criteria: Type 1AB schools with poor A-Level science laboratories
- Target 1C schools: 800 schools
- Criteria: Type1C schools with needs for upgrading science laboratories and libraries

4.4 Programs and Projects

Proposed projects in the Master Plan are briefly explained under each program and presented below. Main contents of the programs are in the attached project profile sheets.

4.4.1 Program 1: Strengthening of Managerial Capabilities of Schools

(1) Project 1.1: Establishment of Institutional Framework for Educational Kaizen Activities

1) Objectives

The objectives of Project 1.1 are as follows:

- To develop institutional framework to support Educational Kaizen activities under MOE
- To develop institutional framework to support Educational Kaizen activities under Zonal Education Office

2) Components

a) Setting up of NEIKA (National Educational Initiative of Kaizen Activities) for promotion of Educational Kaizen activities (2005-2007)

- MOE will review and clarify NEIKA's objectives and functions in order to provide strong policy backing to promote Educational Kaizen activities at school level. The functions of NEIKA may include:
  - Formulation of policy guideline on Educational Kaizen activities;
  - Approval of implementation and financial plan prepared by MOE;
  - Coordination between MOE and other relevant organizations; and
  - Coordination with other government funded and foreign loan/grant funded projects.
- MOE will formulate regulations and nominate committee members. NEIKA committee members may include:
  - Additional Secretary of MOE in charge of Planning Division
  - Director General of NIE
  - Private Sector Representatives (1-2 members)
  - Representatives from Provincial Education Offices (3-4 members)
  - ZEIKA Representatives (5-6 members)

- MOE will set up NEIKA under the Secretary of MOE.

b) Setting up of ZEIKA (Zonal Education Initiative of Kaizen Activities) for promotion of Educational Kaizen activities (2005-2012)

ZEIKA will be established as a pilot basis in the zones where the Educational Kaizen activities will be conducted.

- MOE will clarify ZEIKA's objectives and functions to promote Educational Kaizen activities at school level. Functions of ZEIKA may include:
  - Approval of implementation and financial plan prepared by Zonal Office on Educational Kaizen activities;
  - Supervision, monitoring and evaluation of Zonal level Educational Kaizen activities; and
  - Promotion and coordination of Educational Kaizen activities in the zone.
- MOE will formulate regulations and membership of ZEIKA after consulting Provincial Directors of Education. ZEIKA member may include:
  - Zonal Director of Education
  - Zonal education officer in charge of planning and monitoring
  - ISAs (2-3 members)
  - SEIKA representatives (5-6 members)
  - Representatives from local communities (2-3 members)
- Provincial Department of Education will set up ZEIKA under Zonal Education Office. Zonal Education Office, under the supervision of NEIKA, will select appropriate members for each ZEIKA following ZEIKA regulation.

3) Outputs

The expected outputs of Project 1.1 are as follows:

- NEIKA will be established under MOE as a supervisory body to promote Educational Kaizen activities by 2007.
- ZEIKA will be first established in the zones where Educational Kaizen activities will be implemented under Zonal Education Office.
- In all zones ZEIKA will be established under Zonal Education Office to promote Educational Kaizen activities by 2012.

4) Implementing Schedule

2005-2012 (See the Program 1 Profile for the details.)

5) Estimated Cost

Rs.2.6 million for 2005-2007 and Rs.6.7 million for 2008-2012 (See the Program 1 Profile for the details.)

6) Executing Agencies

MOE (Central, Provincial and Zonal Offices)

(2) Project 1.2: Institutional Strengthening of MOE and PEA for Educational Kaizen Activities

1) Objectives

The objectives of Project 1.2 are as follows:

- To set up a Unit for promoting Educational Kaizen activities under Planning Division of MOE,
- To strengthen capacity of MOE and PEA in promoting and supporting Educational Kaizen activities at school-level.

2) Components

Setting up of Educational Kaizen Unit under Planning Division of MOE (2005-2007)

- MOE, under the supervision of NEIKA, will define objectives and functions of Educational Kaizen Unit, which is the promoting body of Educational Kaizen activities.
- MOE will establish the Educational Kaizen Unit under Planning Division of MOE. Coordination of activities and demarcation of functions with Quality Assurance Unit of MOE should be considered. The function of Unit may include:
  - Formulation of annual implementation and financial plan on Educational Kaizen activities at national level;
  - Secure the budget;
  - Implementation of Educational Kaizen activities at national level;
  - Coordination with Provincial Departments of Education;
  - Supervision, monitoring and evaluation of ZEIKA; and
  - Collaboration and coordination with NIE Unit.
- MOE will appoint necessary staff to the Unit. The following staff may be included:
  - Head of Unit (Director of Education)
  - 3 Officers (Assistant Director of Education)
  - 1 Assistant Staff
  - 1 Secretary
- MOE will organize training for the staff in Educational Kaizen activities. As the MOE and NIE counterparts of JICA Master Plan Study in Science and Mathematics have good experiences in Educational Kaizen activities, they will be charged to design and implement the training program. The training should include the following issues. Possible tools and available materials are listed in the brackets.

- Concept of Educational Kaizen activities (Educational Kaizen booklets developed by JICA Project)
- Experience of school-based Educational Kaizen Activities (instructional videos developed by JICA Project; visit to JICA pilot schools and hold discussion with SEIKA members on QEC activities)
- MOE's support to school-based Educational Kaizen activities (Lessons Learned prepared by JICA Project)

- Educational Kaizen Unit will plan and implement promotion of Educational Kaizen activities. The following activities may be considered:
  - Distribution of instructional materials on Educational Kaizen activities developed by JICA Project
  - Development and dissemination of further instructional materials (booklets, videos, etc.) on Educational Kaizen activities
  - Development of QEC Network (newsletter, website, etc.)
  - Organization of annual QEC (Quality Education Circle) Convention
- Educational Kaizen Unit will monitor and evaluate Educational Kaizen activities. Primarily school-level activities will be monitored by ZEIKA. Educational Kaizen Unit will review the quarterly report sent by ZEIKA and evaluate overall progress. The Unit may conduct independent monitoring at school level.

<u>Training for MOE and PEA Officers on Educational Kaizen Activities (2005-2012)</u>

- The Unit will organize a 2-day sensitization workshop on Educational Kaizen activities. The workshop focuses on the concept of school-based Educational Kaizen activities and MOE's and PEA's supporting roles to promote such activities. The instructional materials developed by JICA Project will be used during the workshop as well as guest speakers may be invited from JICA pilot schools to share the experiences. The participants may include:
  - Additional Secretaries of MOE (5)
  - Directors of relevant branches of MOE (26)
  - Provincial Director of Education (8)
- The Unit will design the training program on Educational Kaizen activities and leadership training for zonal education officers and SEIKA members. The training will use cascade system. The zones where School-based Educational Kaizen Project (2005-2007) will be implemented are first included in the training. The training program include:
  - 5-day National-level training in Colombo: the Unit will train 3 provincial trainers from each province

- 5-day Provincial-level Training in each province: Provincial trainers will train 3 zonal trainers from each zone.
- 5-day Zonal-level Training in each zone: Zonal trainers will train all the ZEIKA members and School Principals
- ZEIKA will train all SEIKA members in different batches.
- Zonal-level Refresh Training: ZEIKA will organize one-day refresh training course twice a year inviting principals and SEIKA members.

- The Unit and ZEIKA will organize and implement the above training. The Unit will monitor and evaluate the training session at each level.

3) Outputs

The expected outputs of Project 1.2 are as follows:

- The Educational Kaizen Unit will be established under Planning Division of MOE.
- The Unit will formulate the operation plan for promotion of Educational Kaizen activities and implement the plan.
- MOE and Provincial Directors will be sensitized on Educational Kaizen activities.
- Training program on Educational Kaizen activities will be developed and implemented using cascade system.

4) Implementing Schedule: 2005-2012 (See the Program 1 Profile for the details.)

5) Estimated Cost: Rs.11.4 million for 2005-2007; Rs.74.1 million for 2008-2012 (See the Program Profile for the details.)

6) Executing Agencies: MOE, Educational Kaizen Unit, ZEIKA

(3) Project 1.3: Awareness Campaign and Training for Educational Kaizen Activities (2005-2012)

1) Objectives

The objectives of Project 1.3 are as follows:

- To create awareness on benefits of Educational Kaizen activities in wider community.
- To develop leadership quality of principals and zonal officers.

2) Components

<u>Implementation of awareness campaign for Educational Kaizen Activities (2005-2012)</u>

- The Educational Kaizen Unit will formulate objectives and strategies to achieve awareness in wider community. Based on the strategies identified, the Unit will develop an activity plan for awareness campaign through media such as TV and radio broadcast and newspaper advertisement. For securing the budget, the Unit should consider of obtaining contributions from private businesses and organizations.

- The Unit will develop promotional materials on Educational Kaizen activities. Outputs from the Pilot Project such as booklets and videos should be utilized and the experiences from the pilot schools maybe further consolidated for this purpose.
- The Unit will organize a series of workshops in Colombo and different locations to promote Educational Kaizen activities.

<u>Leadership Training of principals and zonal directors (2005-2012)</u>

- NIE, together with the Unit, will develop a 5-day leadership training course for principals and zonal directors. Existing principals training program at NIE may be modified to include introduction of Educational Kaizen activities and the role of zonal officers. Materials developed by the Pilot Project such as booklets and videos may be utilized in the program. The training should include:
  - Introduction of Educational Kaizen activities
  - Formation of QE circles and SEIKA
  - Preparation of School Development Plan
  - School-based activities such as mutual assessment system, open class and development of teaching materials
  - Financial management
- NIE will implement leadership training for principals and zonal directors by batches to cover principals and zonal directors (92) by 2012.
- Zonal officers will make follow up visits to schools every three months. School visit should be conducted as an effective on-site consultation. Issues identified during the school visits should be reported to the next ZEIKA meeting and effective solution should be identified.

3) Outputs

The expected outputs of Project 1.3 are as follows:

- Media campaign for Educational Kaizen activities will be conducted.
- Wider community will be aware of benefits of Educational Kaizen activities.
- All principals and zonal directors will be provided with 5-day leadership training.
- Schools will be visited by zonal officers every three months and effective on-site consultation will be held at school.

4) Implementing Schedule: 2005-2012

(See the Program 1 Profile for the details.)

5) Estimated Cost: Rs.6.0 million for 2005-2007; Rs.29.5 million for 2008-2012 (See Program 1 Profile for the details.)

6) Executing Agencies: Educational Kaizen Unit, NIE, Zonal Education Office

(4) Project 1.4: Establishment of School Framework for Educational Kaizen Activities

1) Objectives

The objectives of Project 1.4 are as follows:

- To establish school development organization at schools (SEIKA)
- To introduce school-based training program for all relevant personnel in schools
- To formulate school development plan
- To form QE circle in schools
- To introduce internal and external monitoring system

2) Components

All components will be implemented as a pilot basis in 500 schools from 2005 to 2007, and expanded to nationwide by covering all (9,790) government schools by 2012.

<u>Establishment of school development organization (SEIKA)</u>

- The schools will study the concept of Educational Kaizen by reports, booklets, videos and CDs developed by the Pilot Project.
- The schools will learn Educational Kaizen activities by visiting the neighboring pilot schools of the Pilot Project, attending seminars and organizing in-house workshops, in order to reach consensus in introducing Educational Kaizen activities among principal, teachers, parents and community. In particular, all of the school staff should learn administrative and financial matters.
- The principal will appoint SEIKA members at a meeting of School Development Society. SEIKA members will consist of around 10 to 15 people including a principal, teachers, parents, community, zonal officers and principals from neighboring schools.
- The principal will be a chairperson of SEIKA.
- The principal will organize SEIKA meeting every month. Minutes of meeting have to be recorded and reported to a respective zonal office. All decisions should be approved by the SEIKA. In order to maintain transparency, all information, particularly expenditure of budget, has to be disclosed. The function of SEIKA will include:
  - Formulation of a school development plan;
  - Approval of QE circle implementation and financial plan;

- Coordination among QE circles; and
- Internal monitoring and evaluation of QE circle activities.

Introduction of school-based training program for all relevant personnel in schools

- SEIKA will design training program on Educational Kaizen activities based on materials learned from Project I.2.ii) c), as well as reports, booklets, videos and CDs developed by the Pilot Project.
- SEIKA will implement training program periodically for teachers, parents, community and students. The training program should be conducted in an interactive manner so that the participants will understand the concept and benefit gradually through discussions among them. Small group discussion should be encouraged.

Formulation of school development plan (-2012)

- The principal and some SEIKA members will learn how to prepare school development plan through workshops organized by zonal office from sub-component I.2.(2) c).
- SEIKA will list up problems and select topics with higher priority. SEIKA should also ask non-SEIKA members their constraints and problems. These problems will be divided into a short, mid and long term plan. It is advisable to select relatively easy and less costly topics in the short term plan.
- SEIKA will formulate school development plan with cost estimation. SEIKA should form several working groups by topics to make school development plan and let them discuss openly, so that the preparation process will be shared.

Formulation of QE circle (-2012)

- SEIKA will form 3 to 5 QE circles for each selected topic listed as the short term plan in the school development plan, each of which consists of 5 to 10 activated members including teachers, parents and students. QEC members should be selected by voluntarily basis.
- SEIKA will officially appoint a teacher as a QEC leader. It is desirable that QE circle members select the leader.
- QE circle will develop a 6-month action plan with cost estimation, which should be approved by SEIKA.
- QE circle will have a 15-minute meeting two times a week and keep activity record, which should be reported at SEIKA meeting
- SEIKA will review activities of QE circles every 6 months and change members, if necessary, and develop the new 6-month plan. The review items include progress in comparison with the 6-month action plan,

activity records and receipt book.

Introduction of internal and external monitoring system (-2012)

- SEIKA will carefully learn a financial guideline developed by MOE.
- Zonal office will assign 5 external resource persons as an external monitoring team, consisting of a zonal officer, two representatives of parent and two principals of neighboring schools.
- The school will assign 3 school staff as an internal monitoring team to inspect all expenditure spent by SEIKA and QECs. This consists of an administrative staff, a teacher and a parent, all of whom should be neither SEIKA members nor QE circle members. In case that improper expenditure is found, SEIKA members have to take responsibility.
- SEIKA will disclose a financial report to the public so as to maintain transparency. In the financial report all receipts should be signed by all SEIKA members for approval.

3) Outputs

The expected outputs of Project 1.4 are as follows:

- SEIKA will be formed at 500 schools by 2007 and at all schools by 2012.
- All relevant personnel in 500 schools will understand the concept and benefit of Educational Kaizen activities by 2007 and in all schools by 2012.
- 500 schools will develop their school development plan by 2007 and all schools by 2012.
- 500 schools will form 3 to 5 QE circles and start Educational Kaizen activities by 2007 and all schools by 2012.
- 500 schools will form internal and external monitoring teams by 2007 and all schools by 2012.

4) Implementation Schedule: 2005-2012 (See the Program 1 Profile for the details.)

5) Estimated Cost: Rs.50.6 million for 2005-2007; Rs.2,520.0 million for 2008-2012 (See Program 1 Profile for the details.)

6) Executing Agencies: MOE (Central, Provincial and Zonal Officers), NIE (for the leadership training) and schools

(5) Project 1.5: Strengthening of School Information Management System

1) Objectives

The objectives of Project 1.4 are as follows:

- To provide computer training for school staff to develop school-based information management system for effective and efficient school management

- To construct data base for document based information management system
- To establish computerized information management system

2) Components

All components will be implemented as a pilot basis in 500 schools from 2005 to 2007, and expanded to nationwide by covering all (9,790) government schools by 2012. This component is available only for the schools with computer facilities.

Computer training for school staff

- The school will form a QE circle consisting of teachers, students and parents. The QE circle members will be voluntarily selected. Computer literacy should not be selection criteria. However, a team leader should have basic computer skills.
- The QE circle will study basic computer skills among members by using a training manual developed by the Pilot Project and other guidebooks available in bookshops. Computer skills can be obtained by self-learning.
- The QE circle will design and conduct computer training courses for other school staff. All school staff should be multi-skilled workers.

Construction of data base

- The QE circle will select data to be included in the database. The data may include attendant record, personnel data, examination mark, library books and lending and inventory.
- The QE circle will develop data collection system and data entry format and hold a sensitization workshop for all school staff. The QE circle will construct an efficient filing system by using 5S method and will develop a standardized analysis method.
- The QE circle will collect data and keep in paper file and make analysis.
- The QE circle members will enter data in computer and analyze. The QE circle may ask students to enter data. The results of analysis by computer should be compared with that of manual analysis.

3) Outputs

The expected outputs of Project 1.5 are as follows:

- All school staff, as well as some students and some parents, will acquire the basic computer skills at 500 schools by 2007 and at all schools by 2012.
- Database will be constructed in document basis in 500 schools by 2007 and in all schools by 2012.
- Computerized data base will be constructed in 500 schools by 2007 and

in all schools by 2012.

4) Implementation Schedule: 2005-2012 (See the Program 1 Profile for the details.)

5) Estimated Cost: Rs.7.7 million for 2005-2007; Rs.154.5 million for 2008-2012 (See the Program 1 Profile for the details.)

6) Executing Agencies: Schools

(6) Project 1.6: Expansion of Educational Kaizen Activities

1) Objectives

The objectives of Project 1.6 are as follows:

- To promote school-based workshop and to expand Educational Kaizen activities to all government schools
- To introduce inter-school collaboration system to encourage collaborative works among teachers

2) Components

All components will be implemented as a pilot basis in 500 schools from 2005 to 2007, and expanded to nationwide by covering all (9,790) government schools by 2012.

