

## **CHAPTER 2 PROJECT BACKGROUND**



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In the background of the intention of the Government of the Philippines to give in-service training to science and mathematics teachers and to develop teaching materials for science and mathematics education, there is an economic problem that the country faces as an underlying cause, but the direct cause is the present insufficient condition of the education of the country as a whole, particularly that of science and mathematics.

Consisting of more than 7,000 islands scattered along 1,100 km from east to west and 1,800 km from north to south, the country's population is scattered over a wide area and because of a high rate of population growth, there has been a rapid increase in the number of school children, causing shortages of not only schools but also teaching materials, including textbooks.

The curriculums in the field of science and mathematics education for elementary and secondary schools were revised and their implementation are expected shortly in reflection of the government's policy that places an emphasis on science and mathematics education. But the in-service training of teachers in new science and mathematics curriculum methods to attain a step forward from the traditional education of "reading, writing and arithmetic" is considered insufficient in the elementary schools and the in-service training of educational leaders and the cultivation of teachers with necessary capabilities is also lacking in the secondary schools.

To make science and mathematics education more effective, experiments and practical exercises have been made compulsory, but the goal of a sufficient distribution of teaching materials for experiments and practical exercises for this purpose has not yet been realized despite the efforts of the government so far.

Therefore, it is necessary to procure teaching materials for experiments and practical exercises using locally available materials

and at the same time, it is also required the training in developing teaching materials and research in this field.

## 2-1 GENERAL CIRCUMSTANCES

### (1) Geography, Residents

- 1) The area of the country covers 299,000 km<sup>2</sup>, about the size of Honshu and Hokkaido Islands in Japan. However, it consists of 7,109 islands in total which are scattered in an equilateral triangle of ocean with about 1,100 km from east to west as a base and about 1,800 km from north to south as a height.
- 2) The population is estimated at about 48.1 million and the rate of increase per year at 2.71% from the census taken in 1980. Although family planning has gradually diffused in the general public, the rate of increase still remains very high.

According to the statistics on new school children, there has been an increase in number of 22.3%, from 7.02 million in 1972 to 8.59 million in 1982, an important factor preventing the educational environment from developing and improving, including the development of educational facilities and teaching materials.

### (2) Economy

The economy of the Republic of the Philippines grew at a substantial average rate of 6.3% during the period between 1972 and 1978, then started to slow down gradually because of the second oil crisis which occurred in 1979 and hovered at 1.6% in 1982 and 1.3% in 1983.

The political stability of the country following the assassination of Mr. Aquino (August 1983) accelerated the uncertainty of the economy and in 1984 the economic growth rate dropped to -5.3% with the inflation rate of 50.3% and an unemployment rate of 6.1%, worsening the economy by a large margin. Although it showed a slight improvement thereafter, the rate of economic growth in 1985 and the first half of 1986 continued to be negative.

The reconstruction of the economy is the most important subject that faces the Republic of the Philippines and efforts have been directed toward stabilizing the economy and improving productivity.

## 2-2 POLICY FOR PROMOTION OF SCIENCE EDUCATION

### (1) Science Education Development Plan - SEDP

The Government of the Philippines is paying attention to the importance of the roles played by the science education in the field of development of human resources required for the improvement of productivity in the country. SEDP was started as a joint project between DECS and DOST in 1982. Since then, this SEDP that was established after more than 3 years has made the following four points as the main objectives of its implementation:

1. Science education for the enhancement of the nation's morals and capacities that conforms to the demands of the nation.
2. Dissemination of knowledge of scientific technology to upgrade the standard of living of the citizens.
3. Awakening of interest in science and technology.
4. Upgrading the quality of science and mathematics teachers.

The final plan adopted upgrading the quality of science and mathematics teachers as one of its main objectives.

### (2) Medium-Term Philippine Development Plan, 1987-92

The Government of the Philippines has established a medium-term national development plan for the 6 years between 1987 and 1992 in which the construction of the National Learning Resource Center for Teacher Training in Science and Mathematics Education is included as one of the projects to be implemented.

The above 6-year plan also includes the Regional Centers for Science and Mathematics Training Programs as a related project.

## 2-3 PRESENT CONDITION OF SCIENCE AND MATHEMATICS EDUCATION

### (1) School Education System

The elementary and secondary school of the Philippines uses the 6- and 4-year system in which the first 6 years are called elementary school, which is compulsory, and the 4 years that follow are called secondary school or high school. Universities are 4-year higher educational institutions following secondary school education.

For admission to university, students are required to pass a qualification test for universities while they are in secondary school (high school). Applicants must also take the entrance examination of the university they wish to enter. Whether they are accepted or not will be determined based on the results of the test including their performance in secondary school.

