# School-Based Training Program (SBTP) For Science And Mathematics Teachers: The Philippines Experience

Cleofe S. Velasquez-Ocampo
Member, Central Project Management Team, SBTP
Department of Education, Philippines
(velasquez_oks@yahoo.com)

**Abstract**

When something is good, then it should be shared and talked about The Central Project Management Team (CPMT) of the School-Based Training Program (SBTP) for Science and Mathematics Teachers, feeling and seeing that something good is coming out of the School-Based Training Program (SBTP), saw the need to share its experience to its neighbors in the Asia-Pacific region. The Department of Education is the biggest bureaucracy in the Philippines with a little less than five hundred thousand teaching and non-teaching personnel. The shear size of the agency deprives it to train the majority of its teaching force. Unless training is done in the school level, training programs will always be handed to our teachers watered down: watered-down concepts and activities. The SBTP proved to be the solution to the problem encountered by teachers who are not trained due to the lack of funding or the distance of training centers from their schools. The training program guaranteed that teachers are exposed to new ideas, strategies and solutions specific to their problems and realities. Teachers in pilot and expansion schools divisions underwent the process of learning, sharing and working together.

## School-Based Training Program (SBTP) For Science And Mathematics Teachers: The Philippine Experience

**What is the SBTP?**

The results of the last Third International Science and Mathematics Study Repeat (TIMMS-R) conducted by the International Association for the Evaluation of Educational Achievement (IEA), showed that our students performed lower than their Asian counterparts. These brought the need to train our teachers so they can teach our students better. The focus of the trainings given our teachers was the teaching of how knowledge, skills and attitudes acquired in the classroom be used outside the classroom. Initial training however were done at the national level. Regional offices were asked to send trainers for training at the Institute of Science and Mathematics Education at the University of the Philippines (ISMED-UP). Piloting in three regions, Bicol Region in Southern Luzon, Western Visayas and Central Mindanao in 1999, the SBTP tried to maximize the gains of the national training conducted by ISMED-UP with the following goal: To continuously improve performance level of students in science and mathematics at the basic education level.

The project which was under a package cooperation with the Japan International Cooperation Agency (JICA) aimed to upgrade teaching skills and deepen understanding of subject matter content for facilitating learner-centered classroom instruction in science and mathematics education. The specific objective of the project was to further develop the instructional competencies of science and mathematics teachers by:

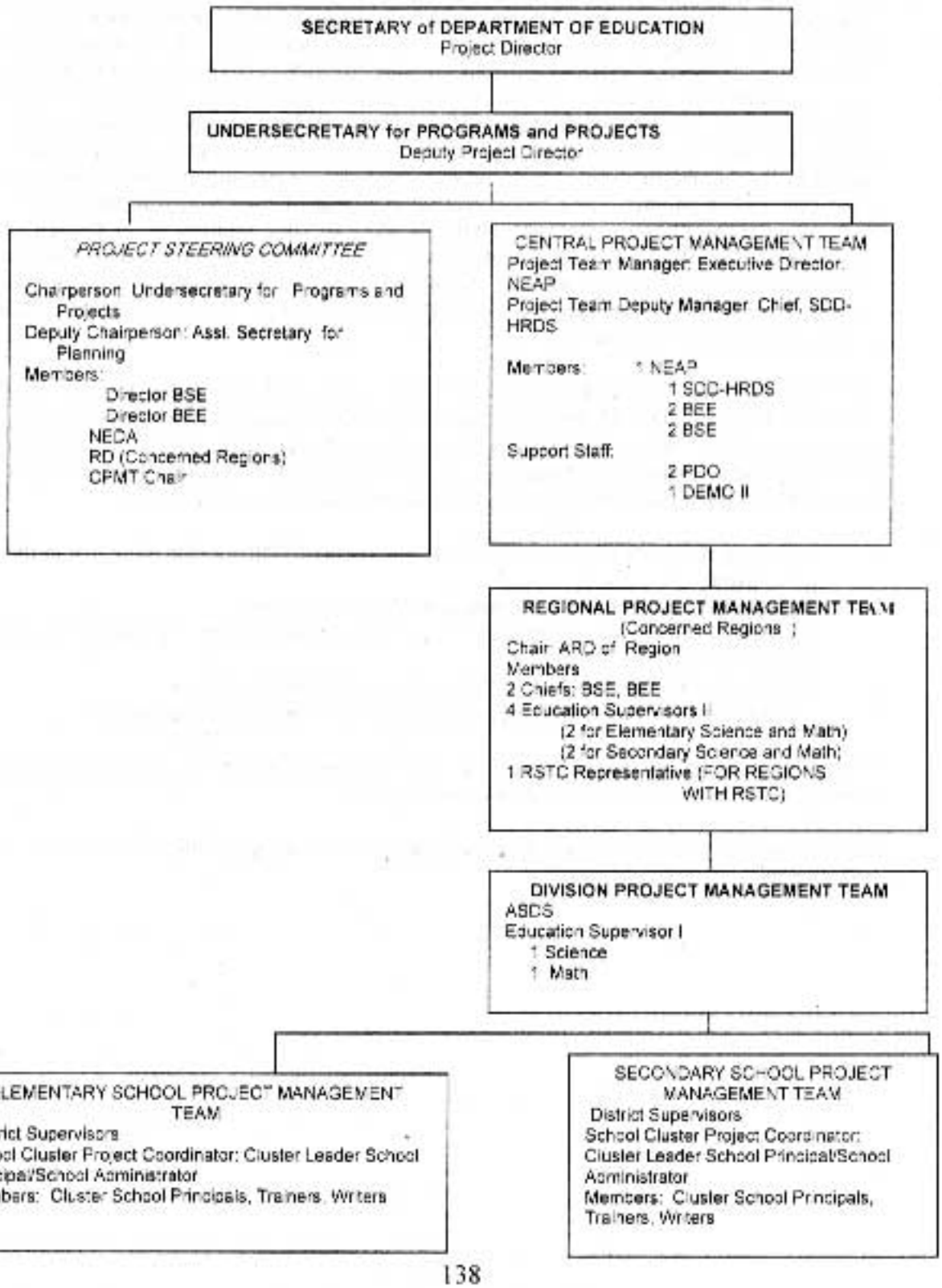
a. sustaining the gains of previous similar Science and Mathematics programs in the department;
b. operationalizing a continuing school-based INSET program;
c. providing venues for continuing capability enhancement for teachers and administrators;
d. creating opportunities to develop future instructional leaders; and
e. sharing of instructional expertise and experiences among and across regions.

The program specifies that trainings are school based to reach the greatest number possible in the shortest time possible, with less expense.

To facilitate the implementation of the program, the following organizational structure was adopted.

## ORGANIZATIONAL STRUCTURE

## ORGANIZATIONAL CHART



This structure assures that responsibilities are equally divided among the coordinating offices. The Central Project Management Team, the implementation arm of the project, works under the guidance of the Project Steering committee which is headed by the Undersecretary for Programs and Projects. A Regional Project Management Team (RPMT) heads the regional level which supervises the implementation of the program in the division level. The Division Project Management Team (DPMT), manages the implementation of the program in the school level. Since the trainings are school-based, the program also involves the school administrators and instructional supervisors in monitoring how the program is implemented at the school level. To ensure the smooth execution of the task at all levels, periodic monitoring is done according to a project development matrix.