<u>Promotion of school-based workshop</u>

- Zonal office will form a School-based Workshop Promoting Committee under ZEIKA. The Committee will consist of a provincial officer, 2-3 zonal officers and 4-5 principals of schools. The role of the Committee is to promote school-based workshop and zonal level QEC Convention.
- The Committee will develop an instruction manual to implement the school-based workshop. The instruction manual includes objectives, model program, preparation of handouts, selection of participants, promotion campaign, financing, selection of the best QE circle and award giving.
- The Committee will organize a sensitization workshop in zonal office, inviting principals and some SEIKA members of all target schools and explain the instruction manual.
- The schools will hold school-based workshop and select the best presentation of QE circle.
- The Committee will conduct a zonal level QEC convention inviting the best QE circles selected from school-based workshop. The best zonal QE circles will be selected.
- The Unit in MOE will develop and organize the national level QEC conventions. The best zonal QE circles will make presentations. The best national QE circles are selected and awarded.

- The Unit will publish a set of materials presented in the national level QEC convention.

3) Outputs

The expected outputs of Project 1.6 are as follows:

- 500 schools will have school-based workshop every year by 2007 and all government schools by 2012.
- Corresponding zones of 500 schools will have zonal level QEC convention every year by 2007 and all zonal offices by 2012.
- National level QEC convention will be held every year by 2012.

4) Implementation Schedule: 2005-2012 (See the Program 1 Profile for the details.)

5) Estimated Cost: Rs.12.3 million for 2005-2007; Rs.278.0 million for 2008-2012 (See the Program 1 Profile for the details.)

6) Executing Agencies: MOE (Central, Provincial and Zonal Officers) and schools

4.4.2 Program 2: Promotion of Activity-based and Interactive Teaching and Learning

(1) Project 2.1: Institutional Support for Activity-based and Interactive Teaching and Learning

1) Objectives

The objectives of Project 2.1 are as follows:

- To establish a new unit for activity-based teaching and learning for science and mathematics under the faculty of Science and Technology in NIE by providing necessary facilities and equipment for hands-on activities
- To review all science and mathematics syllabuses and teachers guides and produce a list of suitable hands on-activities for each subject.
- From these lists, to produce hands-on activity manuals and kits for classroom use.

2) Components

The promotion of activity-based and interactive teaching and learning comprises three components. These are:

- Establishment of an NIE unit for activity-based and interactive teaching and learning of science and mathematics
- Preparation of syllabus-based lists of activities for science and mathematics subjects

- Preparation of Activity Manuals and Kits for science and mathematics subjects

The first component will be implemented in the first part of 2005, the second by the end of 2005 and the third component by the end of 2006.

<u>Establishment of an NIE Unit for activity-based and interactive for the teaching and learning of science and mathematics (2005)</u>

- NIE will provide suitable room(s) and furnish with necessary equipment to accommodate the Unit.
- NIE will appoint a director for the Unit, lecturer(s) and necessary staff.
- The Unit in collaboration with MOE will decide on the time allocation and targeted teachers for in-service training courses. The content for the courses will be a range of subject/grade level programs assisting teachers with interactive teaching and learning methods using the Activity Manuals and Kits (see Component 3 of this project). The programs will cover ERA, primary *mathematics*, grade 6-11 *'science and technology'*, grade 6-11 *mathematics*, A-Level sciences and A-Level *'combined mathematics'*.

<u>Preparation of syllabus-based lists of Activities for science and mathematics subjects (2005)</u>

- The Unit will review each syllabus and select topics for which activities can be developed and taught using interactive teaching and learning methods. These activities will take the form of experiments, assignments, projects, puzzles, competitions etc. and real-life problems. They will not be typical textbook material. The activities will also include the 100-box calculation and model experiments developed as a result of the Pilot Project. A preliminary list of activities will be compiled under headings such as primary mathematics grade 5, A-Level chemistry grade 12 etc.
- The Unit will ask for comments from the wider science and mathematics community as to the suitability of various activities and then select a final list of at least twenty activities for each subject/grade to be developed as contents for the Activity Manual and Kits. These activities will be used for SBA material as well as a vehicle for developing teachers' skills in interactive teaching and learning.

<u>Preparation of Activity Manuals and Kits for science and mathematics subjects (2006)</u>

- As well as NIE staff, groups of interested teachers will be invited to write up the activities including content and methods to be used.
- Each activity will be developed using a suitable format, written, edited, prepared for publication and printed. Where special equipment is required for an activity, a kit for that activity will be prepared.

- The Activity Manuals and Kits will be introduced in in-service training courses at the newly formed NIE Unit, and then become a significant teaching material to supplement the textbook for each grade. As well, the Activity Manuals and Kits will be tried out in the in-service training program on upgraded science and mathematics curricula. (See Project 3.1 and Project 3.2)
- Activity Manuals and Kits should be distributed to schools by the unit to be established in NIE.

3) Outputs

The expected outputs of Project 2.1 are as follows:

- An NIE unit will be established for activity-based and interactive teaching and learning of science and mathematics.
- Lists of at least twenty activities for each grade in ERA, primary *mathematics*, grade 6-11 *'science and technology'*, grade 6-11 *mathematics*, A-Level sciences and A-Level *'combined mathematics'* will be prepared.
- Activity Manuals and Kits for each grade in ERA, primary *mathematics*, grade 6-11 '*science and technology'* grade 6-11 *mathematics*, A-Level sciences and A-Level *'combined mathematics'* will be developed and distributed to schools by NIE.

4) Implementing Schedule: 2005-2006 (See Program 2 Profile for details.)

5) Estimated Cost: Rs.25 million for 2005-2007; Rs.400 million for 2008-2012 (See Program 2 Profile for details.)

6) Executing Agencies: MOE and NIE

(2) Project 2.2: Training of Science and Mathematics Teachers on Activity-based and Interactive Teaching and Learning

1) Objectives

The objectives of Project 2.2 are as follows:

- to provide the necessary number of science and mathematics ISAs, primary school teachers and science and mathematics teachers, especially for rural schools
- to improve science and mathematics teacher's capacity to implement activity-based and interactive teaching and learning

2) Components

All components will be conducted as a pilot basis in 500 schools and 16 zones from 2005 to 2007, and expanded to nationwide by covering all (9,790) government schools and all (92) zones by 2012.

Deployment of necessary number of science and mathematics ISAs and teachers particularly for rural schools (2005-2012)

- MOE will assess the current situation of required numbers of science and mathematics ISAs, primary school teachers, and science and mathematics teachers especially for rural schools.
- MOE will organize the national mass media campaign (TV and radio commercials, posters and banners, and movies), in which the national importance and fruitfulness for teachers to work for rural schools will be emphasized.
- MOE Provincial Office will recruit and deploy the necessary number of science and mathematics ISAs including those who specialize in A-Level and teachers especially for rural schools, as estimated in Table 4.4.1.

Table 4.4.1 Estimated Number for Science and Mathematics Teachers and ISAs

	Current Number	Required Number	Need for Additional Number
Primary school teachers	about 55,000 (2004)	about 60,000	5,000
Science and mathematics teachers in grade 6 to 11	about 24,000 (2004)	about 25,000	1,000
Science and mathematics teachers in grade 12 to 13	about 4,000 (2004)	about 4,500	500
Science and mathematics ISAs (up to O-level)	about 500 (2002)	about 700	200
Science and mathematics ISAs (A-Level)	None	About 60	60

Source: Planning Division, MOE

In-service training of science and mathematics ISAs and teachers on activity-based and interactive teaching and learning in NIE and Teachers' Centers (2007-2012)

- NIE will design and establish an updating course for science and mathematics ISAs for activity-based and interactive teaching and learning (25-35 participants/course, 5 days/course, 20 courses/year), equipped with multimedia and necessary facilities, by utilizing model experiment booklets and video programs developed in JICA Pilot Project, and hands-on activity manuals and kits for activity-based and interactive teaching and learning which will be developed in Project 2.1.
- NIE and MOE will design annual cascade training and follow-up system (refer to Figure 4.4.2).

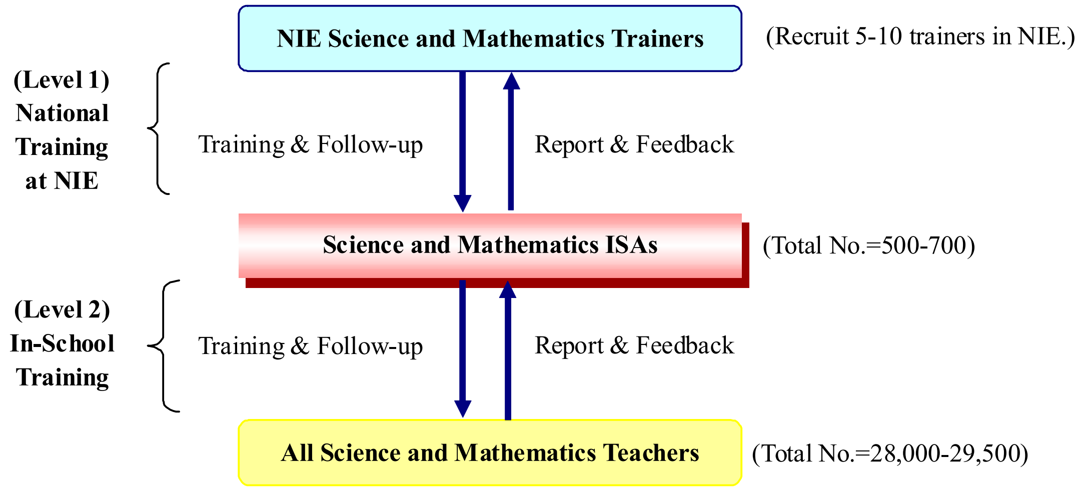


Figure 4.4.1 Cascade Training and Follow-up System

- NIE and MOE will implement the above in-service training in the following 2 levels of cascade system:
  - (Level 1) Every year, NIE trainers will conduct annual updating courses for all science and mathematics ISAs at NIE (a national training course)
  - (Level 2) Every year, each trained science and mathematics ISA will visit 5-10 schools which he/she is in charge of, and organize 5-day in-school training for all science and mathematics teachers in the school

<u>Strengthening ISA's support to science and mathematics teachers (2008-2012)</u>

- MOE Zonal Offices will design the appropriate schedule for ISAs' follow-up school visits after the above in-school training.
- During the follow-up school visits, ISAs are expected to conduct demonstration lessons in which teachers can observe the lesson and learn the new teaching methods.

<u>Monitoring and evaluating teaching performance of science and mathematics ISAs and teachers (2008-2012)</u>

- MOE will establish national performance standards for science and mathematics ISAs and teachers.
- MOE Zonal Office will conduct periodic monitoring and evaluation of teaching performance of all science and mathematics ISAs by Zonal Office, and all primary and science and mathematics teachers by ISAs.
- MOE will award best performing science and mathematics ISAs and teachers, at zonal, provincial and national levels, in annual teachers' conferences organized in Project 2.3 (3).

3) Outputs

The expected outputs of Project 2.2 are as follows:

- The number of science and mathematics ISAs, primary school teachers and science and mathematics teachers will be increased up to the level indicated in Table 4.4.2.1 by 2012,
- In-service training on activity-based and interactive teaching and learning will be provided to all science and mathematics ISAs and teachers by 2012,
- All schools (including rural schools) will be visited by science and mathematics ISAs at least once a month by 2012, and at school, science and mathematics ISAs conduct demonstration lessons for activity-based and interactive teaching and learning,
- Periodic performance monitoring and evaluation for all science and mathematics ISAs by Zonal Office and all primary and science and mathematics teachers by ISAs will be conducted by 2012, and
- Best performing science and mathematics ISAs and teachers will be awarded at zonal, provincial and national level teachers' conferences every year from 2006 to 2012.

4) Implementing Schedule

2005-2012 (See the Program Profile for the details.)

5) Estimated Cost

Rs.104 million for 2005 –2007 and Rs.15 million for 2008-2012

(See the Program Profile for the details.)

6) Executing Agencies

MOE (Central, Provincial and Zonal Offices) and NIE (for in-service training)

(3) Project 2.3: Enhancement of Professionalism of Science and Mathematics Teachers

1) Objectives

The objectives of Project 2.3 are as follows:

- To establish zonal science and mathematics teachers societies
- To organize and hold regular meetings and produce science and mathematics newsletters for each society
- To organize and hold annual zonal science and mathematics teachers conferences
- To extend these conferences to the Provincial and national levels

2) Components

Professionalism among science and mathematics teachers comprises three components. These are:

- Establishment of zonal science and mathematics teachers' societies
- Organization of meetings, newsletters of the teachers' Societies
- Organization of annual zonal, provincial and national science and mathematics teacher's conferences

The first component will be implemented in 2005-2007, the second over the years 2005-2012 and the third from 2006-2012.

Establishment of zonal science and mathematics teachers' societies (2005-2007)

- A national committee will be established and they will initiate an awareness campaign informing teachers of the professional benefits of subject-base teacher societies. The campaign will take place at the school level through principals, section heads, ISAs and master teachers
- Interested teachers will be invited to meet to form a society at the zonal level. Each new society will begin as a committee to establish a constitution, elect officers etc. and publicize the society to teachers throughout the zone. Benefits such as being able to meet regularly to discuss new materials, successful classroom-teaching methods, assessment ideas and new developments in their subject etc. Also, just to meet other teachers of their subjects and informally discuss issues and problems. There should be no compulsion to join a society but members will be encouraged to spread information from the society meetings to their colleagues at their own schools. The societies will meet at teachers' centers or at various schools in the zones and will be a part of a teacher's professional development activities.
- It is expected that science and mathematics societies will be formed in all zones over the years 2005-2007. The societies will be piloted in 16 zones (2 zones per province) in 2005, 32 zones in 2006 and 44 zones in 2007.

Organization of meetings, newsletters of the teachers' Societies (2005-2012)

- The committee for each society will organize speakers, activities, regular meeting times, venues, notices of meetings for members.
- The committee for each society will produce and distribute member's newsletters (one per term). These newsletters will contain teaching hints, subject content, assessment ideas, information from overseas teachers journals, teachers-based action research etc. Members will also be asked for their own contributions. (through the years 2005-2012)

Organization of annual zonal science and mathematics teachers' conferences (2006-2012)

- The zonal society committee will organize and hold an annual conference in their subject inviting society members, other teachers and community members. These conferences will have an important national or international figure as the main speaker and comprise seminars, workshops, demonstrations and lectures from outstanding teachers in the zone. (from 2006)

- As an extension of the zonal conference, biennial (every two years) provincial and national conferences will be organized with inputs from zonal societies island-wide. The first of these conferences will be held in 2008.

3) Outputs

The expected outputs of Project 2.3 are as follows:

- 92 science teachers' societies, 92 mathematics teachers' societies and 92 ERA and mathematics societies, one of each in every zone. (2005-2007)
- Regular society meetings and three newsletters per year for every society (2005).
- Annual Zonal conferences for each society (commencing 2006)
- Biennial Provincial and National conferences for each society (commencing 2008)

4) Implementing Schedule

2005-2012 (See Program 2 Profile for details.)

5) Estimated Cost

Rs.68.1 million for 2005-2007 and Rs.138.8 million for 2008-2012

(See Program 2 Profile for details.)

6) Executing Agencies

MOE (Central, Provincial and Zonal Offices)

(4) Project 2.4: School-based Promotion of Activity-based and Interactive Teaching and Learning

1) Objectives

The objectives of Project 2.4 are as follows:

- To strengthen basic calculation skills through 100-box calculation
- To strengthen activity-based and interactive teaching and learning in science and mathematics through model experiments
- To develop teachers' hand-made teaching materials

2) Components

All components will be implemented as a pilot basis in 500 schools from 2005 to 2007, and expanded to nationwide by covering all (9,790) government schools by 2012.

Strengthening basic calculation skills through 100-box calculation (2005-2007)

- The schools will form a QE circle to promote 100-box calculation.
- The QE circle members will study a concept and implementation method of 100-box calculation through a booklet and a video program developed in JICA Pilot Project.
- The QE circle members will visit a nearby JICA pilot school to observe implementation of 100-box calculation. Non-QE circle members also should join the observation tour. They should learn implementation process, difficulties, benefit and analysis method, interviewing teachers and students in the pilot school.
- The QE circle members will demonstrate 100-box calculation to relevant teachers. The teachers should do the 100-box calculation to experience their own progress in calculation speed and accuracy.
- The QE circle members will prepare sheets for 100-box calculation by copying from the booklet developed in JICA Pilot Project.
- The teachers will collect results of marks and calculation speed and analyze the results. The students can help teachers in all these implementation process.
- The teachers will summarize the results, make analysis and discuss the results at the QE circle. In case that the progress is not as much as expected, QE circle members identify causes and find solutions. It is a good way for teachers to visit classes each other in order to discover differences in implementing 100-box calculation.

Strengthening activity-based and interactive teaching and learning in science and mathematics through model experiments (2005-2007)

- The schools will form a QE circle to promote activity-based teaching and learning.
- The QE circle members will study the contents and implementation method of a booklet of model experiments developed in JICA Pilot Project. 36 topics are included in science and mathematics covering grade 1 to 11. (Refer to "Guideline of Model Experiment" in the attached CDROM.)
- The schools will visit a nearby JICA pilot school to observe implementation of model experiments. Non-QE circle members also should join the observation tour.
- The QE circle members will demonstrate model experiment for teachers and discuss among themselves how to implement all model experiments in the classroom and learn what activity-based and interactive teaching and learning is.

- After introducing model experiments in classes, the QE circle members and teachers will analyze the results of using model experiments, and revise and upgrade them if necessary. Assessment by students will be a valuable feedback to upgrade model experiments.
- After revising and upgrading, model experiments will be used every year with a support of QE circle.