In secondary school there is a vocational course in addition to a general course. Also there are many vocational schools, such as secretary training, seaman training, etc.

All the educational branches from elementary education to higher education fall within the jurisdiction of the Department of Education, Culture and Sports (DECS).

Fig. 1 shows the education system of the Philippines and Table 1 the actual condition of elementary and secondary education in the Philippines.

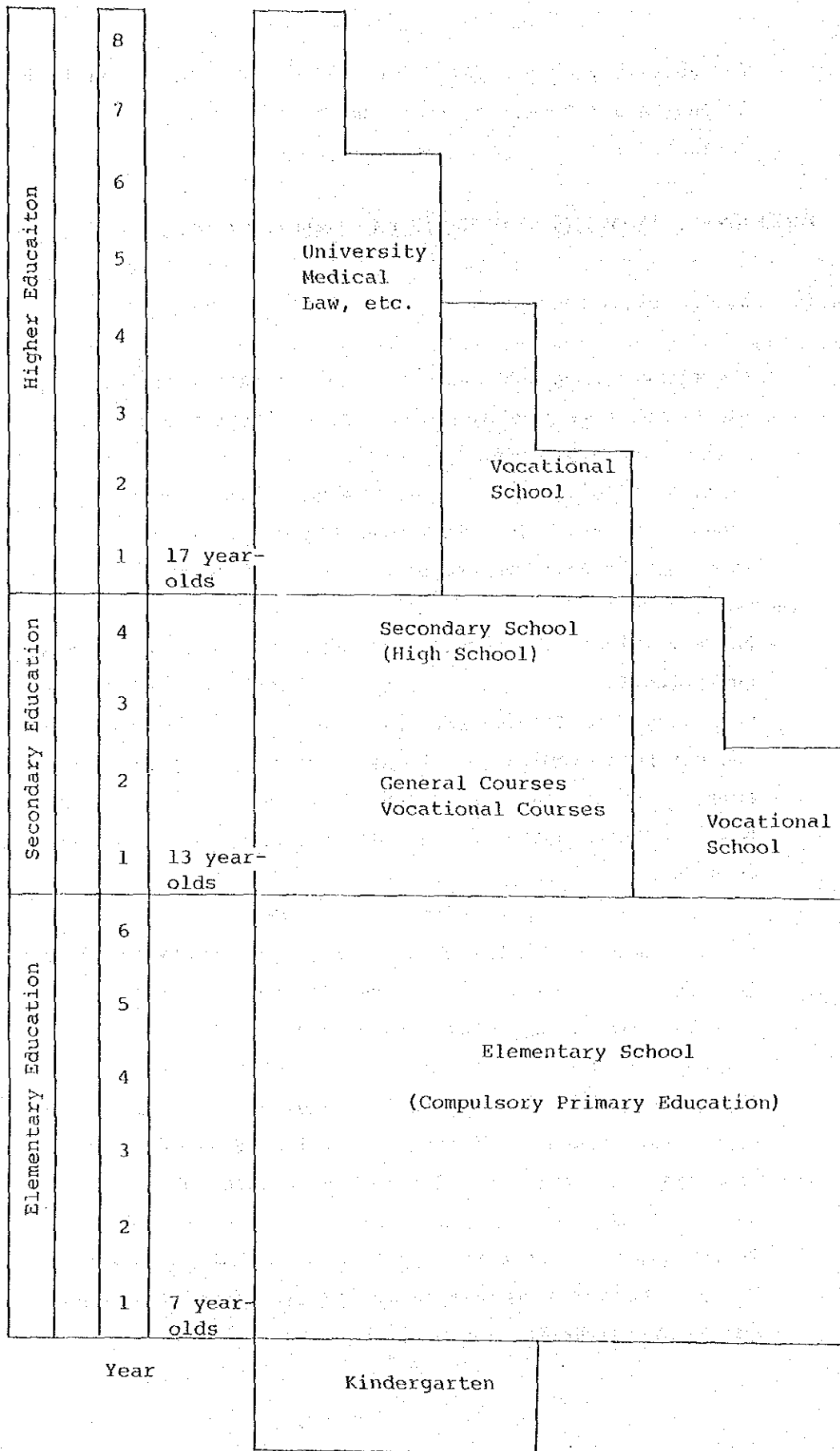


Fig. 1 Education System of the Philippines



Table 1 Actual Condition of Elementary and Secondary Education in the Philippines