**How is the SBTP Conducted?**

The first phase in conducting the SBTP is the identification of the regions where it will be carried out. Criteria for selection of regions include the willingness of the Regional Director to be an SBTP implementing region, poor performance of students in achievement tests and low National Elementary Achievement Test (NEAT) results and other related performance indicators in Science and Mathematics. The program is also conducted in the secondary level.

The regions are tasked to identify divisions they would like to involve in the program. Criteria for selection are the same as the criteria for selection for the region. In the pilot year, the region identifies 3 divisions to implement the program. The pilot runs for 3 years which is considered one cycle. During the second year of implementation, the region identify additional divisions to expand the reach of the program. This expansion continues until all divisions in the region have been exhausted.

After divisions have been identified, a training needs analysis (TNA) is conducted to identify the least learned/taught concepts. The results of the will be used to identify topics to be discussed during SBTP sessions. SBTP sessions are conducted once a month alternately in the schools belonging to a training cluster. Schools are clustered to have a minimum of 8 teachers per grade level. Host schools provides not only the physical facilities but also human and material resources. For the purpose of demonstration lessons, fifteen (15) to twenty (20) students are made available by the host school.

The SBTP session is composed of an orientation/sharing portion, a demonstration of a lesson plan and an analysis of the process, materials and strategies used by the demonstration teacher. Participants are later asked to prepare a parallel lesson plan which suits the realities and requirements of their classes. Two sessions are conducted every meeting, one in the morning and another in the afternoon.

SBTP sessions use the Practical Work Approach (PWA) as much as possible in the presentation of the lessons. The PWA assures that learning is made more meaningful for students.

**GAINS FROM SBTP**

After three years of implementation, at least 3,000 elementary schools have been involved and 22,000+ teachers from the elementary and secondary levels trained. This cannot be achieved if the trainings were not on school-based.

Aside from the number of trained teachers, a survey among the participants gave the following results:

1. teachers developed self-confidence in discussing the topics discussed during the SBTP sessions;

2. subject mastery of teachers were improved;

3. PWA helps students understand concepts and apply them; and

4. SBTP sessions are much anticipated not only because of the concepts discussed but also for the socialization and camaraderie it provides.

On the part of the administrators, SBTP sessions provide them a venue to observe and supervise the teachers. It affords the school managers a chance to witness strengths and potentials as well the areas for improvement of their teachers as well as their co-managers. Sharing of experiences among teachers and administrators allow them to train future education managers.

Among students, although there are no conclusive results yet, initial results of achievement tests in one pilot region shows that students from SBTP schools perform better than students from non-SBTP schools in science and mathematics achievement tests. Additional studies should be done in this area to make concrete conclusions on the effect of SBTP intervention on the performance of students in science and mathematics achievement tests.

In terms of sustainability, because of the low cost of institutionalization of the program, it is being continued with minimum financial requirement in the pilot regions and has now expanded to Central Visayas. The program is now conducted in Regions V (Bicol Region), VI (Western Visayas), VII (Central Visayas) and XI (Central Mindanao).

**SBTP Issues and Concerns**

The program, although gaining in terms of developing the competency of teachers and students, is not spared from problems. Some issues and concerns are:

1. the inferior quality of session guides developed;
2. some materials are not properly compiled/documented;
3. the program is not properly monitored;
4. monitoring and evaluation is not yet integrated in the project management cycle;
5. overlapping of activities prevent trainers and participants from attending SBTP sessions;
6. Philippine government counterpart for the project is limited by lack of budget;
7. schedule of meetings are left to the regions and divisions. Meetings should be encouraged for proper guidance in program implementation; and

8. regions/divisions are so dependent on the CPMT for financial support.

Having identified issues and concerns in the regional, division and even in the school level, the CPMT is now looking closely at how the issues and concerns can be addressed so that they can be reduced if not totally eliminated.

**Future Directions for SBTP**

As of July, the CPMT is reproducing the implementation manual and will be distributing it in August so that expansion divisions and regions will be properly guided on how to implement the SBTP. The orientation program conducted for non-SBTP regions will have a follow-up before the end of the year.

Skills enhancement programs for trainers, writers and school administrators are continuing and source books for elementary level will be reproduced and distributed early next year.

The program is going strong because of the presence of JICA experts and JOCVs who continuously help the Department in implementing the project in the concerned regions. As part of the JICA commitment, laboratory equipment are distributed to Regions V, VI and VII. The inclusion of Region XI is assured for the next batch of equipment which will be given by JICA.

It is expected that the program will be expanded to more regions in the future ensuring a more relevant science and mathematics education for Filipino students.

Title : **School-Based Training Program (SBTP) for Science and Mathematics Teachers: The Philippine Experience**

Presenter : Ms Cleofe S. Velasquez – Ocampo
Human Resource Management Officer, Department. of Education, Philippines

Date & Time : 12 August 2003, 3.00 – 3.30 pm

## 1. Content of the Paper

1.1 The video presentation showed a school project on how Grade 1 Mathematics class activities were conducted using learning stations. A group of teachers was given the opportunity to observe the class and provide comments for improvement.

1.2 SBTP resulted from the last Third International Science and Mathematics Study Repeat (TIMMS-R). Results showed that Philippine students performed lower than their Asian counterparts. Training for teachers is difficult with about 17 million students and 475,000 teachers and large class size (ranging from 60-90 students per class). SBTP was suggested as an alternative to provide teacher training with the cooperation of the Japan International Agency (JICA). The curriculum was based on the training need analysis.

## 2. Discussion

2.1 *The Chairperson* enquired why Science was not taught at Grades 1 and 2 in the Philippines.

*Answer*
The Department has recently adopted the Basic Education Curriculum, replacing the old curriculum where Science for Grades 1-4 was included. Presently science concepts are included in English lessons.

2.2 *Dr. Badariah from the Economic Planning Unit* enquired where the English teachers for Grades 1 and 2 obtained their science background.

*Answer*
The Department has recruited volunteers among professionals from other courses.

2.2 *The Chairperson* asked whether the Government gave awards to schools, apart from the school projects by JICA.

*Answer*
The government has allocated 4 million Pesos for subsidising instruments.

## Seminar on Best Practices and Innovations in the Teaching and Learning of Science and Mathematics at the Primary School Level

*Hannes, Otto (Ministry of National Education, Jakarta, Indonesia)*

### Implementation of Reform in Science Teaching in Indonesia

**Abstract**

The reform of an existing and longtime practiced teaching approach is a very complex task. It might differ according to the culture and value system of the society involved. A strategy for Indonesian conditions was developed and implemented. The results show the expected changes in teachers' behavior and improved learning results of the pupils compared to a control group. A learning by doing approach is used where children are encouraged to observe phenomena, to draw their own conclusions, formulate their own ideas and perceptions and interact with other children during the learning process.

The project components comprise: a training system to train local consultants, headmasters, inspectors, advisory teachers and teachers as well as personnel for the management of project implementation, a teacher support system to bridge the gap between being able to do appropirate lesson and doing it on regular everyday basis, a bonus system for appropriate performance and follow-up activities. The approach includes also a set of teaching materials, such as book, manuals, and equipment including maintenance of the materials provided. The innovations introduced in the teaching process are taken care of in the evaluation system which is changed in order to measure understanding rather than memorized facts. A monitoring system controls the development on the level of training consultants and advisory teachers. Classroom observations, the use of materials provided, and children learning results are monitored as well.