Development of teachers' hand-made teaching materials (2008-2012)

- The schools will form a QE circle to promote development of teacher's hand-made teaching materials.
- The schools will visit a nearby JICA pilot school to observe how they are developing teaching materials. Non-QE circle members also should join the observation tour.
- The QE circle members will prepare a development plan of teaching materials, specifying subjects and grades and assign teachers for each topic. The QE circle should start with limited target areas first.
- The QE circle and relevant teachers will review the teaching materials developed, and revise them if necessary.
- The teachers will make a trial use of the above-developed teaching materials at certain classes, analyze the impact of using them, and improve them if necessary. Assessment by students will be a valuable feedback to upgrade teaching materials.
- The schools will share the developed teaching materials and experiences of using them, with teachers from neighboring schools, ISAs and zonal officers, through school-based workshops, open classes and professional teachers' group activities.
- The schools will organize annual teachers' conventions to collect and evaluate teachers' hand-made teaching materials at zonal and national level (jointly held together with annual science and mathematics teachers' conferences in Project 2.3)

3) Outputs

The expected outputs of Project 2.4 are as follows:

- 100-box calculation will be widely used to strengthen basic calculation capabilities of students at 500 schools by 2007 and at all schools by 2012.
- 36 model experiments developed by the Pilot Project will be introduced in 500 schools by 2007 and in all schools by 2012.
- 500 schools will start to develop teachers' hand-made teaching materials by 2007 and all schools by 2012.

4) Implementation Schedule

2005-2012 (See the Program 2 Profile for the details.)

5) Estimated Cost

Rs.5.2 million for 2005-2007 and Rs.103 million for 2008-2012 (See Program 2 Profile for details.)

6) Executing Agencies

Schools, Zonal Offices

(5) Project 2.5: Promotion of ICT in Science and Mathematics Education

1) Objectives

The objectives of Project 2.5 are as follows:

- To raise the level of ICT literacy skills of the teachers and students
- To produce low-cost resource materials using ICT for science and mathematics education
- To enhance communication among schools and access to sources of information related to science and mathematics using Internet

2) Components

<u>Strengthening the capacity for ICT training and maintenance using the Computer Resource Centers (CRCs) (2005-2007)</u>

- A task force team is established in NIE for reviewing the functions and available ICT equipment in CRCs. The main function of the CRCs is to be resource centers of ICT education, including maintenance of school computer laboratories.
- The training function of the CRCs on ICT education is strengthened by providing the following equipment:
  - Computers (1000)
  - UPS (500)
  - Network printers (73)
  - Scanners (73)
- Each CRC will prepare the training program and schedule of advanced training of ICT in education for responsible ICT teachers. The training will take place in the CRCs twice a year in groups of 25 teachers.
- The CRC staff will provide supplemental training on demand basis to the schools having specific training needs, through visiting the schools. The training will take place on site during school hours.

<u>Strengthening of digital communication capacity (2008-2012)</u>

- The IT Unit of MOE will prepare a program and a schedule by to provide schools with Internet access.

- The IT Unit of MOE will make arrangements for setting up Internet access to all schools.
  - The current alternatives will be investigated, including wireless solutions.
  - Feasibility of Internet Access will be studied covering all Provincial and Zonal offices, CRCs and schools.
  - The best applicable Internet access will be arranged into all locations.

Strengthening of computer literacy and increasing production of teaching materials (2005-2007)

- The teachers will set up study circles (QE circles) in schools to study general ICT skills.
- Through Educational Kaizen activities, the study circles will prepare an ICT study plan and schedule.
- Teachers will produce documents (e.g. school brochures, invitation letters, lesson plans, festival programs) for the school and the local community using ICT tools.
- Teachers will produce teaching material for science and mathematics using ICT.
- Zonal Education Offices will arrange zonal competitions of performance in general ICT skills among the schools and among individual students.

Enhancement of joint project work with neighboring schools using ICT (2005-2012)

- Teachers will select a responsible teacher among the proposed teachers' society to manage contacts with neighboring schools.
- Teachers will start correspondence and exchange materials and experiences with neighboring schools.
- Teachers will expand the correspondence to cover more schools within the zone.
- Teachers will start using e-mail and web-based discussion forums, if Internet is accessible.

3) Outputs

The expected outputs of Project 2.5 are as follows:

- The CRCs will be provided with new ICT equipment that is modern and based on clearly defined national standards
- Teachers will have sufficient ICT skills to utilize ICT in their teaching and maintain the ICT equipment properly
- Internet connections will be established in all schools, using applicable and cost-efficient technical solutions

- ICT literacy among teachers will be strengthened by school-based study circles that are based on Kaizen activities and supported by the CRCs
- Various teaching material is produced using ICT
- Best ICT teaching practices and best ICT talents are found in the zonal ICT competitions
- Teachers of science and mathematics will join discussion with their colleagues in other schools using web-based forums

4) Implementing Schedule

2005-2012 (See the Program Profile for the details.)

5) Estimated Cost

Rs.238.8 million for 2005-2007 and Rs.1,535.4 million for 2008-2012 (See the Program Profile for the details.)

Note that the costs for years 2008-2012 contain Internet costs that depend highly on the development of telecommunication technology and on the overall Government telecommunication policy, and therefore it is only possible to give a very rough estimate based on a possible annual cost level of Rs.50,000/school in the year 2010.

6) Executing Agencies

MOE (Central, Provincial and Zonal Offices) with NIE, and individual schools

4.4.3 Program 3: Upgrading of Science and Mathematics Curriculum Focusing on Syllabus and Teachers' Guides

(1) Project 3.1: Upgrading of Science Curriculum (Primary ERA (grades 1-5), Junior Secondary (grades 6-9), O-Level and A-Level)

1) Objectives

The objectives of Project 3.1 are as follows:

- To upgrade the present ERA curriculum, O-Level '*science and technology'* and A-Level *biology*, *chemistry* and *physics* curricula to motivate students to enjoy their studies of the environment and science and to improve their performance in science subjects
- To reduce the number of topics in each curriculum to allow time for deeper understanding of concepts and to complete required SBA activities.

2) Components

The curriculum upgrading for each subject comprises three components. These are:

- Preparation of the upgraded curriculum, syllabuses and teachers guides for each grade
- ISA, master teacher and teacher training on the revisions to the curriculum, syllabuses and teachers guides
- Implementation of the upgraded curriculum, syllabuses and teachers guides

The first component will be implemented in 2005, the second over the years 2005-2006 and the third from 2007-2011 for ERA (grade by grade), from 2007-2012 for *'science and technology'* (grade by grade) and from 2008-2009 for *biology*, *chemistry* and *physics* (grade by grade).

Preparation of upgraded curriculum, syllabuses and teachers guides

- Upgrading of ERA, Junior Secondary and O-Level *'science and technology'*, and A-Level sciences curriculum documents

For purposes of this project, it is assumed that grade 6 *'environmental studies'* is grade 6 '*science and technology'*.

- NIE will establish (a) an ERA curriculum committee (b) a *'science and technology'* curriculum committee and (c) *biology*, *chemistry* and *physics* curriculum committees with members from MOE, NIE, teachers and university people
- The committees will review the present curriculum and suggest topic deletions, alterations and additions bearing in mind that the total number of topics needs to be reduced and that the upgrade does not mean the production of a completely new curriculum. Their brief is to retain the themes/topics that awaken students' interest, delete those that are not attractive or outdated and only add new themes/topics if they are exciting, practical, science-based and for ERA part of the students' own environment.
- NIE will prepare draft upgraded curricula, allow for comments from stakeholders and prepare a final version.
- NIE will prepare draft syllabuses for each subject in each grade, put them out for comment and prepare final versions.
- NIE will prepare teachers guides for each subject in each grade with an emphasis on activity-based interactive teaching-learning methods where relevant, use of experiments, activities etc.

ISA, master teacher and teacher training on the revisions to the curriculum, syllabuses and teachers guides

A 'cascade' in-service training method will be used to introduce the upgraded curriculum, syllabuses and teachers guides to teachers.

- NIE will train 184 ERA ISAs, 184 '*science and technology'* ISAs, 184 *biology*, 184 *chemistry* and 184 *physics* master teachers (2 per zone in each subject) in 5-day workshops at NIE.
- ERA ISAs, *'science and technology'* ISAs, A-Level master teachers wil1 train 920 selected teachers in their subjects (10 per zone in each subject) in 5-day workshops at teachers centers.
- Selected ERA, *'science and technology'*, *biology*, *chemistry*, *physics* teachers will train 1840 general teachers in their subjects (20 per zone) at schools/teachers centers.
- ISAs, master teachers, selected and general teachers will train teachers in individual schools.
- Selected and general primary teachers are those with special skills in ERA.

<u>Implementation of the upgraded curriculum, syllabuses and teachers guides</u>

Implementation for ERA will take place in grades 1-5 (year by year) from 2007-2011, *'science and technology'* grades 6-11 (year by year) from 2007-2012 and A-Level sciences from 2008-2009.

By that time, the number of activities that will be available to teachers and students will have increased as a result of the output of activity manuals and kits in Program 2, Project 2.1.

3) Outputs

The expected outputs of project 3.1 are as follows:

- An upgraded (a) ERA curriculum, (b) *'science and technology'* curriculum, and (c) A-Level sciences curricula to make the subjects more interesting and rewarding for students.
- Upgraded ERA (grades 1-5) and *'science and technology'* syllabuses (grades 6-11) with reduced content, linkages to science concepts and school-based environmental themes to provide broader understanding of the environment and science for students. Upgraded A-Level science syllabuses with reduced content, broader development of difficult key concepts and less abstract topics.
- Upgraded teachers guides for ERA (grades 1-5), *'science and technology'* (grades 6-11) and A-Level sciences (grades 12-13) with more details on activities and activity-based interactive teaching –learning methods to motivate students.
- For each subject, trained ISAs (184), master teachers (184), selected teachers (920) and general teachers (1840) to train other teachers in the use of the upgraded curriculum material.

- Implemented upgraded ERA, *'science and technology'*, A-Level curricula. ERA to grade 5 by end of 2011, *'science and technology'* to grade 11 by the end of 2012 and A-Level science by the end of 2009.

3) Implementing Schedule:

   2005-2012 (See Program 3 Profile for details)

4) Estimated Cost:

   Rs.39.1 million for 2005-2007 and Rs.9.2 million for 2008-2012 (See Program 3 Profile for details)

5) Executing Agencies:

   MOE (Central, Provincial and Zonal Offices) and NIE (for in-service training)

(2) Project 3.2: Upgrading of Mathematics Curriculum (Junior Secondary (grades 6-9), O-Level and A-Level)

1) Objectives

   The objectives of Project 3.2 are as follows:

   - To upgrade the present O-Level *mathematics* and A-Level *'combined mathematics'* curricula to motivate students to enjoy their study of the mathematics and to improve their performance mathematics subjects.
   - To reduce the number of topics in each curriculum to allow time for deeper understanding of concepts and to complete required SBA activities.

2) Components

   The curriculum upgrading for each subject comprises three components. These are:

   - Preparation of the upgraded curriculum, syllabuses and teachers guides for each grade
   - In-service ISA, master teacher and teacher training on the revisions to the curriculum, syllabuses and teachers guides
   - Implementation of the upgraded curriculum, syllabuses and teachers guides

   The first component will be implemented in 2005, the second over the years 2005-2006 and the third from 2007-2012 for O-Level *mathematics* (grade by grade) and from 2008-2009 for A-Level *'combined mathematics'* (grade by grade).

   <u>Preparation of upgraded curriculum, syllabuses and teachers guides</u>

   - Upgrading of O-Level *mathematics* and A-Level *'combined mathematics'* documents.

- NIE will establish (a) an O-Level *mathematics* curriculum committee and (b) an A-Level *'combined mathematics'* curriculum committee with members from MOE, NIE, teachers and university people.
- The committees will review the present curriculum and suggest topic deletions, alterations and additions bearing in mind that the total number of topics needs to be reduced and that the upgrade does not mean the production of a completely new curriculum. Their brief is to retain the themes/topics that awaken students' interest, delete those that are not attractive or outdated and only add new themes/topics if they are exciting, practical, mathematics based and contemporary.
- NIE will prepare draft upgraded curricula, allow for comments from stakeholders and prepare a final version.
- NIE will prepare draft syllabuses for each subject in each grade, put them out for comment and prepare final versions.
- NIE will prepare teachers guides for each subject in each grade with an emphasis on activity-based and interactive teaching-learning methods where relevant, use of projects, activities, assignments etc.

ISA, master teacher and teacher training on the revisions to the curriculum, syllabuses and teachers guides

A 'cascade' in-service training method will be used to introduce the upgraded curriculum, syllabuses and teachers guides to teachers.

- NIE will train 184 O-Level mathematics ERAs and 184 A-Level *'combined mathematics'* master teachers (2 per zone in each subject) in 5-day workshops at NIE.
- O-Level *mathematics* and A-Level *'combined mathematics'* master teachers will train 920 selected teachers in their subjects (10 per zone in each subject) in 5-day workshops at teachers' centers.
- Selected O-Level mathematics and A-Level *'combined mathematics'* teachers will train 1840 general teachers in their subjects (20 per zone) at schools/teachers centers.
- ISAs, master teachers, selected and general teachers will train teachers in individual schools.

Implementation of the upgraded curriculum, syllabuses and teachers guides

Implementation will take place for O-Level *mathematics* (year by year) from 2007-2012 and for A-Level *'combined mathematics'* from 2008-2009.

By that time, the number of activities that will be available to teachers and students will have increased as a result of the outputs such as activity manuals in Program 2.

3) Outputs

The expected outputs of project 3.2 are as follows:

- An upgraded (a) O-Level *mathematics* curriculum and (b) A-Level *'combined mathematics'* curriculum to make the subjects more interesting and rewarding for students.
- Upgraded O-Level *mathematics* syllabuses (grades 6-11) with reduced content, linkages to the real world, practical exercises etc. to provide broader understanding of mathematics for students. Upgraded A-Level *'combined mathematics'* syllabuses with reduced/modernized content, broader development of difficult key concepts and less abstract topics.
- Upgraded teachers guides for junior secondary and O-Level *mathematics* (grades 6-11) and A-Level *'combined mathematics'* (grades 12-13) with more details on activities, projects, assignments and activity-based interactive teaching –learning methods to motivate students.
- For each subject, trained ISAs (184), master teachers (184), selected teachers (920) and general teachers (1840) to train other teachers in the use of the upgraded curriculum material.
- Implemented upgraded junior secondary and O-Level, A-Level curricula. *Mathematics* to grade 11 by the end of 2012 and *'combined mathematics'* by the end of 2009.

3) Implementing Schedule:

2005-2012 (See Program 3 Profile for details)

4) Estimated Cost:

Rs.15.64 million for 2005-2007 and Rs.1.84 million for 2008-2012 (See Program 3 Profile for details)

5) Executing Agencies:

MOE (Central, Provincial and Zonal Offices) and NIE (for in-service training)

4.4.4 Program 4: Overall Promotion of Science and Mathematics Education

(1) Project 4.1: Establishment of National Science Education Center

1) Objectives

The objectives of Project 4.1 are as follows:

- To provide school students and general public with the opportunity to experience science.
- To disseminate the latest information on science and mathematics to people all around the country.

2) Components

Establishment of National Science Education Center (2005 – 2012)

The National Science Education Center will provide students, teachers, and general public with opportunities to experience hands-on science activities.

- Establishment of a Steering Committee in MOE to develop a plan of establishment for the National Science Education Center. (2007)
- Preparation of basic design of the Center with cost estimation. (2008)
- Acquisition of land for the Center and fund arrangements with donor agencies. (2008)
- Construction of building, facilities, and installation of equipment. (2009-2010)
- Establishment of a management unit under the Steering Committee. Recruitment and training of staff in operation and maintenance of facilities and equipment. The management unit membership will consist of MOE staff and include private sector members e.g. from the engineering and IT industries. The unit will formulate a plan of operation for the Center including private sector participation.
- Official commencement of operation. Schools will visit the center annually as one of their co-curricular activities.
- The Steering Committee will encourage collaboration with private companies. For instance, the private companies will be given the responsibility of organizing industrial technology demonstrations and the opportunity for exposure to the public in exchange. After two years of operation, an autonomous management system will be established. (2012)

Issue of Science and Mathematics Journals

The newly established National Science Education Center will not function only as a center to provide physical resources but also as a center of intelligence in the field of Science and Technology. The Center will function so that high standard researchers and academics both from the public sector (universities, research institute, etc.) and the private sector (private companies in technology field, etc.) can freely meet and exchange the latest scientific news and ideas. In order to facilitate this, publication of science journals and mathematics journals will be organized.

- Establishment of a sub-committee under the Steering Committee to prepare the journals. Proposed members will be from the universities (faculty of science and faculty of education), NIE, primary and secondary schools and private sector science and technology research organizations/divisions. The committee will also discuss the journal contents and the system of publication and distribution.

- Establishment of an editorial group under the committee to arrange issuing journals including design and request for writers and editors for the journals. (2006)
- Issue of the first journals will be in 2006, and thereafter they will be issued semi annually.
- Arrangements will be made for continuous issue of the journals through Government support and private sector contribution. (2007)

Production and Distribution of Science and Mathematics Directory

The editorial group established for the science and mathematics journals will also produce the Mathematics and Science Directory.

- Design of format and gathering of information for Mathematics and Science Directory. A user-friendly directory needs to be designed so that school students can make use of it. (2006)
- Organizing workshop for the launch of the Directory to publicize the purpose of the Directory. (2006)
- Production of the Directory and distribution to schools and educational offices. (2007)

3) Outputs

The expected outputs are as follows:

- National Science Education Center is established and operational in 2010.
  - Annual school visits (approx. 600,000 students) are organized.
  - Family visit (voluntary) will be approximately 300,000 visitors annually.
- Science journal and mathematics journal are published and distributed to schools and education related offices/organization semiannually from 2006.
- Science and mathematics directory distributed to schools and zonal and provincial offices in 2007.

4) Implementation Schedule

2005-2012 (See the Program Profile for the details)

5) Estimated Cost

Rs.51 million: 2005-2007
Rs.1,000 million: 2008-2012

6) Executing Agency

MOE in collaboration with NIE

(2) Project 4.2: Promotion of Awareness for Science and Mathematics (2005-2007)

1) Objectives

To promote the awareness and importance of science and mathematics education to students, parents, principals and teachers.