	Elementary School	Secondary School
School years	6 years - compulsory	4 years - general course There is a vocational school starting from the elementary level
No. of schools 1984-85	About 31,500 - National or public About 1,200 - Private 32,700 in total	About 3,350 - National or public About 2,000 - Private 5,350 in total
No. of teachers (National or public) 1984-95	About 273,000 Of the above number, science and mathematics teachers make up about 120,000	About 59,000 mathematics teachers make up about 120,000
No. of students 1985-85	About 8,270,000 - National or public About 524,000 - Private 8,794,000 in total	About 1,957,000 - National or public About 1,366,000 - Private 3,323,000 in total
Percentage of school attendance	At the time of admission - about 100% At the time of graduation - about 60%	At the time of admission - about 60% of graduates of elementary school At the time of graduation - about 40% of the above
Teaching materials etc.	Textbooks are distributed at the rate of one per two students free of charge. There are some schools that teach in two shifts, mornings and afternoons.  The rate of budget for education to the national budget - 8.85% in 1983. 10.50% in 1984, 10.54% in 1985, 12.92% in 1986, showing a steady increase.	Textbooks are distributed at the rate of one per two students free of charge.

(2) Elementary Education

1) Curriculum

In elementary schools, the New Elementary School Curriculum was implemented in 1983. It is implemented from the first year and before 1988 the new curriculum will be implemented up to the 6th year. Compared with the former curriculum, the new curriculum places more emphasis on giving self-consciousness as a Filipino and the development of human beings who can contribute to the development of the nation, as well as inculcating the fundamentals of reading, writing, and arithmetic.

The school hours according to the new curriculum are as shown in Table 2.

For the first two years science education is deleted and a period of 40 minutes per day (200 minutes per week) is allotted for science education from the third year to the sixth year.

The former "Science" was changed to "Science and Health" incorporating subjects such as health, hygiene, nutrition, improvement of productivity, population problems, etc. The language used in the textbooks is English for "Mathematics" and "Science and Health" and Filipino (Tagalog) for other textbooks.

2) Present condition

Reportedly the dropout rate is very high with only 60% of the children admitted to schools completing the course of education. Particularly dropouts in the first and second years, said to reach 15%, are presenting problems. Since science education starts from the third year according to the new curriculum,

this means that such dropouts will receive no education in science, which require measures to be taken.

Another pressing problem in the educational society is that scholastic achievement in science and mathematics, particularly science, has been very poor.

Generally, various teaching materials are lacking, particularly in science education. Although a system in which personal effects and low-price experimental materials were to be used, there are almost no teaching materials for experiments and observation, seems to be causing a drop in the level of scholastic ability of children as they have no recourse but rote memorization.

Textbooks are furnished free of charge. Because of the efforts of the government to provide textbooks free of charge at the rate of one per to children in response to the former debacle of one textbook per eight children, textbook distribution has now reached the stage where there is one textbook per 1.57 children for science and one per 1.39 children for mathematics. Education authorities expect to enhance the effect of education by improving the quality of textbooks as well as increasing the quantity thereof.

With regard to the facilities and teaching materials for experiments, attempts have been made to redress a shortage both in items and quantity. The government, with assistance from UNICEF, decided to provide one or more sets of "Elementary School Science Kit" which consists of a set of experiment equipment for science education to public elementary schools, but in reality only 22% in Luzon, 34% in Visayas and 40% in Mindanao were able to receive the kit. Many schools depend upon makeshift equipment and efforts are being requested for

the fabrication and reproduction of apparatus using local materials.

A survey taken by Dumas et al in 1983 showed that the low level of science and mathematics education were due to the following reasons:

- (1) Since the teachers tend to stay on duty at the same grade level for a long time, their teaching methods become routine.
- (2) Teachers, especially those in charge of grades one through four are lack in aggressiveness when it come to teaching mathematics.
- (3) Teachers had no opportunities to receive in-service training within the preceding three years.

For the above reasons, there are doubts about the quality of their instruction.

The total number of elementary school teachers is 281,456 (1983-84), including public and private. Considering that science education starts in the third grade of elementary school, it is assumed that almost all of the approximately 180,000 teachers except those who are in charge of the first and the second grades will be candidates for the participation in the in-service training program.