## Implementation of Reform in Science Teaching in Indonesia

### 1. Introduction

At the time of Indonesia's independence in 1945, the country did not have a functional education system. During the 350 years of Dutch colonial rule, only those persons were trained that the colonial administration required. There was no general education system and the importance of a school system for the development of the society was not completely realized.

Today there are nine years of required schooling in Indonesia, with a network of elementary schools that stretches even to remote villages. The school attendance rate (95%) is relatively high for a developing country. The problems are not about quantity but rather the quality of education. Indonesia's level of education is low.

In the beginning of the of the 21st century the science and mathematics knowledge increases with accelerated speed. The use of this knowledge is becoming crucial to personal and national "survival."

The advance of human condition worldwide will rest on our success in the education of children especially in science and mathematics.

Basic education is strongly influencing the development and the changes occurring in societies. The knowledge made available to the children and the value system established during basic education have long term effects.

The approaches for reform of existing education systems might differ according to the culture and value system of the society involved. An example is presented for the reform of science teaching in Indonesia including strategies, crucial components in implementation and measuring of impacts.

### 2. Strategies and Procedures

#### Strategies

What can the strategy for reform in science education look like under the given Indonesian conditions?

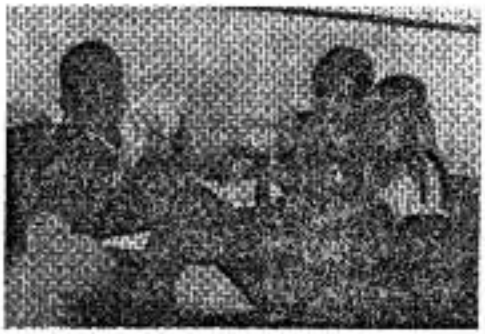
1. The interventions on the existing system have to provide a strong first impact to achieve changes especially in the behavior of teachers but also in administration procedures.
2. An integrated package of support components and benefits for teachers has to be provided to improve the quality of classroom activities and to facilitate better job satisfaction.
3. The knowledge on the importance of basic education and science education for society development has to be improved within the community and in the education administration (make teachers feel proud to be a teacher and promote science for all in the society).

4. Make things happen, **don't hope.**
5. Measure and show the results achieved. Find supporters for the approach.

**Objectives and Procedures**

The project was initiated from the Indonesian side and is supported by the German government as part of its development cooperation[1]. Cooperation partners on the German side are GTZ (Deutsche Gesellschaft für Technische Zusammenarbeit) and KfW (Kreditanstalt für Wiederaufbau).All responsibility lies with the Ministry of National Education in Jakarta.

The project aims at improving science education in elementary schools. It wants to enable children to develop a solid basis of science understanding to apply science concepts in daily live to understand natural phenomena and interact with the living environment in an appropriate and sustainable way.



The project uses a "learning by doing" approach which aims at deeper understanding rather than memorizing facts. Children are encouraged to observe phenomena to draw their own conclusions, formulate their own ideas and perceptions and interact with other children during the learning process.

The project should, in long-term provide a contribution for stronger involvement of the poorer population in the economic and political affairs, for sustainable relationships with the environment and to support the reform processes, particularly in the light of intended democratization.

Enhancing the teachers' skills and establish a comprehensive support system for teachers to apply the teaching methods and innovations at classroom level is another focal point.

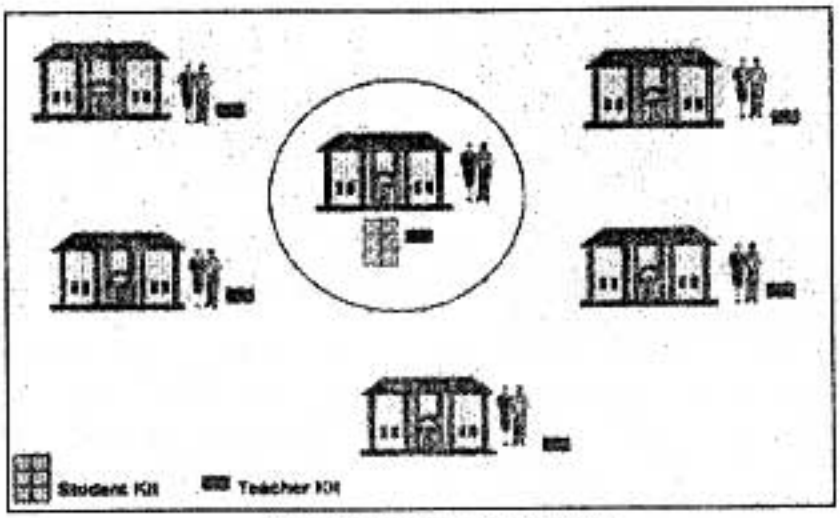
The most important changes to be achieved in classroom activities include:
- change in teachers' behavior,
- change in materials used,
- change in evaluation system.

**During project preparation** the project applies a set of procedures such as:
- it involves all stakeholders at an early stage to create a sense of local ownership.
- it collects advice from parties involved to win their support.
- the project prepares for high quality of services and materials, such as a training system according to the needs of the persons trained, handbooks and textbooks of high quality standard, teaching equipment long lasting and easy to use.
- all important shortcomings are addressed for a strong first impact towards change of learning procedures.

Factors which are specially important **during project implementation** comprise:

- delivery of project components simultaneously,
- activation of supporters in a useful sequence (provincial coordinators and decision makers, district coordinators, inspectors and headmasters and finally advisory teachers and teachers),
- the implementation of activities is organized in a down to earth approach including: modeling of lessons and activities, focus on teaching methods rather than subject matter knowledge, many practical and peer teaching activities in order to build up the teachers' confidence.

The smallest working unit of the project is the school cluster[2] consisting of 5 to 8 schools. It serves as a resource sharing and development unit as well as platform for training and exchange of experience in weekly teacher working group meetings.