2) Components

Production and distribution of awareness materials

- a) Establishment of a taskforce group for promoting public awareness in the Division of Education Quality Development, MOE. (2005)
- b) The taskforce group will identify media (e.g. brochure, video material, etc.), required contents and distribution plans. (2005)
- c) Basic contents of the campaign materials will be discussed by the taskforce group in collaboration with NIE. (2005 – 2006)
- d) Funding arrangements and contract for the preparation of campaign materials. (2006)
- e) Production of materials and distribution to community through schools will be implemented. (2006-2007)
- f) Taskforce group will conduct monitoring and impact assessment. (2006-2007)

International assessment of national education

- a) MOE and NETS will gather information on available international assessment programs to assess science and mathematics education in Sri Lanka (e.g. TIMSS by IEA, PISA by OECD).
- b) Selection of international assessment programs that best suit the country and after authorization, submit a proposal for participation.
- c) Necessary arrangements will be made to participate in the assessment program.
- d) The international assessment will be conducted.

3) Outputs

The expected outputs are as follows:

- i) Brochure prepared and distributed to the community through schools.
- ii) Video materials prepared and distributed to every school and schools organize a video show workshop.
- iii) Participation in the international assessment program organized by 2007.

4) Implementation Schedule

2005-2007 (See the Program Profile for the details)

5) Estimated Cost

Rs.29 million: 2005-2007

6) Executing Agency

MOE (Central, Provincial, and Zonal)

(3) Project 4.3: Promotion of Science Project Competition and Mathematics Competition (2005-2007)

1) Objectives

To provide school students with opportunities to learn how interesting science and mathematics can be.

2) Components

Project 4.3 will implement two major nation-wide activities, namely, a science project competition and a mathematics competition.

<u>Science Project Competition</u>

a) Establishment a committee under MOE to organize science project competitions. (2005)

b) Selection of recommended reference books and/or video materials on science projects by the committee and translations of the material. Reproduction of these for schools for the science project competition.

c) Training of zonal officers and science teachers for pilot science project competition in selected zones (2 zones per province). The selected mathematics reference books on science projects will be distributed through training. (2005)

d) Pilot implementation in the selected zones. Divisions of participation by grade will be set (e.g. grade 4-5, grade 6-9, and grade 10-11). (2005)

e) Implementation of the science project competition up to Provincial final with award for Provincial level. (2006)

f) Training of zonal office science teachers for nation-wide competitions. (2006)

g) Nation-wide implementation of the science project competition up to the national final with award for national level. (2007).

<u>Mathematics Competition</u>

a) Establishment a committee under MOE to organize the mathematics competition. (2005)

b) Selection of recommended mathematics books and/or video materials by the committee and translations of the materials. Reproduction of these for schools for the mathematics competition.

c) Training of zonal officers and mathematics teachers for pilot mathematics competitions in selected zones (2 zones per province). The selected mathematics books will be distributed through training. (2005)

d) Pilot implementation in the selected zones. Divisions of participation by grade will be set (e.g. grade 4-5, grade 6-9, and grade 10-11). (2005)

e) Implementation of mathematics competition up to Provincial final with award for Provincial level. (2006)

f) Training of zonal office mathematics teachers for nation-wide competitions. (2006)

g) Nation-wide implementation of mathematics competition up to the national final, with award for national level. (2007)

h) Send winning students to an international mathematics competition (e.g. International Mathematics Olympiad). (2007)

3) Outputs

The expected outputs are as follows:

- 100,000 school students will participate in science project competition in 2007.
- 100,000 school students will participate in the mathematics competition in 2007.
- Best students in the mathematics competition will be awarded prizes with an invitation to attend an international competition (e.g. International Mathematics Olympiad)

4) Implementation Schedule: 2005-2007 (See the Program Profile for the details)

5) Estimated Cost: Rs.32 million: 2005-2007

6) Executing Agency: MOE (Central, Provincial, and zonal), NIE

4.4.5 Program 5: Improvement of School Infrastructure and Facilities

(1) Project 5.1: Improvement of Minimum Infrastructure and Facilities of Type 2 and Type 3 Schools

1) Objectives

The objectives of Project 5.1 are as follows:

- To improve access to schools for Type 2 and 3, particularly in rural areas
- To improve quality of education, particularly in rural areas

2) Components

Planning and implementation of the minimum infrastructure and facilities (2005 – 2012)

- Review of the JICA Study (Pre-feasibility Study for the Minimum Facilities Improvement ion the Primary and Secondary Levels) and include the proposed improvement (about 250 schools) in the list of SIRUP II. The minimum infrastructure and facilities defined in the pre-feasibility study includes water supply, electricity, toilet, classroom, teachers' quarter, laboratory, library, etc.
- During implementation of the listed project, prepare the succeeding improvement plan under the initiative of MOE and the Financial Commission in cooperation with Provincial Councils for 2006-2007(1,000 schools), and 2008-2012(2,700 schools).
- Fund arrangement for the implementation of the short term plan (2006-2007).
- Implementation of the short term plan.
- Review and finalization of the plan for 2008-2012, and arrangement for the required fund, and implementation of the plan.

Promotion of community participation in facility development

For the implementation of the improvement of minimum infrastructure and facilities, community participation at the school during construction are planned to be enhanced as experienced in the JICA Pilot Project. Necessary process for the community participation is as follows:

- Organize SEIKA at each of the objective school for the Project and form a QE circle for minimum infrastructure and facility development
- Provide training for SEIKA and QE circle for the Educational Kaizen activities through Zonal Office
- Promote community participation and supervise construction works through the QE circle

3) Outputs

The expected outputs are as follows:

- Basic infrastructure and facilities are improved for Type 2 and 3 schools(1,200 schools during 2005-2007, and 2500 schools during 2008-2012)
- Community participation is promoted and facilities are well maintained.

4) Implementation Schedule:

2005-2012 (See the Program Profile for the details)

5) Estimated Cost:

Rs.3,520 million: 2005-2007; Rs.6,804 million: 2008-2012

6) Executing Agency:

MOE (Central, Provincial, and Zonal Offices), Financial Commission

(2) Project 5.2: Improvement of Type 1AB and Type 1C Schools for Science and Mathematics Education

1) Objectives

The objectives of Project 5.2 are as follows:

- To improve access to the secondary level and quality of science and mathematics education at O-Level and A-Level

2) Components

Improvement of Type 1AB schools

- Prepare list and upgrading plan of 1AB schools for improvement under the initiative of the Department of School Supplies, Services and Works in MOE
- Fund arrangement for short term improvement (150 1AB schools).
- Implement works for short term improvement (2006-2007)
- Review and finalize long term plan for improvement, and arrange fund for the works.
- Implement works for long term improvement (250 Type 1AB schools)

Improvement of Type 1C schools

- Review of the on-going projects for upgrading Type 1C to Type 1AB and clarify the required standard for the improvement (science laboratory and library).
- Prepare list and upgrading plan of Type 1C schools under the initiative of the Department of School Supplies, Services and Works in MOE
- Fund arrangement for short term improvement (300 Type 1C schools).
- Implement works for short term improvement (2006-2007)
- Review and finalize long term plan for improvement, and arrange fund for the works.
- Implement works for long term improvement (800 Type 1C schools)

3) Outputs

The expected outputs are as follows:

- A-Level science laboratories (*physics*, *chemistry*, and *biology*) are upgraded for Type 1AB schools (150 schools during 2005-2007, and 250 schools during 2008-2012)

- O-Level science laboratories and libraries are upgraded for Type 1C schools (300 schools during 2005-2007, and 800 schools during 2008-2012).

4) Implementation Schedule:

   2005-2012 (See the Program Profile for the details)

5) Estimated Cost:

   Rs.795 million: 2005-2007; Rs.1,745 million: 2008-2012

6) Executing Agency:

   MOE (Central, Provincial)

PROGRAM PROFILE: I

1. Program Title
Strengthening of Managerial Capabilities of Schools
2. Overall Goal
1. To strengthen managerial capabilities of schools by introducing Educational Kaizen activities 2. To develop institutional framework to support Educational Kaizen activities within MOE and PEA
3. Program Outputs with Measurable Indicators
<u>Institutional and Organizational Support for School-based Educational Kaizen Activities</u> 1. Institutional framework for Educational Kaizen activities will be prepared through a) Setting-up of NEIKA (National Educational Initiative of Kaizen Activities), for promotion of Educational Kaizen activities (2005-2007) b) Setting-up of ZEIKA (Zonal Educational Initiative of Kaizen Activities), for promotion of Educational Kaizen Activities (2005-2007) 2. Institutional strengthening of MOE and PEA for Educational Kaizen activities will be accomplished through a) Setting-up of Educational Kaizen Unit under Planning Division of MOE (2005-2007) b) Training for MOE and PEA officers on Educational Kaizen activities (2005-2007) 3. Awareness campaign and training will be conducted through a) Implementation of awareness campaign for Educational Kaizen activities b) Leadership training of principals and zonal directors <u>School-based Educational Kaizen Activities:</u> 4. Framework for Educational Kaizen activities will be established through (2005-2012) a) Establishment of school development organization (SEIKA) b) Introduction of school-based training program for all relevant personnel in schools c) Formulation of school development plan (-2012) d) Formulation of QE circle (-2012) e) Introduction of internal and external monitoring system (-2012) 5. School information management system will be strengthened through (2005-2012) a) Computer training for school staff b) Construction of data base for effective and efficient school management c) Establishment of computerized information management system 6. Educational Kaizen activities will be expanded through (2005-2012) a) Promotion of school-based workshop b) Introduction of inter-school collaboration system in each zone Target numbers of schools are 500 up to 2007 and all schools (9,790) up to 2012.
4. Program Rationale (Need for the Program)
Schools have been suffering from stagnation in school culture partly due to long years of top-down management system and partly due to lack of schools' initiative in conducting school-based activities. This stagnation has resulted in low motivation of

teachers and poor results of students.

However, 25 pilot schools tried various school-based activities with the support of the JICA Study Team, which proved the Educational Kaizen approach was effective to improve school management, quality of education, and basic infrastructure and facility development. This also contributed to improvement of teachers' motivation and enthusiasm as well as community participation.

In order to expand Educational Kaizen activities, it is important to strengthen managerial capabilities at the school level (bottom-up) and institutional and organizational support by MOE and PEA (top-down).

5. Projects and its Components

Project 1.1: Establishment of Institutional Framework for Educational Kaizen Activities (-2007)
(1) Setting-up of NEIKA (National Educational Initiative of Kaizen Activities), for promotion of Educational Kaizen activities (2005-2007)
(2) Setting-up of ZEIKA (Zonal Educational Initiative of Kaizen Activities), for promotion of Educational Kaizen Activities (2005-2007)

Project 1.2: Institutional Strengthening of MOE and PEA for Educational Kaizen Activities (2005-2007)
(1) Setting-up of Educational Kaizen Unit under Planning Division of MOE (2005-2007)
(2) Training for MOE and PEA officers on Educational Kaizen activities (2004-2007)

Project 1.3: Awareness Campaign and Training for Educational Kaizen Activities (2005-2012)
(1) Implementation of awareness campaign for Educational Kaizen activities
(2) Leadership training of principals and zonal directors

Project 1.4: Establishment of School Framework for Educational Kaizen Activities (-2012)
(1) Establishment of school development organization (SEIKA)
(2) Introduction of school-based training program for all relevant personnel in schools
(3) Formulation of school development plan (-2012)
(4) Formulation of QE circle (-2012)
(5) Introduction of internal and external monitoring system (-2012)

Project 1.5: Strengthening of School Information Management System (-2012)
(1) Computer training for school staff
(2) Construction of data base for effective and efficient school management
(3) Establishment of computerized information management system

Project 1.6: Expansion of Educational Kaizen Activities (-2012)
(1) Promotion of school-based workshop

6. Target Areas & Beneficiaries
School staff, students and parents of 500 schools and associated provincial and zonal officers by 2007 All school staff, students and parents of all government schools (9,790) and all provincial and zonal officers by 2012
7. Implementing Schedule
2005-2012 (See the attached table.)
8. Executing Agencies
MOE (Central, Provincial and Zonal Offices) and NIE (for leadership training)
9. Estimated Cost (in US$)
Rs. 90.6 million for 2005-2007 Rs. 3,062.8 million for 2008-2012 (See the attached table for the details.)
10. Expected Fund Sources
MOE’s own budget and donors’ assistance

Cost Estimate for Program 1: Strengthening of Managerial Capabilities of Schools

	Unit Price (Rs.)	2005-2007	No.	Total Cost (Rs.)	2008-2012	No.	Total Cost (Rs.)
Project 1.1: Establishment of Institutional Framework for Educational Kaizen Activities							
Provision of necessary facilities and equipment for NEIKA	100,000	x 1 set	=	100,000			
Provision of necessary facilities and equipment for ZEIKA	100,000	x 25 sets	=	2,500,000	67 sets	=	6,700,000
Project 1.1 Sub-Total				**2,600,000**			**6,700,000**
Project 1.2: Institutional strengthening of MOE and PEA for Educational Kaizen Activities							
Provision of necessary facilities and equipment for Unit	300,000	x 1 set	=	300,000			
Training for the Unit members	2,000	x 30 days x	5 persons =	300,000			
Printing of instruction manuals (A4 size, 100 pages)	100	x x	3,000 copies =	300,000		10,000 copies =	1,000,000
Printing of booklets on Educational Kaizen activities (B5 size, 50 pages, color)	200	x 2 kinds x	3,000 copies =	1,200,000	2 kinds x	10,000 copies =	4,000,000
Production of video for Educational Kaizen promotion (30 min)	1,000	x 5 kinds x	100 copies =	500,000	5 kinds x	500 copies =	2,500,000
Issue of newsletter (A4, 4 pages, color)	16	x 12 times x	10,000 copies =	1,920,000	20 times x	10,000 copies =	3,200,000
Development and maintenance of website	5,000	x 36 months	=	180,000	60 months x	=	300,000
Monitoring cost of Unit for ZEIKA	1,000	x 25 zones x 6 times	=	150,000	92 zones x 10 times	=	920,000
Monitoring cost of ZEIKA for schools	200	x 6 times	250 schools* =	300,000	10 times x	5,000 schools** =	10,000,000
Sensitization workshop	1,000	x 2 days x 39 persons	1 time =	78,000			
National level training	1,000	x 5 days x 3 persons	8 provinces =	120,000			
Provincial level training	500	x 5 days x 3 persons	25 zones =	187,500	5 days x 3 persons x	67 zones =	502,500
Zonal level training	500	x 5 days x 30 persons	25 zones =	1,875,000	5 days x 10 persons x	67 zones =	1,675,000
Training for all SEIKA members	100	x 5 days x 10 persons	500 schools =	2,500,000	5 days x 5 persons x	10,000 schools =	25,000,000
Refresh training for SEIKA members	100	x 3 days x 10 persons	500 schools =	1,500,000	5 days 5 persons x	10,000 schools =	25,000,000
Project 1.2 Sub-Total				**11,410,500**			**74,097,500**
Project 1.3: Awareness Campaign and Training for Educational Kaizen Activities							
Development of promotional materials for Educational Kaizen activities	500,000	x 1 set	=	500,000			
Media campaign through TV	300,000	x 6 times	=	1,800,000	10 times	=	3,000,000
Media campaign through radio	100,000	x 12 times	=	1,200,000	10 times	=	1,000,000
Media campaign through newspaper	50,000	x 24 times	=	1,200,000	10 times	=	500,000
Leadership training	1,000	x 5 days x	250 schools* =	1,250,000	5 days x	5,000 schools** =	25,000,000
Project 1.3 Sub-Total				**5,950,000**			**29,500,000**
Project 1.4: Establishment of School Framework for Educational Kaizen Activities							
Provision of necessary facilities and equipment for SEIKA	20,000	x 1 set	=	20,000	67 sets	=	1,340,000
School based training for all relevant personnel in schools	100	x 6 times x	500 schools =	300,000	10 times x	10,000 schools =	10,000,000
Cost for Educational Kaizen activities at schools (2005-2007)	100,000	x 2.0 years x	250 schools* =	50,000,000	5 years x	5,000 schools** =	2,500,000,000
External monitoring cost	100	x 12 times x	250 schools* =	300,000	20 times x	5,000 schools** =	10,000,000
Project 1.4 Sub-Total				**50,620,000**			**2,520,000,000**
Project 1.5: Strengthening of School Information Management System							
Computer training for QE circle members	100	x 10 days x 10 Persons x	500 schools =	5,000,000	10 days x 10 persons x	10,000 schools	100,000,000
Computer training for all school staff	50	x 10 days x 10 Persons x	500 schools =	2,500,000	10 days x 10 days x	10,000 schools	50,000,000
Sensitization workshop for information management system	50	x 3 days x 3 Persons x	500 schools =	225,000	3 days x 3 days x	10,000 schools	4,500,000
Project 1.5 Sub-Total				**7,725,000**			**154,500,000**
Project 1.6: Expansion of Educational Kaizen Activities							
Sensitization workshop for school based workshop	100	x 5 persons x 2 times x	500 schools =	500,000	5 times x 5 persons x	10,000 schools =	25,000,000
School based workshop	200	x 40 persons x 2 times x	250 schools* =	4,000,000	5 times x 40 persons x	5,000 schools** =	200,000,000
Zonal level QEC convention	500	x 200 persons x 2 times x	25 zones =	5,000,000	5 times x 200 persons x	92 zones =	46,000,000
National level QEC convention	1,000	x 400 persons x 2 times x		800,000	5 times x 400 persons x	=	2,000,000
Publishing cost for presentation materials at national level QEC convention	100	x 2 times x	10,000 copies =	2,000,000	5 times x	10,000 copies =	5,000,000
Project 1.6 Sub-Total				**12,300,000**			**278,000,000**
Program 1 Total Cost				**90,605,500**			**3,062,797,500**

Note:

Unit cost for training and conferences includes not only per-diem and traveling cost for participants, but also other necessary costs such as cost for venue, printing handouts, awards for best performers, etc.

A number of schools marked by * indicates average numbers per year during the period, since the target schools increased year by year and a number of target schools become 500 by the year of 2005.

A number of schools marked by ** indicates average numbers per year during the period, since the target schools increased year by year and a number of target schools become 10,000 by the year of 2012.

Implementation Schedule for Program 1 : Strengthening of Managerial Capabilities of Schools

	2005				2006				2007				2008	2009	2010	2011	2012
	I	II	III	IV	I	II	III	IV	I	II	III	IV					
Project 1.1 Establishment of Institutional Framework for Educational Kaizen Activities																	
i) Setting-up of NEIKA for promotion of Educational Kaizen activities (2005-2007)		■															
ii) Setting-up of ZEIKA for promotion of Educational Kaizen activities (2005-2007)			■	■													
Project 1.2 Institutional Strengthening of MOE and PEA for Educational Kaizen Activities																	
i) Setting-up of Educational Kaizen Unit under Planning Division of MOE (2005-2007)		■															
ii) Train MOE and PEA officers on Educational Kaizen activities (2004-2007)			■	■													
Project 1.3 Awareness Campaign and Training for Educational Kaizen Activities																	
i) Conduct awareness campaign for Educational Kaizen activities					■	■	■	■	■	■	■	■	■	■	■	■	■
ii) Leadership training of principals and zonal directors					■		■		■		■		■	■	■	■	■
Project 1.4 Establishment of School Framework for Educational Kaizen Activities																	
i) Establishment of school development organization (SEIKA)			■										■	■	■	■	■
ii) Introduction of school based training programme for all relevant personnel in schools				■									■	■	■	■	■
iii) Formulation of school development plan (~2012)					■								■	■	■	■	■
iv) Formulation of QE circle (~2012)					■	■	■	■	■	■	■	■	■	■	■	■	■
v) Introduction of internal and external monitoring system (~2012)						■	■	■	■	■	■	■	■	■	■	■	■
Project 1.5 Strengthening of School Information Management System																	
i) Computer training for school staff						■							■	■	■	■	■
ii) Construction of data base							■						■	■	■	■	■
iii) Establishment of computerized information management system								■					■	■	■	■	■
Project 1.6 Expansion of Educational Kaizen Activities																	
i) Promotion of school based workshop							■	■	■	■	■	■	■	■	■	■	■

PROGRAM PROFILE: 2

1. Program Title
Promotion of Activity-based and Interactive Teaching and Learning
2. Overall Goal
To improve students' interests and achievements in science and mathematics through promotion of activity-based and interactive teaching and learning
3. Program Outputs with Measurable Indicators
1. Activity-based and interactive teaching and learning for science and mathematics at the school level will be improved, through a) establishment of a new unit for activity-based and interactive teaching and learning in NIE by 2005, and b) developing activity manuals for science and mathematics at all levels as resource books for activity-based and interactive teaching and learning by 2007 2. Access to the quality science and mathematics education will be improved by a) deploying the necessary number of science and mathematics ISAs, primary school teachers and science and mathematics teachers especially for rural schools by 2012 (The following are the estimated numbers for required science and mathematics ISAs and teachers) i) No. of science and mathematics ISAs: from about 500 (2002) to about 750 (2012) ii) No. of primary school teachers: from about 55,000 (2004) to about 60,000 (2012) iii) No. of science and mathematics teachers in grade 6 to 11: from about 24,000 (2004) to about 25,000 (2012) iv) No. of science and mathematics teachers in grade 12 to 13: from about 4,000 (2004) to about 4,500 (2012) b) upgrading science and mathematics teachers' competency through i) in-service training of science and mathematics ISAs and teachers on activity-based and interactive teaching and learning, ii) improved ISAs' support to science and mathematics teachers, and iii) regular performance monitoring and evaluation for science and mathematics ISAs and teachers at 500 pilot schools by 2007, and at all (9,790) government schools by 2012 3. Science and mathematics teachers' professional competence will be enhanced by a) establishing the zonal level science and mathematics teachers' societies: i) Zonal Science Teachers' Societies (for both A-Level and O-Level science teachers) ii) Zonal Mathematics Teachers' Society (for both A-Level and O-Level mathematics teachers) iii) Zonal Primary ERA and Mathematics Teachers' Society (for primary school teachers) b) organizing regular meetings and producing and distributing science and mathematics teachers' newsletters issued by the above zonal teachers' societies - No. of issues of newsletter: 828 issues (3 terms/year x 92 zones x 3 subjects) c) holding annual science and mathematics teachers' conferences at the zonal, provincial and national levels from 2005 to 2012

- No. of teachers participating the conference: 200 teachers per conference in each level

in 16 pilot zones in 2005, additional 32 zones in 2006, and remaining 44 zones in 2007 to cover all 92 zones

4. Activity-based and interactive teaching and learning for science and mathematics at the school level will be promoted, through
   1) introduction of 100-box calculation, and
   2) development of teachers' hand-made teaching materials (at least one material per school), at 500 pilot schools by 2007, and at all (9,790) government schools by 2012

5. The level of ICT literacy for all science and mathematics teachers will be improved by
   a) helping science and mathematics teachers to develop school-based teaching materials using ICT
   b) establishing Internet access for schools to increase use of web-based information and communication between schools and teachers

   at 500 pilot schools by 2007, and at all (9,790) government schools by 2012

4. Program Rationale (Need for the Program)

In spite of NEC's recommendation to promote activity-based and interactive teaching and learning in the classroom in order to make learning at school more joyful, practical and relevant to students, education in Sri Lanka (especially grade 6-13) is still dominated with lecture-type lessons and written examinations. This situation is caused by 1) lack of enough science and mathematics teachers and ISAs especially for rural schools, and 2) teachers' low competence on activity-based and interactive teaching and learning. The latter is mainly caused by a) teachers' lack of confidence to use new approaches, b) lack of practical support to teachers from their teacher colleagues and ISAs (such as demonstration lessons), c) no effective performance monitoring and evaluation system of teachers, and d) lack of suitable teaching materials for activity-based and interactive teaching and learning. It is also noted that ICT literacy among science and mathematics teachers is still very low, while many schools have received computers from the donor. To remedy these problems, Project 2.1, 2.2, 2.3, 2.4 and 2.5 are proposed to increase the number of science and mathematics teachers and to empower science and mathematics teachers with necessary skills and knowledge.

5. Projects and its Components

Project 2.1: Institutional Support for Activity-based and Interactive Teaching and Learning

i) Establishment of an NIE Unit for activity-based and interactive for the teaching and learning of science and mathematics (2005)
ii) Preparation of syllabus-based lists of Activities for science and mathematics subjects (2005)
iii) Preparation of Activity Manuals and Kits for science and mathematics subjects (2006)

Project 2.2: Training of Science and Mathematics Teachers on Activity-based and Interactive Teaching and Learning

i) Deployment of necessary number of science and mathematics ISAs including A-Level and teachers particularly for rural schools (2005-2012)
ii) In-service training of science and mathematics ISAs and teachers on activity-based and interactive teaching and learning in NIE and Teachers' Centers (2007-2012)
iii) Strengthening ISA's support to science and mathematics teachers (2008-2012)
iv) Monitoring and evaluating teaching performance of science and mathematics ISAs and teachers (2008-2012)

Project 2.3: Enhancement of Professionalism of Science and Mathematics Teachers

i) Establishment of zonal science and mathematics teachers' societies (2005-2007)
ii) Organization of meetings, newsletters of the teachers' Societies (2005-2012)
iii) Organization of annual zonal science and mathematics teachers' conferences (2006-2012)

Project 2.4: School-based Promotion of Activity-based and Interactive Teaching and Learning

i) Strengthening basic calculation skills through 100-box calculation (2005-2007)
ii) Strengthening activity-based and interactive teaching and learning in science and mathematics through model experiments (2005-2007)
iii) Development of teachers' hand-made teaching materials (2008-2012)

Project 2.5: Promotion of ICT in Science and Mathematics Education

(Institutional and Organizational Support)

i) Strengthening the capacity for ICT training and maintenance using the Computer Resource Centers (CRCs) (2005-2007)
ii) Strengthening of digital communication capacity (2008-2012)

(School-based Activities)

iii) Strengthening of computer literacy and increasing production of teaching materials (2005-2007)
iv) Enhancement of joint project work with neighboring schools using ICT (2005-2012)

6. Target Areas & Beneficiaries

Science and mathematics teachers and students in 500 pilot schools, corresponding science and mathematics ISAs by 2007
Science and mathematics teachers and students in all (9,790) government schools, and all science and mathematics ISAs by 2012

7. Implementing Schedule

2005-2012 (See the attached table for the details.)

8. Executing Agencies

NIE and MOE (Central, Provincial and Zonal Offices) (CRCs for Project 2.4)

9. Estimated Cost (in Rs.)

Rs. 441.0 million for 2005-2007
Rs. 2,192.2 million for 2008-2012
(See the attached table for the details.)

10. Expected Fund Sources

MOE's own budget and donors' assistance

Cost Estimate for Program 2: Promotion of Activity-based and Interactrive Teaching and Learning

	Unit Price (Rs.)	2005-2007	No.	Total Cost (Rs.)	2008-2012	No.	Total Cost (Rs.)
Project 2.1: Institutional Support for Activity-based and Interactive Teaching and Learning							
Provision of necessary facilities and equipment for NIE's new unit activity-based and interactive teaching and learning for science and mathematics	5,000,000			5,000,000			
Printing of Hands-on Activity Manuals for 8 subjects (50 pages per subject, color)	250	x 8 kinds x	5,000 copies =	10,000,000	8 kinds x	100,000 copies =	200,000,000
Production of Hands-on Activity Kits for 8 subjects	2,500	x 8 kinds x	500 kits =	10,000,000	8 kinds x	10,000 kits =	200,000,000
Project 2.1 Sub-Total				**25,000,000**			**400,000,000**
Project 2.2: Training Science and Mathematics Teachers in Activity-based and Interactive Teaching and Learning							
Mass media campaign to attract more teachers to rural schools (Poster)	100	x 2 kinds x	100,000 copies =	20,000,000			
Mass media campaign to attract more teachers to rural schools (Banner)	500	x 4 kinds x	10,000 copies =	20,000,000			
Mass media campaign to attract more teachers to rural schools (TV)	300,000	x 1 kind x	90 times =	27,000,000			
Mass media campaign to attract more teachers to rural schools (Radio)	100,000	x 2 kinds x	90 times =	18,000,000			
Mass media campaign to attract more teachers to rural schools (Movie)	10,000,000		=	10,000,000			
Recruitment of 250 new science and mathematics ISAs (salary*)	8,000	x 36 months x	250 persons =	(72,000,000)	60 months x	250 persons =	(120,000,000)
Recruitment of 6,500 new primary school teachers and science and mathematics teachers (Grade 1-5: 5,000; Grade 6-11: 1,000; Grade 12-13: 500) (salary*)	5,000	x 36 months x	6,500 persons =	(1,170,000,000)	60 months x	6,500 persons =	(1,950,000,000)
In-service training of ISAs in NIE (5 days/course, 20 courses/year, 30 participants/course)**	1,000	x 5 days x 60 times x	30 persons =	9,000,000	5 days x 100 times x	30 persons =	15,000,000
Project 2.2 Sub-Total				**104,000,000**			**15,000,000**
Project 2.3: Enhancement of Professionalism of Science and Mathematics Teachers							
Production and distribution of Science and Mathematics Teachers Newsletters (3 societies, 3 times/year, A4 size, 16 pages/issue, black and white)	20	x 27 times x 92 zones x	1,000 copies =	49,680,000	45 times x 92 zones x	1,000 copies =	82,800,000
Annual science and mathematics teachers conference at the zonal level (1 day/year)**	500	x 2 day-times x 92 zones x	200 persons =	18,400,000	5 day-times x 92 zones x	200 persons =	46,000,000
Annual science and mathematics teachers conference at the provincial level (2 days/year)**	500				10 day-times x 8 provinces x	200 persons =	8,000,000
Annual science and mathematics teachers conferences at the national level (2 days/year)**	1,000				10 day-times x	200 persons =	2,000,000
Project 2.3 Sub-Total				**68,080,000**			**138,800,000**
Project 2.4: School-based Promotion of Activity-based and Interactive Teaching and Learning							
Printing of 100-box calculation booklet (B5 size, 20 pages per subject, black & white)	20	x 1 kind x	5,000 copies =	100,000	1 kind x	100,000 copies =	2,000,000
Copying of 100-box calculation video program	100	x 1 kind x	500 copies =	50,000	1 kind x	10,000 copies =	1,000,000
Printing of model experiment booklets for 4 subjects (B5 size, 50 pages per subject, color)	250	x 4 kinds x	5,000 copies =	5,000,000	4 kinds x	100,000 copies =	100,000,000
Project 2.4 Sub-Total				**5,150,000**			**103,000,000**
Project 2.5: Promotion of ICT in Science and Mathematics Education							
Purchase of equipment for 73 CRCs							
- computers (including UPS units)	100,000	x	730 units =	73,000,000			
- LAN servers	500,000	x	73 units =	36,500,000			
- LAN servers software	300,000	x	73 units =	21,900,000			
- network printers	50,000	x	73 units =	3,650,000			
- scanners	30,000	x	73 units =	2,190,000			
Internet access to schools***	50,000				x 4 years x	7,000 schools =	1,400,000,000
Annual training of ICT teachers in the CRCs (2 times/year, 100 teachers/CRC)**	1,000	x 6 times x 73 zones x	100 persons =	43,800,000	8 times x 73 zones x	100 persons =	58,400,000
Annual on-site training of teachers in schools**	1,000	x 150 day-times x 73 zones x	5 persons =	54,750,000	200 day-times x 73 zones x	5 persons =	73,000,000
Zonal annual competition of performance in using ICT in science and mathematics (1 day/year)**	500	x 3 day-times x	2,000 persons =	3,000,000	4 day-times x	2,000 persons =	4,000,000
Project 2.5 Sub-Total				**238,790,000**			**1,535,400,000**
Program 2 Total Cost				**441,020,000**			**2,192,200,000**

Note: * Salaries for additional science and mathematics ISAs and teachers are calculated here, but not included in the sub-total and total, because they should be covered by MOE's recurrent budget.
** Unit cost for training and conferences includes not only per-diem and travelling cost for participants, but also other necessary costs such as cost for venue, printing handouts, awards for best performers, etc.
*** Cost for Internet access to schools may decline dramatically in future due to technological development, so the cost for internet connection is to be estimated accurately later.

Implementation Schedule for Program 2: Promoting Activity-based and Interactrive Teaching and Learning

Project/Components	2005				2006				2007				2008	2009	2010	2011	2012
	I	II	III	IV	I	II	III	IV	I	II	III	IV					
Project 2.1: Institutional Support for Activity-based and Interactive Teaching and Learning																	
i) Establishment of an NIE Unit for activity-based and interactive for the teaching and learning of science and mathematics (2005)																	
ii) Preparation of syllabus-based lists of Activities for science and mathematics subjects (2005)																	
iii) Preparation of Activity Manuals and Kits for science and mathematics subjects (2006)																	
Project 2.2: Training Science and Mathematics Teachers in Activity-based and Interactive Teaching and Learning																	
i) Deployment of necessary number of science and mathematics ISAs and teachers particularly for rural schools (2005-2012)																	
ii) In-service training of science and mathematics ISAs and teachers on activity-based and interactive teaching and learning in NIE and Teachers' Centers (2007-2012)																	
iii) Strengthening ISA's support to science and mathematics teachers (2008-2012)																	
iv) Monitoring and evaluating teaching performance of science and mathematics ISAs and teachers (2008-2012)																	
Project 2.3: Enhancement of Professionalism of Science and Mathematics Teachers																	
i) Establishment of zonal science and mathematics teachers' societies (2005-2007)																	
ii) Organization of meetings, newsletters of the teachers' Societies (2005-2012)																	
iii) Organization of annual zonal science and mathematics teachers' conferences (2006-2012)																	
Project 2.4: School-based Promotion of Activity-based and Interactive Teaching and Learning																	
i) Strengthening basic calculation skills through 100-box calculation (2005-2007)																	
ii) Strengthening activity-based and interactive teaching and learning in science and mathematics through model experiments (2005-2007)																	
iii) Development of teachers' hand-made teaching materials (2008-2012)																	
Project 2.5: Promotion of ICT in Science and Mathematics Education																	
i) Strengthening the capacity for ICT training and maintenance using the Computer Resource Centers (CRCs) (2005-2007)																	
ii) Strengthening of digital communication capacity (2008-2012)																	
iii) Strengthening of computer literacy and increasing production of teaching materials (2005-2007)																	
iv) Enhancement of joint project work with neighboring schools using ICT (2005-2012)																	

PROGRAM PROFILE: 3

1. Program Title
Upgrading of Science and Mathematics Curriculum Focusing on Syllabus and Teachers' Guides
2. Overall Goals
2. To produce improved, relevant, competency-based curricula to motivate students to enjoy science and mathematics and to improve their performance. 3. To reduce the number of topics in each curriculum to allow time for deeper understanding of concepts and to complete required SBA activities.
3. Program Outputs with Measurable Indicators
Project 3.1 Upgrading of Science Curriculum (Primary ERA, Junior Secondary, O-Level and A-Level) a) Primary ERA (grades 1-5) - Upgraded primary environmental related activities (ERA) curriculum (2005) - Upgraded syllabuses and teachers guides for ERA (grades 1-5) (2005) - Trained primary ISAs (2005) - Trained selected ERA teachers (2006) - Trained general ERA teachers (2006-2010) - Implemented upgraded ERA curriculum (2007-2011) b) junior secondary and O-Level Science and Technology - Upgraded '*science and technology*' curriculum (2005) - Upgraded syllabus and teachers guides for '*science and technology*' (grades 6-11) (2005) - Trained '*science and technology*' ISAs (2005) - Trained selected '*science and technology*' teachers (2006) - Trained selected '*science and technology*' teachers (2006-2011) - Implemented upgraded '*science and technology*' curriculum (2007-2012) c) A-Level Biology - Upgraded A-Level *biology* curriculum (2006) - Upgraded syllabus, teachers guides for *biology* (grades 12,13) (2006) - Trained *biology* master teachers at NIE (2006) - Trained selected *biology* teachers (2007) - Trained general *biology* teachers (2007-2008) - Implemented upgraded A-Level *biology* curriculum (2008-2009) d) A-Level Chemistry - Upgraded A-Level *chemistry* curriculum (2006) - Upgraded syllabus, teachers guides for *chemistry* (grades 12,13) (2006) - Trained *chemistry* master teachers (2006) - Trained selected *chemistry* teachers (2007) - Trained general *chemistry* teachers (2007-2008) - Implemented upgraded A-Level *chemistry* curriculum (2008-2009) e) A-Level Physics - Upgraded A-Level *physics* curriculum (2006) - Upgraded syllabus, teachers guides for *physics* (grades 12-13) (2006)

- Trained *physics* master teachers (2006)
- Trained selected *physics* teachers (2007)
- Trained general *physics* teachers (2007-2008)
- Implemented upgraded A-Level *physics* curriculum (2008-2009)

Project 3.2 Upgrading of Mathematics Curriculum (Junior Secondary, O-Level and A-Level)

a) Junior secondary and O-Level Mathematics
- Upgraded maths curriculum (2005)
- Upgraded syllabus and teachers guides for maths (grades 6-11)(2005)
- Trained maths ISAs at (2005)
- Trained selected maths teachers (2006)
- Trained general maths teachers (2006-2011)
- Implemented upgraded maths curriculum (2007-2012)

b) A-Level Combined Mathematics
- Upgraded A-Level *'combined mathematics'* curriculum (2006)
- Upgraded syllabus and teachers guides for *'combined mathematics'* (grades 12-13) (2006)
- Trained '*combined mathematics'* master teachers (2006)
- Trained selected *'combined mathematics'* teachers (2007)
- Trained general *'combined mathematics'* teachers (2007-2008)
- Implemented upgraded A-Level '*combined mathematics'* curriculum (2008-2009)

Note: MOE has decided that the existing primary mathematics curriculum is to remain unchanged and be taught for another cycle.