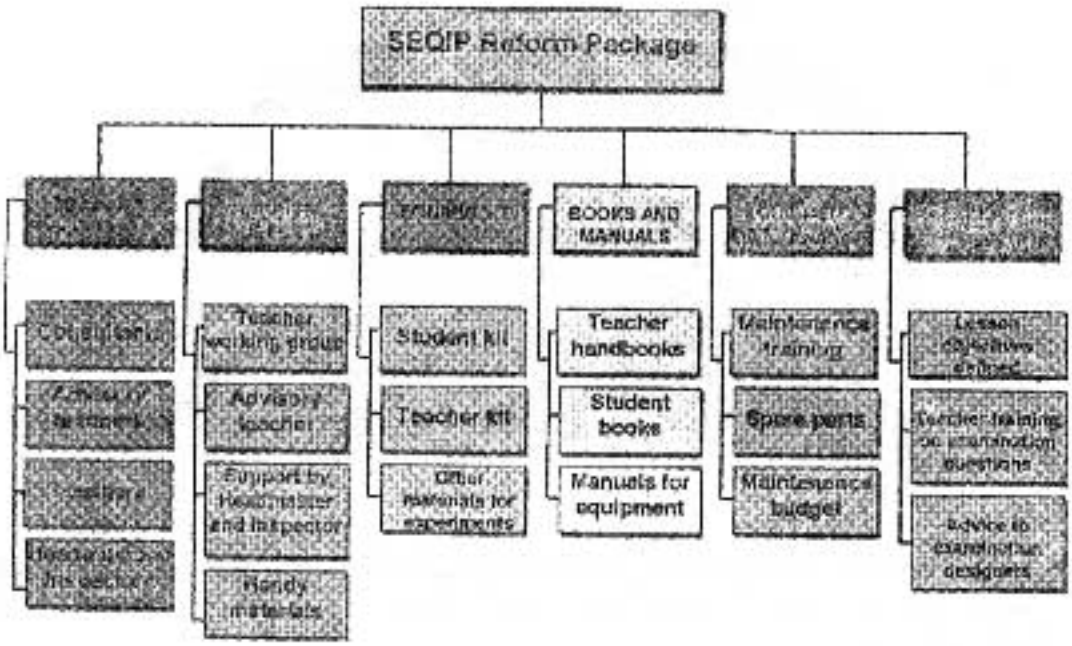

*Overview of a school cluster*

In all these activities basic cultural aspects are taken care of, such as to involve community leaders and informal hierarchies, compromise with the local way of doing and the local value system.

## 3. SEQIP Components

The project targets significant weaknesses in the elementary education system knowing that there are additional factors that influence the quality of science teaching. Among those factors that cannot be influenced by the project are teacher pre-service training, the curriculum, teacher salaries, the system of performance evaluation and advancement, the lack of efficiency of both school management and its administration.

The reform package for science education in Indonesia comprises six main components to overcome important shortcomings of the existing system.




*SEQIP reform package*

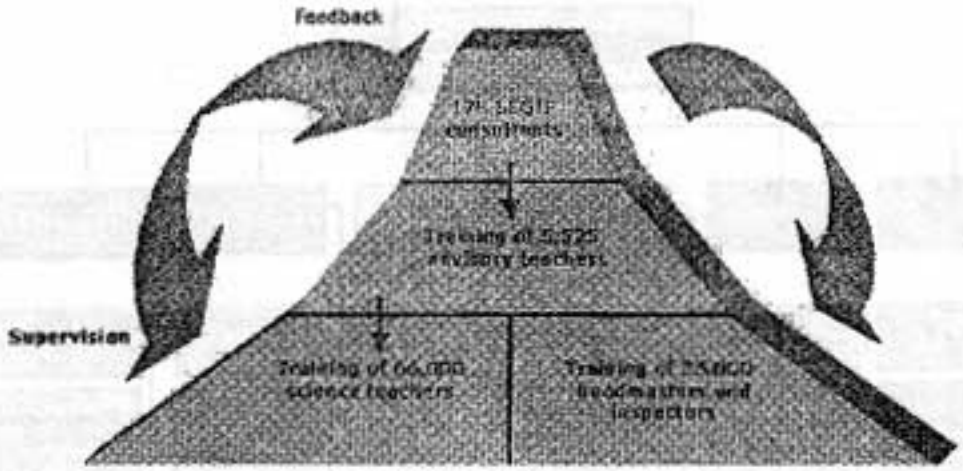
### 3.1 Training system

The training system provides an initial training for key persons such as local training consultants, coordinators, inspectors, headmasters, advisory teachers and teachers. It places a permanent trainer in each school cluster, it initiates follow-up training every week within teacher working groups, it qualifies persons to support the teachers, and it creates teams in provinces and districts for the organization of interventions and for the long-term sustainability.

In light of the total number of elementary school teachers (1.2 million nationwide), in-service training is a large program. There are three conceivable approaches:

- a distance-learning course with or without brief direct interaction. This appears unsuited particularly with respect to the necessary practical education for science teaching.
- training by a team of trainers. For the size of the project area a very large team would be required, or a very long time frame would be necessary.
- training using a training cascade with multiplicators. Considering the conditions in Indonesia, this is the method that promises success.

The training cascade developed by SEQIP has only two transitions. 178 trainers (consultants), who are recruited primarily from pedagogical colleges and universities will train 5,525 advisory teachers who will then be the trainers in the school clusters. The advisory teachers train in teams of two, initially under the direction of their trainers. In this way a total of 66,000 teachers are trained. Additionally, approximately 35,000 headmasters and supervisors will be trained directly by the group of trainers.




*SEQIP training cascade*

The training system is divided into the following steps a) selection of the different groups of people involved, b) initial training, c) long-term training in working groups, and d) quality assurance.

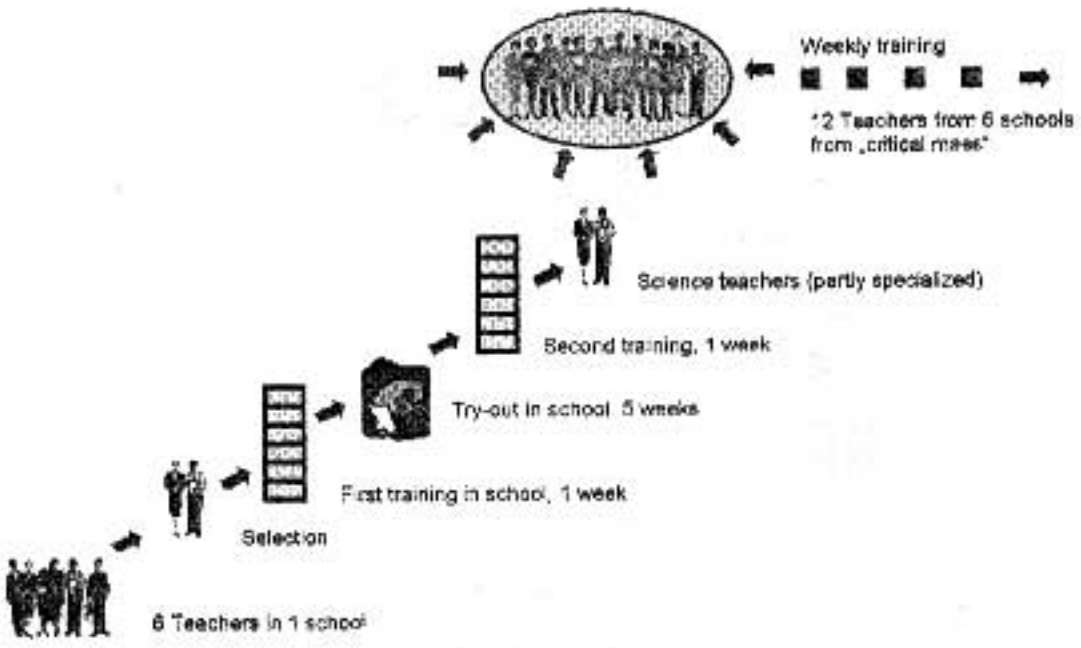
Some characteristics of SEQIP training are:

- training in small groups (15 participants maximum)
- trainer teams of 2 people, who complement one another
- a large portion of hands-on experience during training to develop self-confidence before the teacher shows the experiments to the class
- customizing the training content to the abilities of the trainer and teacher
- modeled procedure with each trainer being a model for the teacher in the classroom
- an emphasis on methodology because of particular weaknesses in that area
- modules are as alike as possible at all training levels to avoid deterioration in the cascade
- a reduction of hierarchy between the persons involved in the training is an important objective. Trainers provide examples on this aspect to create a productive working environment for the teachers.