Note: grade 6 subject *'environmental studies'* will be assumed as grade 6 *'science and technology'* for purposes of this document.

Note: NEC Report 2003 has two recommendations relevant to this Upgraded Curriculum Program.
These are:
(i) A new O-Level subject 'science' to replace '*science and technology*'
(ii) A common curriculum for grades 6-11
Both these recommendations are still under discussion and if approved will require substantial revision of the existing '*science and technology*' curriculum and changes to the grade 6 syllabuses

4. Program Rationale (Need for the Program)

Pass rates in O-Level *'science and technology'* and *mathematics*, A-Level physical sciences and *'combined mathematics'* are low and one of the contributing factors is the curriculum. There are too many topics in most of the syllabuses and many teachers struggle to complete the syllabus that they are teaching. They teach only what they think will be in the written GCE A-Level and GCE O-Level examinations. They also neglect practicals and other activities that go to make up the SBA component of the examinations. For ERA, the present curriculum requires more structure and amplification for teachers.

The curriculum at O-Level and A-Level has reached the end of its present cycle and a review and upgrading is required for these reasons:

- The low pass rates in all science subjects except A-Level *biology*
- The low pass rates in both mathematics subjects
- The need to have vertical integration of science and mathematics (grades 1-13)
- The need to build a bridge between the O-Level and A-Level curricula
- The overcrowding of the present curriculum
- Scientific and mathematical knowledge is changing at a rapid rate
- ICT applications need to be included
- Activity-based interactive teaching and learning has to be implemented at secondary level
- A range of practicals, projects, assignments have to be prepared for effective implementation of SBA

5. Projects and the Components

Project 3.1: Upgrading of Science Curriculum (Primary, Junior Secondary, O-Level and A-Level)

1) Primary ERA

Component 1 – Preparation of Curriculum, Syllabuses, Teachers' Guides
Component 2 – In-service Teacher Training
Component 3 – Implementation of Curriculum

2) Junior Secondary and O-Level Science and Technology

Component 1 – Preparation of Curriculum, Syllabuses, Teachers Guides
Component 2 – In-service Teacher Training
Component 3 – Implementation of Curriculum

3) A-Level Science

The components outlined below are the same for each subject *biology*, *chemistry*, *physics*

Component 1 – Preparation of Curriculum, Syllabuses, Teachers Guides
Component 2 – In-service Teacher Training
Component 3 – Implementation of Curriculum

Project 3.2: Upgrading Mathematics Curriculum (Junior Secondary, O-Level and A-Level)

1) Junior secondary and O-Level Mathematics

Component 1 – Preparation of Curriculum, Syllabuses, Teachers Guides
Component 2 – In-service Teacher Training
Component 3 – Implementation of Curriculum

2) A-Level Combined Mathematics

Component 1 – Preparation of Curriculum, Syllabuses, Teachers Guides
Component 2 – In-service Teacher Training
Component 3 – Implementation of Curriculum

6. Target Areas & Beneficiaries

All science and mathematics teachers, ISAs and master teachers, and all primary and secondary students

7. Implementing Schedule

See the attached table.

8. Executing Agencies
MOE (Central, Provincial and Zonal Offices) with NIE (for ISA, master teacher training)
9. Estimated Cost (in Rs.)
Rs. 54.7 million for 2005-2007 Rs. 11.0 million for 2008-2012 (See the attached table for the details.)
10. Expected Fund Sources
MOE's own budget and donors' assistance

Cost Estimate for Program 3: Upgrading of Science and Mathematics Curriculum Focusing on Syllabus and Teachers' Guides

	Unit Price (Rs.)	2005-2007						Unit Price (Rs.)	2008-2012				
					No.		Total Cost (Rs.)					No.	Total Cost (Rs.)
Project 3.1: Upgrading Science Curriculum (Primary ERA, O-Level and A-Level)													
Primary ERA (grades 1-5)													
In-service training of Primary ISAs in ERA at NIE	1,000	x	5 days	x	184 persons	=	920,000						
In-service training of selected primary teachers in ERA at teachers centres	500	x	5 days	x	920 persons	=	2,300,000						
In-service training of general primary teachers in ERA at schools/teachers centres	500	x	5 days	x	1,840		4,600,000	500	x	20 days	x	184 persons	1,840,000
Junior Secondary and O-Level Science and Technology (grades 6-11)													
In-service training of science and technology ISAs at NIE	1,000	x	5 days	x	184 persons	=	920,000						
In-service training of selected science and technology teachers in ERA at schools/teachers centres	500	x	5 days	x	920 persons		2,300,000						
In-service training of general science and technology teachers at schools/teachers centres	500	x	5 days	x	1,840 persons		4,600,000	500	x	20 days	x	184 persons	1,840,000
A-Level Biology (grades 12-13)													
In-service training of biology master teachers at NIE	1,000	x	5 days	x	184 persons		920,000						
In-service training of selected biology teachers at teachers centres	500	x	5 days	x	920 persons		2,300,000						
In-service training of general biology teachers at schools/teachers centres	500	x	5 days	x	1,840 persons		4,600,000	500	x	20 days	x	184 persons	1,840,000
A-Level Chemistry (grades 12-13)													
In-service training of chemistry master teachers at NIE	1,000	x	5 days	x	184 persons		920,000						
In-service training of selected chemistry teachers at teachers centres	500	x	5 days	x	920 persons		2,300,000						
In-service training of general chemistry teachers at schools/teachers centres	500	x	5 days	x	1,840 persons		4,600,000	500	x	20 days	x	184 persons	1,840,000
A-Level Physics (grades 12-13)													
In-service training of physics master teachers at NIE	1,000	x	5 days	x	184 persons	=	920,000						
In-service training of selected physics teachers at teachers centres	500	x	5 days	x	920 persons	=	2,300,000						
In-service training of general physics teachers at schools/teachers centres	500	x	5 days	x	1,840 persons		4,600,000	500	x	20 days	x	184 persons	1,840,000
Project 3.1 Sub-Total							**39,100,000**						**9,200,000**
Project 3.2: Upgrading Mathematics Curriculum (O-Level and A-Level)													
Junior Secondary and O-Level Mathematics (grades 6-11)													
In-service training of mathematics ISAs at NIE	1,000	x	5 days	x	184 persons	=	920,000						
In-service training of selected mathematics teachers at teachers centres	500	x	5 days	x	920 persons	=	2,300,000						
In-service training of general mathematics teachers at schools/teachers centres	500	x	5 days	x	1,840 persons		4,600,000	500	x	20 days	x	184 persons	1,840,000
A-Level Combined Mathematics (grades 12-13)													
In-service training of combined mathematics master teachers at NIE	1,000	x	5 days	x	184 persons	=	920,000						
In-service training of selected combined mathematics teachers at teachers centres	500	x	5 days	x	920 persons	=	2,300,000						
In-service training of general combined mathematics teachers at schools/teachers centres	500	x	5 days	x	1,840 persons		4,600,000	500	x	20 days	x	184 persons	1,840,000
Project 3.2 Sub-Total							**15,640,000**						**1,840,000**
Program 3 Total Cost							**54,740,000**						**11,040,000**

Implementation Schedule for Program 3 : Upgrading of Science and Mathematics Curriculum Focusing on Syllabus and Teachers' Guides

	2005				2006				2007				2008	2009	2010	2011	2012
	I	II	III	IV	I	II	III	IV	I	II	III	IV					
Project 3.1 Upgrading Science Curriculum (Primary ERA, O-Level and A-Level)																	
i) Primary ERA Curriculum (grades 1-5)																	
1. Upgraded primary ERA curriculum	■																
2. Upgraded syllabuses and teachers guides		■	■														
3. Trained ERA ISAs				■													
4. Trained selected ERA teachers					■	■											
5. Trained general ERA teachers							■	■									
6. Implemented upgraded ERA curriculum									■	■	■	■	■	■	■	■	
ii) Junior Secondary and O-Level Science and Technology Curriculum (grades 6-11)																	
1. Upgraded science and technology curriculum	■																
2. Upgraded syllabuses and teachers guides		■	■														
3. Trained science and technology ISAs				■													
4. Trained selected science and technology teachers					■	■											
5. Trained general science and technology teachers							■	■									
6. Implemented upgraded science and technology curriculum									■	■	■	■	■	■	■	■	■
iii) A-Level Biology, Chemistry, Physics (grades 12-13)																	
1. Upgraded curricula					■												
2. Upgraded syllabuses and teachers guides						■	■										
3. Trained master teachers								■									
4. Trained selected teachers									■	■							
5. Trained general teachers											■	■					
6. Implemented upgraded curriculum													■	■			
Project 3.2 Upgrading Mathematics Curriculum (O-Level and A-Level)																	
i) O-Level Mathematics Curriculum (grades 6-11)																	
1. Upgraded mathematics curriculum	■																
2. Upgraded syllabuses and teachers guides		■	■														
3. Trained mathematics ISAs				■													
4. Trained selected mathematics teachers					■	■											
5. Trained general mathematics teachers							■	■									
6. Implemented upgraded mathematics curriculum									■	■	■	■	■	■	■	■	■
ii) A-Level Combined Mathematics Curriculum (grades12-13)																	
1. Upgraded combined maths curriculum					■												
2. Upgraded syllabuses and teachers guides						■	■										
3. Trained combined maths master teachers								■									
4. Trained selected combined maths teachers									■	■							
5. Trained general combined maths teachers											■	■					
6. Implemented upgraded combined maths curriculum													■	■			

PROGRAM PROFILE: 4

1. Program Title
Overall Promotion of Science and Mathematics Education
2. Overall Goal
To awaken public interest as well as to interest and enthuse primary and secondary school students in *mathematics*, and '*science and technology'*.
3. Program Outputs with Measurable Indicators
(1) To establish National Science Education Center a) Complete construction work of the National Science Education Center (2010) b) Number of school visitors (e.g. all student in grade 8 and 10) approx. 600,000 students (2012) c) Number of family visitors approx. 300,000 (2012) (2) To produce and distribute mathematics and science journals a) Number of issues of journal for mathematics: 2 issues per year, 12,000 copies per country b) Number of issues of journal for science: 2 issues per year, 12,000 copies per country (3) To produce and distribute a mathematics and science directory a) Number of institutions, organization related to mathematics and science listed in the directory: 1,000 (including website address) (2007) b) Number of mathematics and science directory distributed: 10,000 (schools, zonal offices, provincial offices) (2007) (4) To produce and distribute awareness materials for community for schools and educational offices a) Number of different kinds of awareness materials, 20 (e.g. Video-6, Brochures-6, Newspaper-8) (2007) b) National coverage of awareness material: 40% in average (2007) (5) To establish a permanent system to organize mathematics competition and science project competition annually a) Number of participants in national Mathematics Competition, 100,000 (2007) b) Number of participants in national Science Project Competition, 100,000 (2007)
4. Program Rationale (Need for the Program)
In Sri Lanka, Science and mathematics have been recognized as important school subjects in A-Level and O-Level program for those who hope to enter higher education (universities) and are dreaming of a future successful life. However, awareness of science and mathematics in the real world is very limited since school education has been very much examination oriented. Teachers are not equipped with practical knowledge of the science and mathematics applied in modern technology all around us as well as the natural environment observed everyday. So students do not receive such education. And, since there is no other major source of information, many in the general public have little idea on science and technology. Therefore, in order to enhance interest in and understanding of science and mathematics

apart from knowledge and skills required for examinations, the program will implement four projects to raise standard of science literacy and numeracy of the nation.

5. Projects and the Components

Awakening Public Interest in Science and Mathematics

Project 4.1: Establishment of National Science Education Center (2007-2012)

i) Establishment of National Science Education Center
   a) Establishment of a Steering Committee in MOE to develop a plan for the establishment of the National Science Education Center (2007)
   b) Preparation of basic design of the Center (2008)
   c) Fund arrangements with donor agencies and acquiring land for the Center (2007-2008)
   d) Construction of building, facilities, and installation of equipment (2008-2009)
   e) Establishment of operation and maintenance system inviting private companies (2010)
   f) Official commencement of operation (2010)

ii) Issue of Science and Mathematics Journals (2005-2007)
   a) Establishment a sub-committee under a Steering Committee to prepare the journals. The committee will also discuss the system of publication and distribution, contents, etc. (2005)
   b) An editorial group will be established under the committee to produce journals (2005)
   c) The first issues of the journals will be released in January 2006, and thereafter issued semiannually.
   d) Arrangement will be made for continuous issue of the journals through Government support and private sector contribution (2006-2007)

iii) Production and Distribution of Science and Mathematics Directory
   a) Design of format and gathering of information for the Mathematics and Science Directory. User-friendly directory needs to be designed so that school students can make use of them. (2005)
   b) Organizing a workshop for launching of the Directory to disseminate its purpose (2006)
   c) Production of the Directory and distribution to schools and educational offices (2006)

Project 4.2: Promotion of Awareness for Science and Mathematics Education (2005-2007)

i) Production and distribution of awareness materials
   a) Establishment a taskforce group in MOE (2005)
   b) The taskforce group will identify media (e.g. brochure, video material, etc.), contents, distribution plans (2005)
   c) The taskforce group will design the materials (2005-2006)
   d) Production and distribution materials to community through schools (2006-2007)

ii) International assessment of national education

Project 4.3: Promotion of Science Project Competition and Mathematics Competition (2005-2007)

i) Science Project Competition

a) Establishment a committee under MOE to organize competitions (2005)
b) Pilot the science project competition in selected zones, 2 zones per province (2005)
c) Nation-wide implementation of science project competition up to Provincial final (2006)
d) Nation-wide implementation of science project competition up to National final (2007)

ii) Mathematics Competition

a) Establishment a committee under MOE to organize competitions (2005)
b) Pilot mathematics competitions in selected zones, 2 zones per province (2005)
c) Nation-wide implementation of mathematics competition up to Provincial final (2006)
d) Nation-wide implementation of mathematics competition up to National final (2007)
e) Sending the winning students to an international mathematics competition (e.g. International Mathematics Olympiad) (2007)

6. Target Areas & Beneficiaries

All primary and secondary students, general public, primary school teachers, secondary science and mathematics teachers in Sri Lanka

7. Implementing Schedule

2005-2012

8. Executing Agencies

MOE (Central, Provincial and Zonal Offices) with NIE (for trainers)

9. Estimated Cost (in Rs.)

Rs. 132.6 million for 2005-2007
Rs. 1,000 million for 2008-2012
(See the attached table for the details.)

10. Expected Fund Sources

MOE, FC (Provincial budget), International donor agency

Cost Estimate for Program 4: Overall Promotion of Science and Mathemtaics Education

	Unit Price (Rs.)	2005-2007			2008-2012		
			No.	Total Cost (Rs.)		No.	Total Cost (Rs.)
Project 4.1: Establishment of National Science Education Center (2005-2012)							
Basic design of National Science Education Center	50,000,000	x 1 set	=	50,000,000			
Construction of National Science Education Center (2008-2010)	1,000,000,000				1 set	=	1,000,000,000
Production of science and mathematics journals **	100	x 2 kinds x 4 isuues x	12,000 copies =	9,600,000			
Science and Mathematics Directory	200	x 1 kinds x	10,000 copies =	2,000,000			
Workshop for launch of Science and Mathematics Directory *	1,000	x 1 day x 92 zones x	100 teachers =	9,200,000			
Project 4.1 Sub-Total				**70,800,000**			**1,000,000,000**
Project 4.2: Promotion of Awareness for Science and Mathematics (2005-2007)							
Production of brouchure	20	x 6 kinds x	100,000 copies =	12,000,000			
Production of video material	200,000	x 6 kinds	=	1,200,000			
Reproduction of video material	100	x 6 kinds x	10,000 schools =	6,000,000			
Training workshop for awareness campaign *	1,000	x 1 day x 92 zones x	100 teachers =	9,200,000			
Participation in international assessment program	1,000,000	x 1 time		1,000,000			
Project 4.2 Sub-Total				**29,400,000**			**0**
Project 4.3: Promotion Science Project Competition and Mathematics Competition (2005-2007)							
Training of zonal officers and and science teachers * (2005)	1,000	x 1 day x 16 zones x	150 persons =	2,400,000			
Training of zonal officers and and science teachers * (2006)	1,000	x 1 day x 92 zones x	150 persons =	13,800,000			
Training of zonal officers and and mathematics teachers * (2005)	1,000	x 1 day x 16 zones x	150 persons =	2,400,000			
Training of zonal officers and and mathematics teachers * (2006)	1,000	x 1 day x 92 zones x	150 persons =	13,800,000			
Project 4.3 Sub-Total				**32,400,000**			**0**
Program 4 Total Cost				**132,600,000**			**1,000,000,000**

Note: * Unit cost for training and conferences includes not only per-diem and travelling cost for participants, but also other necessary costs such as cost for venue, printing handouts, awards for best performers, etc.
Note: ** After establishment of self-financing system by 2007, journals will be produced and distributed by own financing.