Candidates for training as advisory teachers are pre-selected. They have to take a written exam and they are interviewed[3]. The evaluation is based upon candidates meeting certain criteria; the criteria being decisive for advisory teachers, i.e.:

- ability to organize
- ability to communicate and cooperate
- interest in science
- initiative
- at least two years of teacher pre-service training
- at least 4 years of classroom experience
- creativity
- awareness of responsibility

Using the science teacher as an example, the procedure for the training steps is shown (beginning at the bottom of the page):

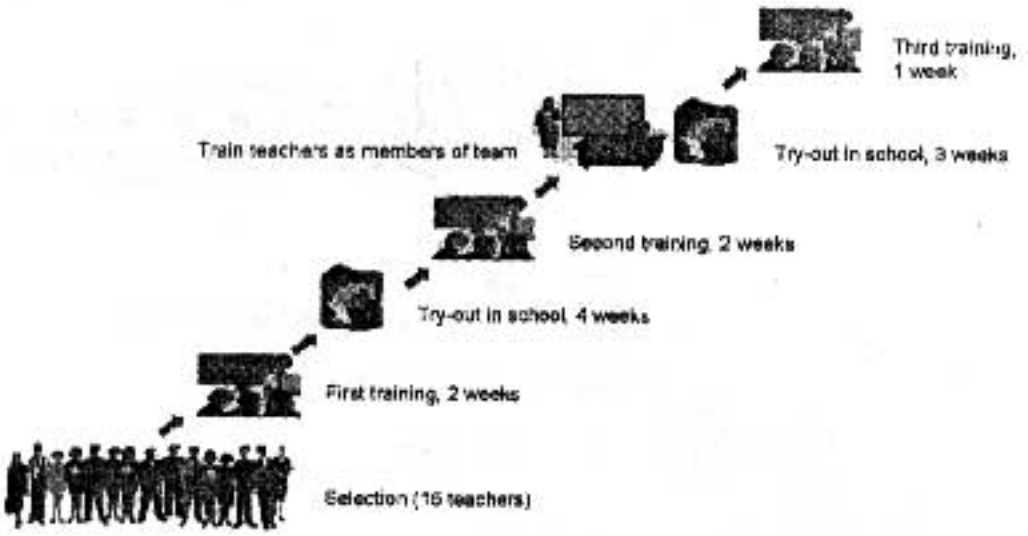



*Training scheme for science teachers*

The two teachers who are to be trained at one school will be selected from the group of 6 homeroom teachers. The selection is done by the headmaster based on criteria provided for the project. Active and curious teachers who are particularly interested in science teaching are to be selected. They attend a first training, in which they are introduced to the methodology and the instruments used. Then they practice the teaching method for 4 weeks in the classroom. The experience they gain here is an important topic for the second training. After this step basic requirements are created for ongoing training in work groups.

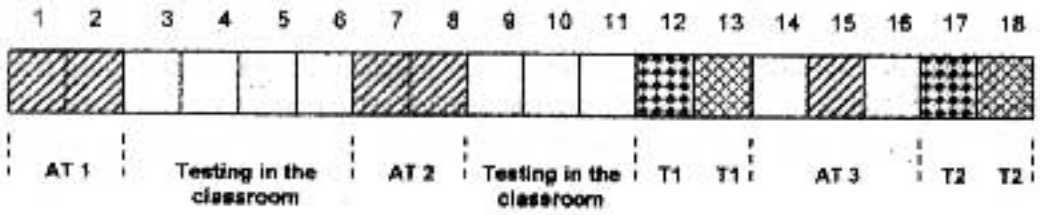
Together with the science teachers of other schools in the school cluster, they participate in the teacher work group. This group consists of approximately 12 teachers guided by an advisory teacher that meets weekly or at least twice a month. The training goal of mastering all curriculum topics appears to only be possible with a combination of both basic and long-term training.

The advisory teacher plays a key role regarding the long-term application of project innovations. Upon selection, the advisory teacher goes through a training sequence, which comprises two week basic training (see AT1), four weeks of testing the innovations in the classroom, an additional training of two weeks (see AT2), followed by 3 weeks of testing in the classroom.




*Training scheme for advisory teachers*

This is followed by the first teacher training (see T1), conducted for a group of 12 teachers together with a colleague, under the direction of the trainer. The same training content is taught twice in two different school clusters, one after the other (see T1a, T1b). Then there is an additional one-week training for the advisory teacher (see AT3) in which the experience of the teacher training is evaluated. Then the team of advisory teachers conducts the second teacher training in two school clusters, one after the other (see T2a, T2b).




*Training sequence for advisory teachers and teachers*

The group of advisory teachers trained together (15 people) meet once a month to exchange experiences and discuss topics that are appropriate for use in the teacher work groups.

After going through the training sequence, it can be seen that advisory teachers and teachers are able to conduct significantly better lessons.

The training of the advisory teachers will be the primary responsibility of the 178 local consultants. These people will be recruited from universities or teacher colleges and in some cases they will be headmasters or science teachers. They will be familiar with the SEQIP system and the materials, as well as with the subject matter, and they will share their knowledge with the advisory teachers and headmasters during workshops and training events. Together with elementary school teachers they will also create a large portion of the written classroom material that can be used in the future with the project.

### 3.2 Teachers' support

The teachers need support to bridge the gap between being able to do appropriate lessons and doing it on a regular basis. Advice for the teacher at any time is made available within his school cluster. A bonus system for attendance of follow-up activities is established. The teacher experiences an increased of status as a member of an "elite team" and he receives positive feedback from students, parents and headmasters.

To ensure that the innovations are regularly used in the classroom, a number of additional factors are important.

Teachers receive a teacher's handbook with suggestions for the structure of the lesson that corresponds to the subject matter. They also receive easy to use equipment and written lesson material. Support from the advisory teacher who always works at one of the schools in a cluster, is available upon request. Headmasters and inspectors go through training with the goal of effectively supporting the teachers with their introduction of innovations. The advisory teachers conduct classroom visits every three months with the trained teachers which ends with consultation and discussion. This discussion uses agreed criteria and is used for additional motivation.

**Teaching Method**

| | | | | |
|---|---|---|---|---|
| 34. Student centered | Often (37.9%) | Sometimes (35.7%) | Seldom (18.1%) | Never (8.3%) |
| 35. The teacher gives lessons relevant tasks to students | Often (51.8%) | Sometimes (40.8%) | Seldom (5.7%) | Never (1.7%) |
| 36. The teacher promotes interaction between the students | Often (35.0%) | Sometimes (39.3%) | Seldom (19.3%) | Never (6.4%) |

**Teacher's explanation**

| | | | | |
|---|---|---|---|---|
| 37. Using simple and clear language | Always (74.5%) | Sometimes (20.2%) | Seldom (4.3%) | Never (1.0%) |
| 38. Using relevant examples | Often (70.4%) | Sometimes (21.2%) | Seldom (6.3%) | Never (2.1%) |

**Students' Answers**

| | | | | |
|---|---|---|---|---|
| 39. Students answer in a chorus | Often (24.2%) | Sometimes (41.9%) | Seldom (24.5%) | Never (9.5%) |
| 40. Students complete gaps in sentences | Often (9.6%) | Sometimes (34.1%) | Seldom (28.7%) | Never (27.7%) |
| 41. Students complete gaps in words | Often (9.2%) | Sometimes (23.8%) | Seldom (26.6%) | Never (40.4%) |

**Teacher's Knowledge of Science**

| | | | | |
|---|---|---|---|---|
| 42. Relate scientific concepts with everyday life | Often (60.7%) | | | No (9.3%) |
| 43. Contains misconceptions | Yes (2.6%) | Some (4.8%) | Few (11.1%) | None (81.8%) |
| 44. Able to link one concept with another | Often (23.5%) | Sometimes (47.8%) | Seldom (22.8%) | Never (5.8%) |

**Teacher's Behavior**

| | | | | |
|---|---|---|---|---|
| 45. Enthusiastic | Always (37.3%) | Sometimes (39.0%) | Seldom (19.3%) | Nothing (4%) |
| 46. Clear and non-monotonous voice | Always (39.2%) | Sometimes (37.8%) | Seldom (22.4%) | Nothing (1%) |
| 47. Appearance | Very pleasant (19.1%) | Pleasant (77.3%) | Unpleasant (4.6%) | Very unpleasant (0%) |

Remarks: excellent good fair should be followed up must be followed-up

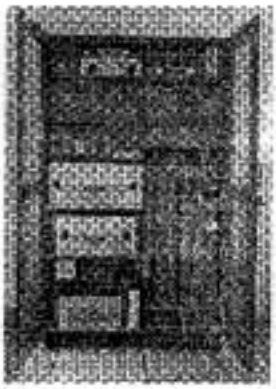
*Observation sheet of science teaching in the classroom*

In addition to the support of the teachers, the system has aspects to motivate the teachers:

- participation in the weekly training events is rewarded with bonus points for job advancement.
- the successful candidates feel personal recognition.
- the new term "science teacher", associated with the specialization, is seen as an increase in status.
- the teacher generally receives positive feedback from students and parents in response to delivering significantly more interesting lessons.
- the consultation after classroom observation gives the headmaster an opportunity to express his recognition and encourage teachers to continue.

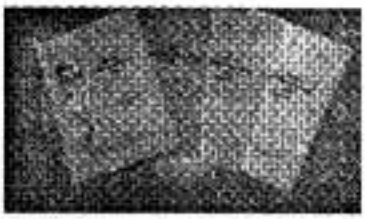
### 3.3 Equipment system

Handy materials, easy to use to prepare the lessons are provided. The materials are designed esthetically nice and attractive.



**Student kit**
1 cupboard with 20 units for 45 experiments for student activities (Each unit with 10 sets for 10 groups of students)

**Teacher kit**
1 box with 26 teacher demonstration experiments



**Manuals for experiments**
Using materials from the environment

The equipment is financed by German government funds via KfW. Student experiment sets are provided for discovering learning, for student-centered lessons, observation of phenomena, and for simulation activities. The materials are used in small groups of 3 students to make sure that all students are actively involved.

A teacher experiment set is used by the teacher for demonstration of phenomena and science effects.

In addition, a manual is provided to use the environment for teaching and learning and to implement hands-on activities for all topics of the curriculum, also for those not covered by equipment.

The equipment system is based upon the guidelines given by the national curriculum. The equipment should facilitate students to experiment and to encourage teachers for student centred lessons.

All experiments and activities can be conducted in the classroom or outside the school building. No laboratory is necessary. The experiments should not exceed 20 minutes in duration and the lessons should not be dominated by experiments.

The student kit contains 20 units for 45 students activities. One unit generally consists of 10 identical experiment sets for the same number of groups of students. The twenty units in the students kits are in a cabinet in the room where the weekly meeting of the teacher work group is scheduled. Depending upon the size of the school cluster 1 to 3 cabinets are distributed per cluster.

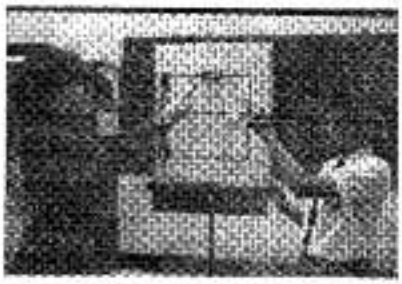
The teacher kit comprises 26 demonstration experiments which complement the student kit. Each school receives the teacher kit, for which the equipment is stored in a case. The lid of the case is fastened to legs to be used as a vertical experiment surface. This surface has a background, which corresponds with the topic.

The manual for experiments gives experiment tips on topics that are not covered by the supplied equipment (student and teacher kit). For these experiments and activities, materials are used from the student's environment. To work with the manual requires experience in using SEQIP materials.

The manual covers topics from grades 3 through 6, and describes 1 to 3 experiments for each topic so that the teacher can select according to relevance for the conditions the children are living in.

The equipment development of the kits was based upon a number of criteria that were jointly defined by all parties involved. Some examples from this list of criteria are:

- relevant to the students' everyday life
- low risk of injury
- easy handling (for children)
- resistant to breakage even if misused
- aesthetic and interesting in shape and colour
- small storage space
- economic viability (good price-performance relationship)
- possibility to be produced in Indonesia (immediate or long-term)



In the context of equipment development there was close cooperation with production companies in Indonesia that provided the desired prototypes at no cost.

### 3.4 Books and manuals

This component is developed to facilitate the preparation and implementation of lessons and to help the teachers to gain more confidence in teaching. The project provides a teacher handbook with background information, lesson objectives, lessons structures, and proposals for the evaluation of learning results. It provides student books for self-studies with attractive design and high quality. It also provides manuals for the use of the equipments provided within the scope of the project.

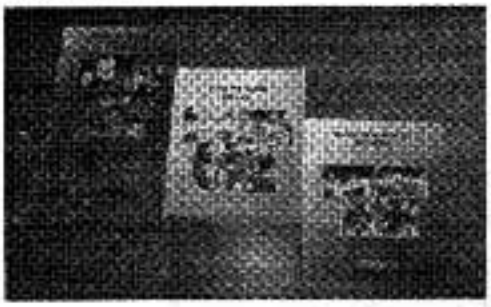
#### 3.4.1 The teacher manual

Since Indonesian elementary school teachers are generally poorly trained in subject matter and didactics, it makes sense to offer them support in their work.

The teachers' manual helps them with the content, such as the didactic preparation of lessons. It is organized by the topics of the curriculum and contains instructions for possible lesson structures as well as integrating the experiments with the lessons.

The teacher's manual is based on the curriculum; however the didactic approach differs from that previously used in Indonesian schools, in which the focus is on repeating information. It takes into consideration the deficits in teacher pre-service training and is based upon the materials supplied by SEQIP. In order to leave room for the creativity and personality of the teacher, lesson ideas are offered, with various levels of detail. Methodology ideas change from lesson to lesson, depending upon the material to be covered.

#### 3.4.2 The student book



Books used to date in Indonesian schools often not only lack in form for the target group, but may also have significant content omitted, with the ethnic and cultural diversity of the country being ignored, whilst gender role are rigid and stereotypical.