Implementation Schedule for Program 4: Overall Promotion of Science and Mathemtaics Education

Project/Components	2005				2006				2007				2008	2009	2010	2011	2012
	I	II	III	IV	I	II	III	IV	I	II	III	IV					
Project 4.1: Establishment of National Science Education Center (2005-2012)																	
i) National Science Education Centter																	
1. Preparation of development plan of national science education center (2005 - 2006)		■	■	■	■												
2. Preparation of basic design (2006)					■	■	■	■									
3. Secure of land and fund arrangement (2006-2007)							■	■	■	■	■	■					
4. Construction of building, facilities, and installation of equipment (2008-2010)													■	■	■		
5. Establishment of Operation and Maintenance System (2010)															■		
6. Commencement of Operation (2010-2012)															■	■	■
ii) Issue of Science and Mathematics Journals (2005-2007)																	
1. Preparation of plan of Science Journals and Mathematics Journals (2006)					■	■	■	■									
2. Production and distribution of Science Journals and Mathematics Journals (2006 - 2012)							■	■	■	■	■	■	■	■	■	■	■
iii) Issue of Science and Mathematics Directory (2005-2007)																	
1. Preparation of plan of Science Journals and Mathematics Directory (2006)							■	■									
2. Production and distribution of Science and Mathematics Directory (2007 - 2012)									■	■	■	■	■	■	■	■	■
Project 4.2 : Promotion of Awareness for Science and Mathematics Education																	
i) Production and Distribution of Awareness Materials																	
1. Preparation of plan by taskforce group (2005)			■	■													
2. Fund arrangement and preparation of materials (2006)					■	■	■	■									
3. Production of awareness materials and distribution to community (2006-2007)							■	■	■	■							
4. Monitoring and assessment (2007)									■	■	■	■					
ii) International Assessment of National Education																	
1. Preparation for participating International Assessment of education (2005-2006)			■	■	■	■											
2. Necessary actions to be taken in colabolation with an international organization. (2006-2007)							■	■	■	■	■	■					
Project 4.3: Promotion of Science Project Competition and Mathematics Competition (2005-2007)																	
i) Science Project Competition																	
1. Pilot implementation in 16 zones (2005)	■	■	■	■													
2. Nation-wide implementation of science project competition up to provincial final (2006)					■	■	■	■									
3. Nation-wide implementation of science project competition up to national final (2007)									■	■	■	■					
ii) Mathematics Competition																	
1. Pilot implementation of mathematics competition in 16 zones (2005)	■	■	■	■													
2. Nation-wide implementation of mathematics competition up to provincial final (2006)					■	■	■	■									
3. Nation-wide implementation of mathematics competition up to national final (2007)									■	■	■	■					

PROGRAM PROFILE: 5

1. Program Title
Improvement of School Infrastructure and Facilities
2. Overall Goal
To ensure that all students equally have access to the basic minimum infrastructure and school facilities as a base for science and mathematics. To encourage community participation for school facility development.
3. Program Outputs with Measurable Indicators
1. To promote community participation among selected schools by 2007 a) No. of schools to be involved, 3,700 schools 2. To improve minimum infrastructure and facilities for Type 2 and Type 3 school by 2012 a) No. of Type 2 and Type 3 schools for improvement plan, 3,700 schools 3. To improve 1AB and Type 1C schools for science and mathematics by 2012 a) No. of Type 1AB schools for improvement plan, 400 schools b) No. of Type 1C schools for improvement plan, 1,100 schools
4. Program Rationale (Need for the Program)
Sri Lanka has attained high enrollment rate and literacy rate. However, equity in access to quality education has not yet attained, i.e. 1) Type 2 and Type 3 schools have limited basic infrastructure and facilities so that students cannot receive quality education, 2) some Type 1AB and Type 1C schools are not equipped with appropriate facilities for science education.
5. Projects and the Components
Project 5.1: Improvement of Minimum Infrastructure and Facilities of Type 2 and Type 3 Schools (2005-2012) i) National and Provincial improvement plan for minimum infrastructure a) Review of JICA Study for Implementation of minimum infrastructure under SIRUP II (2005 - 2006) b) Preparation of succeeding improvement plan (2005-2007) c) Fund arrangement for the short term plan (2006) d) Implementation of short term (2006 –2007) e) Preparation of long term plan for 2008-2012, arrangement for the required fund and implementation of the plan. (2008 – 2012) ii) Promotion of community participation in facility development (2005-2012) a) Organize at each of the objective school for the Project and form a QE circle for facility development (2005) b) Organize training workshop for SEIKA members and the QE circle for facility development by Zonal Offices (2005) c) Promote community participation and supervise construction works by the QE circles (2005) **Project 5.2: Improvement of Type 1AB and Type 1C Schools for Science and Mathematics Education** (2005-2012) a) Review of the ongoing projects for upgrading plan of Type 1C to Type 1AB schools for improvement and clarification of standard for the improvement. b) Preparation of a list and upgrading plan of Type 1AB schools for improvement

and Type 1C under the initiative of the initiative of the Department of School Supplies Services, and Works in MOE (2005) c) Fund arrangement for short term improvement (2006) d) Implementation of works for short term improvement (2006 –2007) e) Review and finalize long term plan for improvement and arrange fund for the works. f) Implement works for long term improvement (2008-2012)
6. Target Areas & Beneficiaries
All primary and secondary students, school teachers.
7. Implementing Schedule
2005-2012
8. Executing Agencies
MOE (Central, Provincial and Zonal Offices), Financial Commission
9. Estimated Cost (in Rs.)
Rs. 4.315 million for 2005-2007 Rs. 8,549 million for 2008-2012 (See the attached table for the details.)
10. Expected Fund Sources
Government budget and International donor agency (Loan scheme)

Cost Estimate for Program 5: Improvement of School Infrastructure and Facilities

	Unit Price (Rs.)	2005-2007			2008-2012		
			No.	Total Cost (Rs.)		No.	Total Cost (Rs.)
Project 5.1: Improvement of Minimum Infrastructure and Facilities of Type 2 & 3 Schools (2005-2012)							
Implementation of short term plan (2006-2007)	3,500,000	x 1 x	1,000 schools	3,500,000,000			0
Implementation of long term plan (2008-2012)	2,500,000				1 x	2,700 schools =	6,750,000,000
Training on community participation in facility development*	1,000	x 5 QE circle r x 4 times x	1,000 schools =	20,000,000	5 QE circle n x 4 times x	2,700 schools =	54,000,000
Project 5.1 Sub-Total				**3,520,000,000**			**6,804,000,000**
Project 5.2: Improvement of Type 1AB & 1C Schools for Science and Mathematics Education (2005-2012)							
A-Level science laboratory of 1AB schools **	2,500,000	x 1 set of science laboratories	150 schools =	375,000,000	1	250 schools =	625,000,000
O-Level science laboratory of 1C schools	800,000	x 1 O-Level laboratory	300 schools =	240,000,000	1	800 schools =	640,000,000
Library for 1C schools	600,000	x 1 Library	300 schools =	180,000,000	1	800 schools =	480,000,000
Project 5.2 Sub-Total				**795,000,000**			**1,745,000,000**
Program 5 Total Cost				**4,315,000,000**			**8,549,000,000**

Note: * Unit cost for training and conferences includes not only per-diem and travelling cost for participants, but also other necessary costs such as cost for venue, printing handouts, awards for best performers, etc.
Note: ** A-Level laboratory consists of laboratories for 3 different subjects, namely, physics, chemistry, and biology.

Implementation Schedule for Program 5: Improvement of School Infrastructure and Facilities

Project/Components	2005				2006				2007				2008	2009	2010	2011	2012
	I	II	III	IV	I	II	III	IV	I	II	III	IV					
Project 5.1: Improvement of Minimum Infrastructure and Facilities for Type 2 & 3 Schools (2005-2012)																	
i) Review of JICA Study for Implementation of minimum infrastructure under SIRUP II (2005)	■																
ii) Preparation of succeeding improvement plan (2005)		■	■														
iii) Fund arrangement (2005)			■	■													
iv) Implementation of short term plan (2006-2007)					■	■	■	■	■	■	■	■					
v) Arrangement for the required fund and implementation of long term plan for 2008-2012, (2008-2012)													■	■	■	■	■
(1). Organize at each of the objective school for the Project and form a QE circle for facility development (2005-2012)	■				■				■				■	■	■	■	■
(2). Organize training workshop for SEIKA members and the QE circle for facility development by Zonal Offices (2005-2012)		■				■				■			■	■	■	■	■
(3). Promote community participation and supervise construction works by the QE circles. (2005-2012)			■	■			■	■			■	■	■	■	■	■	■
Project 5.2: Improvement of Type 1AB & 1C Schools for Science and Mathematics Education (2005-2012)																	
i) Review of the ongoing projects for upgrading plan of 1C to 1AB schools for improvement and clarification of standard for the improvement (2005)	■																
ii) Preparation of a list and upgrading plan of 1AB schools for improvement and 1C (2005)		■															
iii) Fund arrangement for short term improvement (2005)			■	■													
iv) Implementation of works for short term improvement (2006 –2007)					■	■	■	■	■	■	■	■					
v) Arrange fund for the works implement works for long term improvement. (2008-2012)													■	■	■	■	■

4.5 Cost, Benefit and Risks

4.5.1 Cost and Finance

The total cost for implementation of the Master Plan is estimated at Rs.19,850 million: Rs.5,035 million for 2005-2007 and Rs.14,815 million for 2008-2012. The cost for each program component is presented in Table 4.5.1.

- The major cost comes from Program 5: Improving School Infrastructure and Facilities with a share of 64.8%, followed by Program 1: Strengthening Managerial Capabilities of Schools (15.9%) and Program 2: Promoting Activity-based and Interactive Teaching and Learning (13.3%).
- The average annual cost is Rs.2,481 million for the entire program period, that is equivalent to 52.2% of the average annual capital expenditure for the general education during 1998-2002 (Rs.4,750 million). The average annual cost is Rs.1,678 million for 2005-2007 and Rs.2,963 million for 2008-2012, which is 35.3%and 62.4% of the capital budget, respectively.
- From the above and considering the economic growth of the country in the future, the cost required for the proposed programs is within the range of the government finance.

Table 4.5.1 Total Cost of the Proposed Programs

Program		Budget (million Rs.)			
		2005-2007	2008-2012	Total	Share
1	Strengthening managerial capabilities of schools	91	3,063	3,154	(15.9%)
2	Promoting activity-based and interactive teaching and learning	441	2,192	2,633	(13.3%)
3	Upgrading science and mathematics curriculum	55	11	66	(0.3%)
4	Overall promotion of science and mathematics education	133	1,000	1,133	(5.7%)
5	Improving school infrastructure and facilities	4,315	8,549	12,864	(64.8%)
Total		5,035	14,815	19,850	(100.0%)
Average annual budget (Rs. million/year)		1,678	2,963	2,481	

Source: JICA Study Team

4.5.2 Benefits

The proposed programs in the Master Plan aim directly at improving managerial capabilities, quality education in science and mathematics and basic infrastructure and facilities in the education sector. In addition to benefiting the education sector, the programs will have various socio-economic impacts on the entire nation, as summarized below:

(1) Impacts on the Education Sector

Implementation of the proposed programs is expected to have direct and indirect impacts on (i) management and planning, (ii) quality and efficiency, and (iii) access and equity in the education sector.

1) Management and Planning

Implementation of Educational Kaizen activities at schools will strengthen capabilities of management and planning in MOE, NIE, Zonal Offices and schools. Since schools prepare their development plans based on their own priorities, a mismatch of schools' needs and those supplied by MOE will be eliminated. In addition, the improvement in managerial capabilities will lead to reduction of administrative costs by introducing a school information management system.

2) Quality and Efficiency

The Pilot Project has proved that Educational Kaizen activities can change the school culture. This change will lead to challenging activity-based and interactive teaching and learning methods, that will stimulate students' interests in science and mathematics and eventually academic achievement level will be improved. Furthermore, teachers will develop teaching materials considering the real needs of their students. This will make the teaching and learning process more efficient.

Moreover, because of the provision of quality education in science and mathematics, the number of students proceeding to the science stream will increase. This fills the vacancies in the A-Level science stream.

3) Access and Equity

The Pilot Project has proved that the change in school culture made the students' attendance rate increase. In addition, the Pilot Project has also shown that parents' participation in school activities increased through Educational Kaizen activities and the costs of development, rehabilitation and maintenance decreased quite considerably. This was particularly effective in poorly equipped rural schools. Furthermore, the collaborative activities among the pilot schools observed in the Pilot Project provided opportunities for academic leveling among the schools. All this evidence indicates that Educational Kaizen activities contributed to the improvement of the equity.

Through the implementation of the above, the goal of the Master Plan will be achieved. The proposed programs will also contribute to cost reduction in the education sector, enabling efficient budget allocation and use.

(2) Impact on Socio-economy

The various impacts on the socio-economy are also expected from implementing the proposed programs.

1) Activation of community and society

The proposed programs will assist students in acquiring competencies of problem identification and problem solving through participation in Educational Kaizen activities. Active participation of parents and community in school activities will enable the schools to be a community development center. Likewise, Educational Kaizen activities will expand from the schools to students, parents, community and society. Through these, the proposed programs will stimulate people to make the society more active, efficient and dynamic.

2) Development of competency-based human resources

The proposed programs will enhance quality education in science and mathematics. This will help students learn how to apply theories and knowledge of science and mathematics to their daily life, which will provide them with capabilities of self-learning and self-improvement. The industrial sector requires these human resources, who can develop their skills to match changing technologies.

Knowledge of science and mathematics is a powerful tool not only for engineers and scientists, but for the entire society. High quality education in both subjects will enable the society to be effective and productive, which will make the country competitive in the global market.

4.5.3 Risks

Under the assumption that the present peace situation will continue and improve in future, there exist following risks to be considered in implementing the proposed programs:

- Policy change in MOE against the introduction of Educational Kaizen activities, which may come from opposition by the teachers' unions.
- Delay of the devolution process from MOE to Provincial offices, Zonal offices and schools.
- Movement against the Educational Kaizen activities, which may occur if inadequate budget use is discovered at schools due to insufficient administrative preparation prior to introduction of the proposed programs.

4.6 Action Plan and Implementation Arrangement

4.6.1 Action Plan

In the Master Plan, implementation of Educational Kaizen activities at the school level is taken as the key strategy for improving of science and mathematics education, and its expansion to all government schools in the country is proposed. In due consideration of the fact that keeping current momentum and expansion of the Educational Kaizen activities are important and indispensable for attaining the improvement of the sub-sector, the Action Plan is formulated for realizing the short-term target, namely, expansion of the Educational Kaizen activities up to 500 schools. For accomplishing this, the most urgent and high priority projects are identified and selected from 18 projects proposed in the Master Plan, which need to be implemented immediately during 2005-2007.

Projects for the Action Plan are selected using the following criteria:

- Institutional support projects which need to be implemented before other programs and projects, because they will constitute the foundation for other programs and projects. (such as organizational set-up, institutional strengthening, and training)
- School-based projects which can be implemented immediately at the school level, because it does not require big investments from outside.
- School-based projects which are a logical extension of JICA Pilot Project.
- Projects which need to be implemented together due to their interrelated nature.

Based on these criteria, the following 8 projects are selected as the proposed projects for the Action Plan:

Project 1.1:

Establishment of Institutional Framework for Educational Kaizen Activities

Project 1.2:

Institutional Strengthening of MOE and PEA for Educational Kaizen Activities

Project 1.4:

Establishment of School Framework for Educational Kaizen Activities

Project 1.5:

Strengthening of School Information Management System

Project 2.1:

Institutional Support for Activity-based and Interactive Teaching and Learning

Project 2.2:

Training of Science and Mathematics Teachers on Activity-based and Interactive Teaching and Learning

Project 2.3:

Enhancement of Professionalism of Mathematics and Science Teachers

Project 2.4:

School-based Promotion of Activity-based and Interactive Teaching and Learning

While some of the above projects cover not only 2005-2007 but also 2008-2012, only 2005-2007 components are included as the Action Plan. The relationship and order of implementation among these programs and projects are illustrated in Figure 4.6.1.