Under the current conditions, it can also be assumed that the students are often ill-prepared for tests, or that they want to know more about the subject matter than the teacher can provide. For these reasons, an option was found to provide students with an

opportunity to work independently, repeat course material, conduct additional simple experiments, gain additional knowledge and compensate for shortcomings in the classroom. A book for the students was developed that not only shares information, but also encourages experimentation and research. The student book presents connections between the scientific phenomena and the student's personal environment. They are called upon to report on the knowledge they gain, make inquiries and draw their own conclusions.

In addition to the goals defined by the subject, particular value was placed on gender-specific aspects and the representation of the cultural diversity of the country. New ground was also broken with the manufacturing of the book. To date it was not common to have textbooks printed in colour, due to the costs. In order to design the books in a more attractive manner and treat the science topics properly, they were printed in colour. Colours and icons were used with respect to the psychology of learning and should help students to find their way through the book as well as to retain the information.

### 3.5 Equipment maintenance

The idea of maintenance of materials in general is not very much developed in the project area.

The maintenance components of the SEQIP equipment system are designed to assure the long-term function and economic cost-effectiveness of the investments. The maintenance and care of the SEQIP materials should be done step by step.

Simple repairs such as replacing a light bulb are the job of each science teacher. Carrying out complicated repairs, cleaning and storing are all incorporated into the advisory teacher training. The advisory teachers are familiarized with equipment repair in groups of approximately 15 participants. Each training group is lead by 2 trainers, so that the tasks can be shared and the strengths of one trainer compensate the weaknesses of the other.

In order to assure that defect parts in the teacher and student kits can be replaced at any time, each school cluster has spare parts in a sufficient number of the most frequently repaired parts. Only if extensive work is required the repair order will be forwarded to a repair workshop or the manufacturer.

### 3.6 Evaluation system

The changes in the teaching process which lead the students from memorizing to understanding need to be reflected in the evaluation system. This component makes sure that students who understand the topic and are able to apply it, get better marks than those who memorize. Therefore, clear lesson objectives are defined as reference for evaluations. Training of teachers and advisor teachers in design of examination questions and practical examinations is included in teachers training and the project provides advice to examination designers on different levels.

Detailed descriptions and documentation on the SEQIP components are available and can be provided to interested users. This includes training manuals for all training activities with modules applied, time schedules and organizational aspects. It also includes detailed specifications of the equipment including price, quality control, procurement and distribution procedures, etc.

## 4. Impacts and Data

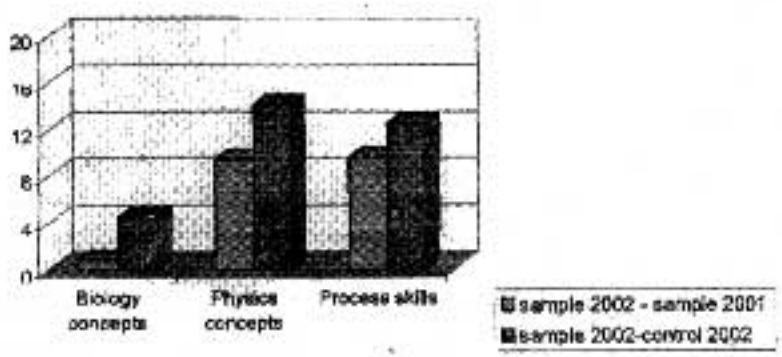
Several evaluation teams from Indonesian side, German side and independent consultants have monitored and evaluated SEQIP impacts[4]. Their findings can be summarized as follows:

### 4.1 Intentional effects

Referring to the **performance of teachers** a number of changes were identified which include improved subject knowledge and varied methodology employed by teachers. Motivation, professionalism, and competence of teachers have increased. Teacher working group activities valued by teachers as a forum for the exchange of ideas and problems solving. Teachers' behavior during lesson has changed favoring student-centered approaches.

Referring to the **performance of pupils** it was stated that a significantly increased enthusiasm of pupils in participating in meaningful activities was observed based on their positive experience of learning. Active involvement of all students has occurred and teachers agree that this approach helps weaker students to progress. The relationship between science and everyday life became more explicit to the pupils with concepts more relevant from them easier accessible. The student's learning achievement was tested randomly with 2,000 children from project schools and 2,000 as control group. The result show significant improvements in all 3 aspects measured (Physics concepts, Biology concepts, teaching methods process skills).

**Improvement over base in percent for year 6 test components**




*Performance of pupils*

## 4.2 Unintentional effects

It was found that advisory teachers trained under SEQIP were employed as instructors for other in-service training activities. The end of term exam questions for provinces were designed by SEQIP advisory teachers. The project's local consultants were asked to revise the national curriculum for science teaching and their proposal became part of the curriculum. Project's students were over proportionally successfully in winning student science competition on district, province and national level. They were able to compete successfully with elite schools.

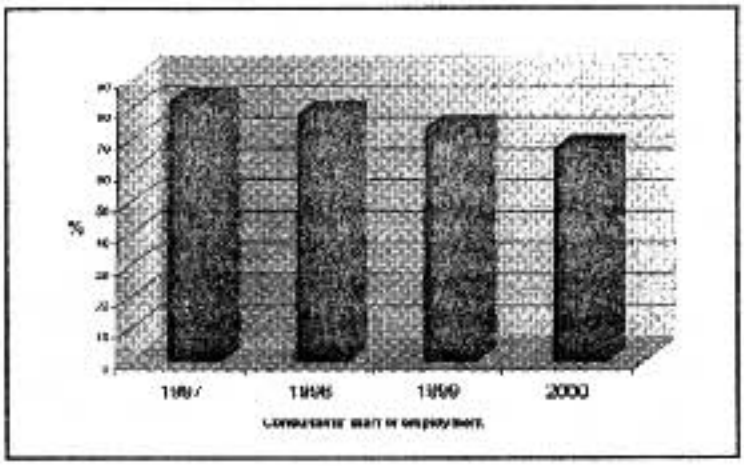
The project repeatedly got requests from private elite schools for training components and teaching materials.

In addition, the evaluation teams made observation concerning raising the standard of science education. SEQIP advisory teachers provide basic training to others who are not yet in SEQIP program using local funds. Schools and clusters developed the reform package within other subject areas. Consultants sometimes voluntarily visit and support teacher working group activities of their previous training group. The quality of student books is far superior to that which has gone before, especially in terms of accuracy of information, presentation, encouragement for experimentation by children. Districts decided to extend the program to schools not covered by the project on own expenses.