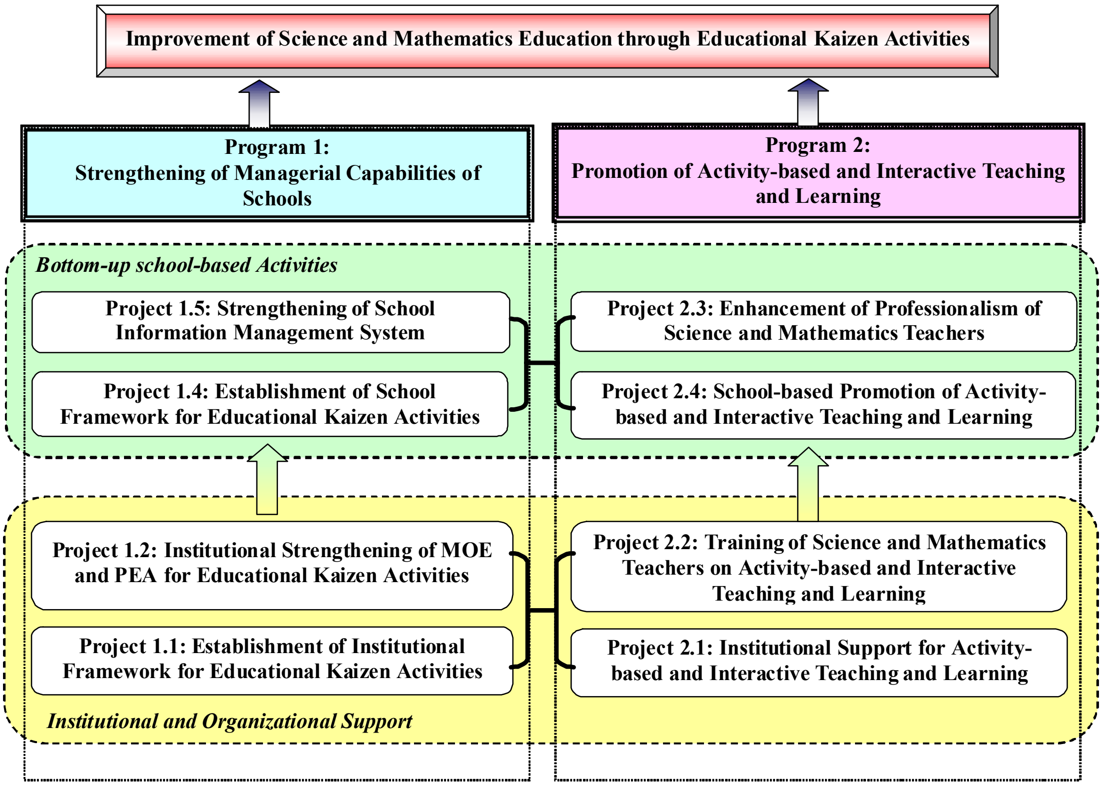


Figure 4.6.1 Programs and Projects in the Action Plan (2005-2007)

4.6.2 Implementation Organization

Implementation Organization for the Action Plan is described in Figure 4.6.2.

Key characteristic of this implementation organization is establishment of the following two new units in MOE and NIE in order to implement the Action Plan:

- MOE's Educational Kaizen Unit
- NIE's Unit for Activity-based and Interactive Teaching and Learning.

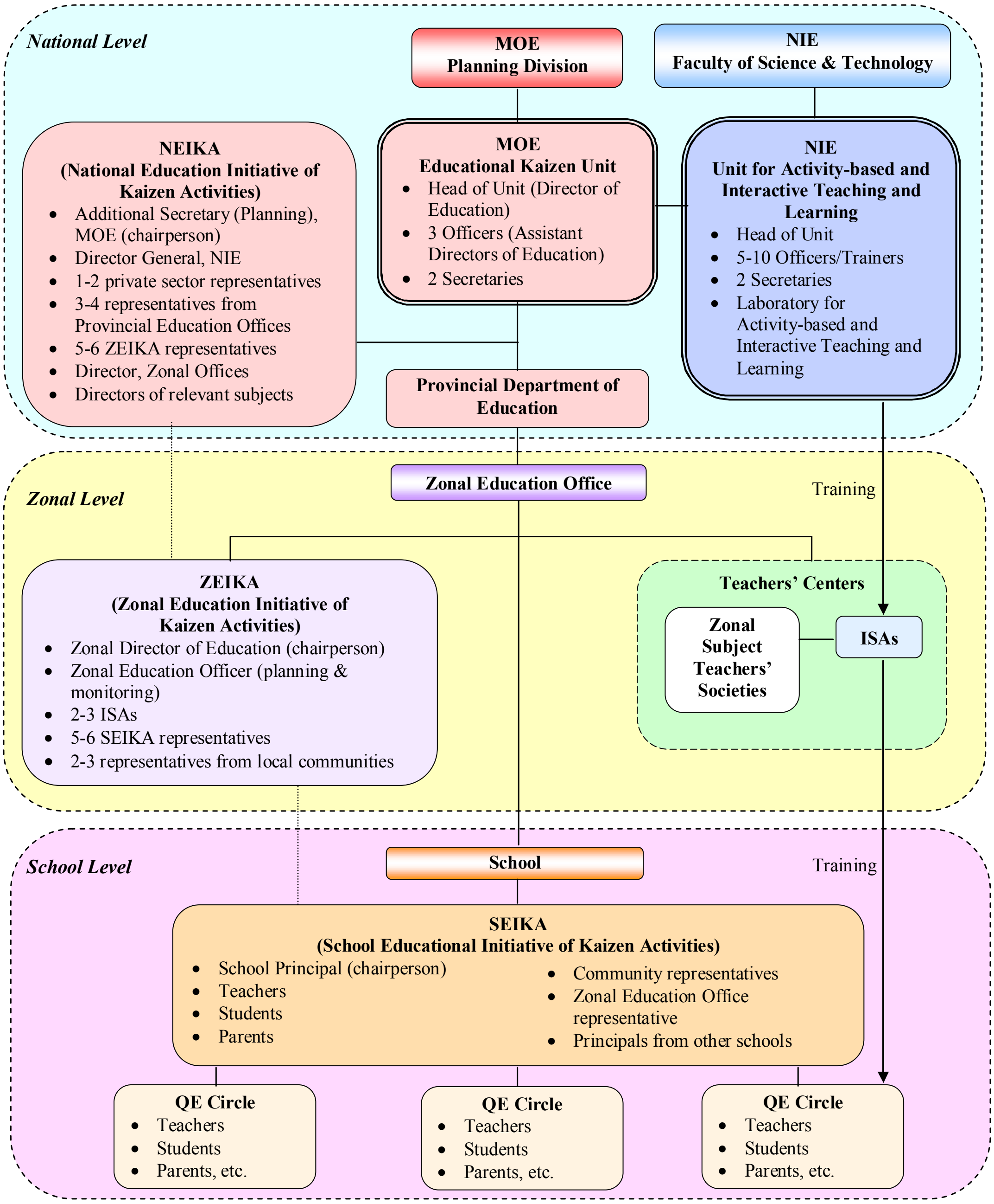


Figure 4.6.2 Implementation Organization for the Action Plan

MOE's Educational Kaizen Unit will be established under Planning Division of MOE, and will be in charge of formulation of annual implementation and financial plans of the Unit, implementation and coordination of Educational Kaizen activities at the national level, coordination with Provincial Department of Education, collaboration with NIE Unit, and supervision, monitoring and evaluation of ZEIKA through Provincial Offices. MOE will appoint necessary staff to Educational Kaizen Unit, but the following staff is recommended:

- Head of Unit (Director of Education)
- 3 Officers (Assistant Director of Education)

- 1 Assistant Staff
- 1 Secretary

NIE's Unit for Activity-based and Interactive Teaching and Learning will be established under the Faculty of Science and Technology, and will be in charge of development of teaching materials and training of ISAs and A-Level master teachers on activity-based and interactive teaching and learning. This Unit will be equipped with multimedia and necessary training. NIE will appoint necessary staff to the Unit, but the following staff is recommended:

- Head of Unit
- 5-10 Officers/Trainers
- 2 Secretaries

For promotion of Educational Kaizen activities, the following three-tiered organizations will be established:

- National Education Initiative of Kaizen Activities (NEIKA) at the national level,
- Zonal Education Initiative of Kaizen Activities (ZEIKA) at the zonal level and
- School Education Initiative of Kaizen Activities (SEIKA) at the school level.

A new NEIKA will be established after review of the current organization and function, under Additional Secretary (Planning and Performance Review) of MOE as a national level supervisory committee to formulate policy guidelines on Educational Kaizen activities, monitor the nation-wide progress of Educational Kaizen activities and provide necessary advice for MOE's Educational Kaizen Unit. Suggested members for NEIKA are:

- Additional Secretary of MOE in charge of Planning Division (as a chairperson)
- Director General of NIE
- 1-2 private sector representatives
- 3-4 representatives from Provincial Education Offices
- 5-6 ZEIKA representatives

In addition, ZEIKA will be established under the Zonal Director of Education in the pilot zones, where the Educational Kaizen activities will be conducted, as the zonal level advisory committee to monitor the zone level progress of Educational Kaizen activities and provide necessary advise for Zonal Director of Education. Suggested members for ZEIKA are:

- Zonal Director of Education (as a chairperson)

- Zonal Education Officer in charge of planning and monitoring
- 2-3 ISAs
- 5-6 SEIKA representatives
- 2-3 representatives from local communities

Unlike NEIKA and ZEIKA, SEIKA will be a decision making and executing body responsible for Educational Kaizen activities at the school level. SEIKA will be established in the pilot schools, where the Educational Kaizen activities will be conducted. It will formulate a school development plan, secure budget, and conduct internal monitoring of QE circles. SEIKA members will be appointed at a meeting of School Development Society, and consist of around 10 to 15 people, who may include:

- School Principal (as a chairperson)
- Teachers
- Students
- Parents
- Community representatives
- Zonal Education Office representative
- Principals from other schools

4.6.3 Implementation Schedule and Cost

The Action Plan is planned to be implemented during the period of 2005-2007 as shown in Table 4.6.1. The cost for each project in the Action Plan is also shown in Table 4.6.1, and the total cost for the Action Plan will be estimated at Rs.300.2 million.

Table 4.6.1 Implementation Schedule and Cost of the Action Plan

Project	Executing Agency	2005	2006	2007	Estimated Cost (Rs.million)
Project 1.1: Preparation of Institutional Framework for Educational Kaizen Activities	MOE				2.6
Project 1.2: Institutional Strengthening of MOE and PEA for Educational Kaizen Activities	MOE ZEIKA				11.7
Project 1.4: Establishment of Framework for Educational Kaizen Activities	MOE NIE Schools				75.9
Project 1.5: Strengthening of School Information Management System	Schools				7.7
Project 2.1: Institutional Support for Activity-based and Interactive Teaching and Learning	MOE NIE				25.0
Project 2.2: Training Science and Mathematics Teachers on Activity-based and Interactive Teaching and Learning	MOE NIE				104.0
Project 2.3: Enhancement of Professionalism of Mathematics and Science Teachers	MOE				68.1
Project 2.4: School-based Promotion of Activity-based and Interactive Teaching and Learning	MOE Schools				5.2
Total Cost for the Action Plan					**300.2**

CHAPTER V

CONCLUSION AND RECOMMENDATION

5.1 Conclusion

5.1.1 Pilot Project

School-based approach or Educational Kaizen activities are applied at the selected 25 schools island wide as the Pilot Project during 2003-2004. In the Pilot Project, 118 QE circles were formulated in which 944 activities were taken up for promoting the improvement. These activities are, in principle, classified into three categories, namely, “School Management”, “Science and Mathematics Education” and “Basic Infrastructure and Facility” that are the three main target fields for the improvement in this study.

After one year implementation, results and impacts of the Pilot Project are evaluated through the monitoring and Post Pilot Survey (PPS) as summarized below.

a) The school-based approach applied in the Pilot Project is quite effective and efficient to improve school management as indicated in “Parents’ Satisfaction with School” or “Parent’s Support” at PPS. Through the introduction of various improvement activities, motivation of principals and teachers changed that finally led to change even the school culture.

b) Through the implementation, it is recognized that the activated school culture is the foundation of any improvement without which any bottom up approaches could not work well. In the Pilot Project, substantial increases in student attendance were recorded as one of the indicators of the change in school culture

c) Science and mathematics education has been facilitated through applying activity-based teaching and learning method using model experiments and creative teaching materials prepared by teachers. Actually, results of Academic Ability Test (AAT) on science and mathematics showed that the students of the pilot schools got higher marks for two subjects than that of non-pilot schools, and application of the school-based approach is quite efficient for science and mathematics education.

d) Basic infrastructure and school facilities were also improved through the school-based activities. These activities were further promoted by the participation of parents and community people that reduced the required cost for the improvement substantially, by 30-40% or more.

e) Through the Pilot Project, it is recognized that the Educational Kaizen activities gave much impacts on non-urban schools than on urban schools, that indicates the school-based approach contributes not only to quality of education, but also to improving inequity among schools.

Various lessons are provided after one year implementation of the Pilot Project, major of which are summarized below.

- Educational Kaizen approach can be applicable to the education sector.
- Improvement of school culture is fundamental for which good communication among them is the key factor.
- Important factors of the successful school-based approach are:
  - facilitative leadership of principals;
  - open discussion among representatives and transparency in the process of decision-making; and
  - maintenance of records of the meeting.

5.1.2 Master Plan

The Master Plan has been formulated after implementing the Pilot Project by fully incorporating the valuable experience and lessons. The strategies applied to the formulation of the Master Plan are:

- A school-based approach or Educational Kaizen activities applied in the Pilot Project and proved effective for improvement are first used as key strategy for formulating the plan.
- Then, institutional and organizational support, or top-down approach is planned for facilitating the school-based approach as a supplemental one.
- Overall improvement for science and mathematics education through enhancement of the awareness of the importance of the two subjects is taken up for the plan formulation.
- Preparation of practical and implementable plans is another key strategy through concentrating on promotion of activities and intensive involvement of counterpart personnel.

Applying the above strategies, various improvement projects are formulated in the short term (2005-2007) and long term (2008-2012), which are classified into the following five program groups:

Program 1: Strengthening of Managerial Capabilities of Schools

- Three (3) projects of Top-down approach
- Three (3) projects of School-based approach

Program 2: Promotion of Activity-based and Interactive Teaching and Learning

- Three (3) projects of Top-down approach
- Two (2) projects of School-based approach

Program 3: Upgrading of Science and Mathematics Curriculum Focusing on Syllabus and Teachers' Guides

- Two (2) projects of Top-down approach

Program 4: Overall Promotion of Science and Mathematics Education

- Three (3) projects of Top-down approach

Program 5: Improvement of School Infrastructure and Facilities

- One (1) project of Top-down approach
- One (1) project of School-based approach

Total cost of implementing the projects for the Master Plan is estimated at Rs.19,850 million, which are divided into Rs.5,035 million for 2005-2007 and Rs.14,815 million for 2008-2012.

The Action Plan is formulated that includes necessary projects to realize implementation of the Educational Kaizen activities in 500 schools or attaining the short term target of the Master Plan. Eight projects from the Program 1 and 2 are selected as the Action Plan. The implementation arrangement of the Action Plan including formation of implementing organization and scheduling is also prepared for early materialization.

5.2 Recommendations

For promoting Educational Kaizen activities and successfully implementing the proposed projects, it is recommended that the following preparation and arrangement are made by MOE in close collaboration with NIE and the related organizations.

1) Authorize the Master Plan and Prepare for Implementation

   First, MOE and NIE are to authorize the Master Plan confirming the policy of promoting the school-based activities for quality improvement of the education and publicize them to all the government agencies concerned. Necessary arrangement for implementing the Action Plan including financial allocation is to be commenced at the earliest stage.

2) Establish New Units in MOE and NIE

   For promoting Educational Kaizen activities and activity-based and interactive teaching and learning, new units are to be established in MOE and NIE. The units are to be equipped with sufficient number of experienced staff and to function as the promotion center providing necessary information and monitoring services through their local offices.

3) Promote Awareness of Educational Kaizen Activities in MOE/NIE

Understanding on the importance of the school-based approach for development of education, particularly on science and mathematics is still not sufficient both in MOE and NIE. Awareness campaign is to be implemented for promoting the activities by the initiative of the Counterpart personnel of the JICA Study Team using the video and other promotional materials. Study tour to the pilot schools where Educational Kaizen activities have been carried out is also to be planned inviting top management and staff related.

4) Use the Models/Products Prepared through JICA Study effectively

Various kinds of materials for implementing activity-based and interactive teaching and learning are prepared including model experiments, teaching aids, 100 box calculation, etc. which are proved to be quite effective for quality education. These materials are to be used more intensively in the teachers' training in NIE and distributed to schools for facilitating the school-based activities.

5) Deploy Required Number of Teachers and Enforce Equitable Deployment Policy

Number of teachers is not sufficient and those for science and mathematics are in acute shortage, particularly in rural areas. Deployment of necessary science and mathematics teachers is to be implemented to fill the gap as soon as possible. Strict application of the deployment policy on teachers is also to be enforced to avoid political intervention on the deployment and personal excuse of escaping assignment in rural areas. Additional financial incentives for teachers working in rural schools are to be devised.

6) Intensify Follow-up of Training on Principals and Teachers

Various in-service trainings have been conducted for principals, ISAs and teachers in NIE. However, the effects or impacts for them are quite limited due to lack of follow-up works. It is, therefore, strongly recommended that regular monitoring and follow-up be conducted in order to ensure the actual implementation of what was trained at the local and school levels. Evaluation of the performance on the basis of the monitoring would be more effective method for enhancing the effects of the training.

7) Enhance Coordination among Stakeholders

Lack of coordination has been the common fault of not only the education sector, but other sectors in the country. Nevertheless, there is a strong need of open dialogues and sharing consensus among stakeholders when introducing and implementing new attempts such as Educational Kaizen activities. As the workshop on SBM held in August, 2004 sponsored by MOE with cooperation of JICA Study Team contributes to deepen understanding of the concept of SBM and on-going projects of different donors. Coordination among stakeholders is further to be enhanced by initiatives of MOE and NIE for the successful implementation of the Master Plan. Necessary fund arrangement for the implementation of the Master Plan is also to be processed under the well coordinated framework of stakeholders.

Appendix 1

Members of the Steering Committee

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Mr. M. Abdul Wahid	Chief Project Officer, NIE
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