## 4.3 Monitoring system

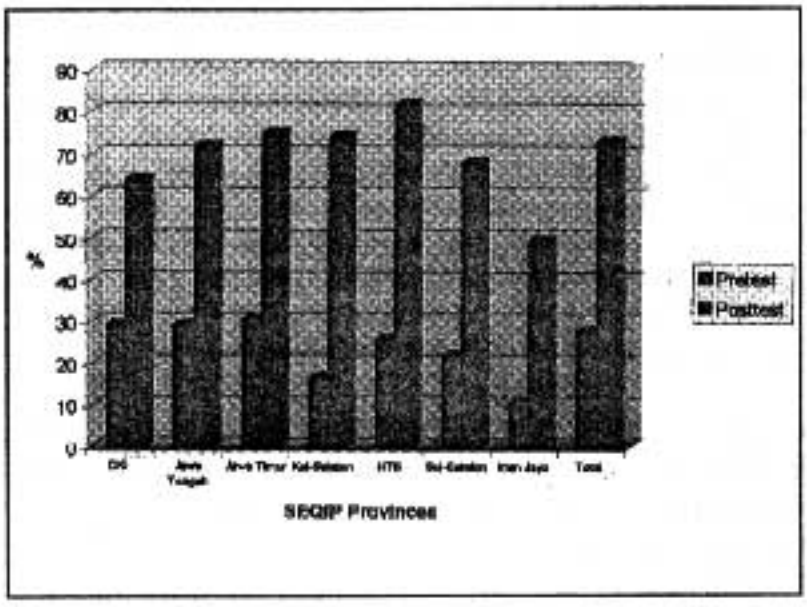
Besides the external evaluations, the project has set up its own impact monitoring system to gain reliable data that allow proper decision making on adjusting implementation procedures and materials[5]. The main monitoring aspects are:

- performance of trainers,
- training results,
- changes at classroom level,
- use of materials,
- learning results of the students.




*Consultants' Performance according to Cohort of Consultants*

From data collected so far the overall results can be assessed and regional differences in the projects impacts can be identified in baseline data, in gains after training, in innovations visible on classroom level, in use of equipment and materials, and in performance of different cohorts of trainers and of advisory teachers in their follow-up activities. The SEQIP monitoring results are compiled in an annual report available on request.




*Advisory Teachers' Performance Trained in Year 2001 (N=1088)*

## 4.4 Data on SEQIP

| | |
|---|---|
| *Terour Phase:* | *April 1994 - September 1996* |
| Technical Cooperation: | EUR 1.7 million |
| No. of provinces participating: | 5 |
| | DKI Jakarta, Riau, East Java, South Sulawesi, West Nusa Tenggara |
| No. of school clusters: | 25 |
| No. of schools: | 161 |
| *1st Phase Implementation:* | *October 1996 - December 2002* |
| Technical Cooperation: | EUR 6.3 million |
| Financial Cooperation: | EUR 12.3 million |
| No. of provinces participating: | 7 |
| | DKI Jakarta, Central Java, East Java, South Kalimantan, West Nusa Tenggara, South Sulawesi, Papua |
| No. of school clusters: | 3,000 |
| No. of schools: | 18,000 |
| No. of teachers participating: | 36,000 |
| No. of classes: | 72,000 |
| No. of students participating: | 2.2 million |
| No. of consultants: | 98 |
| No. of teacher handbooks distributed: | 18,000 copies |
| No. of student books for class 4, 5 and 6: | 3,000 copies for try-out |
| No. of manuals for experiments: | 16,000 copies |
| No. of experiment sets for teachers: | 18,000 |
| No. of experiment sets for students: | 9,000 |
| 2nd Implementation Phase: | January 2003–December 2005 |
| Technical Cooperation: | EUR 2.7 million |
| Financial Cooperation: | EUR 10.4 million |
| Indonesian budget: | IDR 57.2 billion (EUR 5.9 million) |
| No. of provinces participating: | 17 |
| | 7 previous provinces: DKI Jakarta, Central Java, East Java, South Kalimantan, West Nusa Tenggara, South Sulawesi |
| No. of school clusters: | 2,500 |
| No. of schools: | 15,000 |
| No. of teachers participating: | 30,000 |
| No. of classes: | 60,000 |
| No. of students participating: | 1.8 million |
| No. of experiment sets for teachers: | 18,000 |
| No. of experiment sets for students: | 9,000 |

Deleted:
Deleted:
Deleted:
Deleted: Participating provinces:
Deleted: Number ... [1]
Deleted: Number ... [2]
Deleted:
Deleted: TC Amount:...Euro ... [3]
Deleted: FC Amount:...Euro ... [4]
Deleted: Indonesian budget: ..... IDR (EUR .....)
Deleted: Participating teachers:
Deleted: Number
Deleted: Number of ... [5]
Deleted: Participating teachers:
Deleted: Number of ... [6]
Deleted: Participating
Deleted: Number ... [7]
Deleted: Number of exemplars ... [8]
Deleted: S... exemplars as ... printing ... [9]
Deleted: h
Deleted: H
Deleted: and books for self-
Inserted: s
Deleted : instructional
Inserted : instructions
Deleted : instructions
Deleted :
Deleted : accommodate 16,000
Inserted :
Deleted : exemplars
Deleted : copies
Inserted : copies
Deleted : s
Deleted : s
Deleted : TC Amount:
Deleted : Euro
Deleted : FC Amount:
Deleted : Euro
Deleted : .....
Inserted : .....
Deleted : .....
Inserted : EUR
Deleted : .....)
Inserted : .....)
Deleted :
Deleted : Participating
Deleted :
Deleted : n
Deleted : Number
Deleted :
Deleted : Number
Deleted :
Deleted : Participating
Deleted :
Deleted : Number of
Deleted : Participating
Deleted : s
Deleted : s

### 4.5 Things that went wrong in project implementation

- In the beginning the project has underestimated the importance of textbooks. It started only late to develop textbooks related to the teaching approach for self-studying and in order to compensate still existing weaknesses of the teachers. Several setbacks were experienced in the design phase of the textbooks especially in the composition of the author teams.
- The project is still struggling with an unbalanced relation between hardware and training cost. The hardware is the dominating cost factor. Only recently several districts have decided to reduce the hardware component and increase the use of materials from the environment for teaching.
- Involvement of higher education institutions to improve the teacher pre-service training with a similar approach was initiated only with delay.

### 4.6 Things that were not (yet) done

- Development of a regular science program in TV for children and for interested adults
- Development of an efficient information network to exchange experience and keep innovations going
- Qualification of district administrations to manage and maintain the quality of teaching and learning.

Contacts to SEQIP:

GTZ SEQIP
Ministry of National Education
Building E, 17th Floor
Jl. Jenderal Sudirman, Senayan
Jakarta 10270 Indonesia
Tel. (0062-21) 579 00 334, 572 5709, 572 5711
Fax. (0062-21) 572 5708
E-mail: seqipgtz@rad.net.id
Homepage: www.seqip.or.id
Contact persons:
Dr. Otto Hammes, GTZ SEQIP Team Leader
Drs. Husaini Wardi, M.Pd. (Head of Program Division and Interdepartmental Cooperation, Directorate of Kindergarten and Primary Education, Ministry of National Education)

**List of References**

1) Department of Foreign Affairs Republic of Indonesia. *Project Agreement No. D.0372/94/05 dated 03 November 1994*
2) *Departemen Pendidikan dan Kebudayaan, Direktorat Jenderal Pendidikan Dasar dan Menengah, Direktorat Pendidikan Dasar, Bagian Proyek Primary Education Quality Improvement Project (PEQIP) (1993/1994). Pedoman Pengelolaan Gugus Sekolah*
3) *Weber, Klaus, e.t al. (2001). Pelatihan Pemandu Bidang Studi (PBS) dan Guru IPA, Jakarta: Science Education Quality Improvement Project (SEQIP)*
4) *BMZ Evaluation 2-20 March 1997, Project Progress Review 12-28 August 1999, Project Progress Review 20-30 August 2001*
5) *Sulistiorini and Sudomo, J. (2003). Monitoring Report 2002, Jakarta: Science Education Quality Improvement Project (SEQIP)*