Table 2 New Elementary School Curriculum

Year (grade)	1						2						3						4						5						6					
	Time (Min.) Day	Time (Min.) Week	Time (Min.) Day	Time (Min.) Week	Time (Min.) Day	Time (Min.) Week	Time (Min.) Day	Time (Min.) Week	Time (Min.) Day	Time (Min.) Week	Time (Min.) Day	Time (Min.) Week	Time (Min.) Day	Time (Min.) Week	Time (Min.) Day	Time (Min.) Week	Time (Min.) Day	Time (Min.) Week	Time (Min.) Day	Time (Min.) Week	Time (Min.) Day	Time (Min.) Week	Time (Min.) Day	Time (Min.) Week	Time (Min.) Day	Time (Min.) Week										
Character building activities	20-30	100-150	20-30	100-150	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100	20	100										
Pilipino	60	300	60	300	60	300	60	300	60	300	60	300	60	300	60	300	60	300	60	300	60	300	60	300	60	300										
English	60	300	60	300	60	300	60	300	60	300	60	300	60	300	60	300	60	300	60	300	60	300	60	300	60	300										
Mathematics	60	300	60	300	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200										
Civics and Culture	40	200	40	200																																
History/Geography/Work Ethics					40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200										
History/Geography/Civics																																				
Science and Health					40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200										
Arts and Physical Education					40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200	40	200										
Home Economics and Livelihood Education																																				
Total	220-230	1100-1150	220-230	1100-1150	300	1500	340	1700	360	1800	360	1800	360	1800	360	1800	360	1800	360	1800	360	1800	360	1800	360	1800										

(To be implemented from the first year in 1983 and will be implemented to the sixth year in 1988 to complete the program.)

### (3) Secondary Education

#### 1) Curriculum

Although the secondary education is at present, based on the curriculum that was revised in 1973, a new curriculum to be implemented in 1989, to follow the completion of the New Elementary School Curriculum in 1988, is being revised.

The textbooks and lessons in the secondary education for science and mathematics education are in English and other subjects are also mostly in English.

In the curriculum of science and mathematics education, "Comprehensive General Science" in the first year, "Biology" and "Physical Geography" in the second year, "Chemistry" and "Physics" in the fourth year are planned to be completed. Table 3 shows the overall curriculum of secondary education, noting that there is a difference in the unit hours of lessons of vocational and home economics and livelihood education depending on whether or not it is a general course school or a vocational (commerce and industry and agricultural and fishery) or a technical school. Environmental engineering is included in "Biology" and "Chemistry," and as optional subjects, "Astronomy" and "Botany" are studied in the third year and "Applied Chemistry" and "Applied Physics" in the fourth year.

The rate of scientific subjects taken in general schools to total school hours is 11% in the first year, 10-10.7% in the second year, 13.5-15.2% in the third year and 13.5-15.2% in the fourth year. On the other hand, in scientific schools the percentage becomes higher: 17% in the first year, 24% in the second year, 26% in the third year and 25% in the fourth year.

2) Present condition

With regard to scholastic achievement in science and mathematics of the graduates of the secondary school specifically, it is said that scholastic achievement in mathematics is lower than that of other general subjects including the national language and that in the science falls far short of that in mathematics.

Generally it is judged that the students lack in ability to predict, reason and experiment, suggesting the needs for education to develop such abilities. The cause of this may be considered to be an undesirable learning environment and poor teachers.

The lack of apparatus for experiments and practical exercises, teaching materials and facilities required for science and mathematics education is felt far more serious beyond elementary school.

Although textbooks are distributed among the students at the rate of one per 2.14 students for science and one per 2.18 students for mathematics in the nationwide average, the survey (conducted in 1983 by Mr. F. Guiang), on the facility and apparatus, etc., of 1,209 schools chosen from a total 3,298 schools reveals the following results.

Only about 50% of the necessary number of science laboratories are available and because of this in many cases lessons are being given using general course or practical arts classrooms.

The experiment apparatus in the laboratories consists only of about 50 items. Therefore, to procure the required apparatus, about 1/3 of the public secondary schools are asking the vocational training schools to

assist them by fabricating apparatus and using them in teaching.

The experiment kits for general science produced in the Philippines and furnished with the assistance of UNICEF in 1978 were distributed to secondary schools in various localities, but the assistance was suspended due to depletion of funds after the kits were distributed to 61% of the schools in Mindanao, 37% in Visayas and 21% in Luzon and kits for biology, chemistry and physics have not even been fabricated.

UNICEF strongly supports the use of handmade apparatus, and the use of such apparatus should be carefully considered as it represents the dominant trend in science and mathematics education around the world.

However, although handmade apparatus may be improvised, teachers in charge of science and mathematics must also acquire sound teaching method and experimental techniques.



Table 3 Curriculum for Secondary Education

Education	1st year		2nd year		3rd year		4th year	
	Unit	Min/wk.	Unit	Min/wk.	Unit	Min/wk.	Unit	Min/wk.
Communication arts (English)	2	300	1	180	1	180	1	180
Communication arts (Filipino)	1	180	1	180	1	180	1	180
Social studies	1	180	1	180	1	180	1	180
Science	1	180	1	180	2	300	2	300
Mathematics	1	180	1	180	1	180	1	180
Practical arts/ vocational course	1	300	1	300	1	300	1	300
Electives (Academic/vocational)	-	-	1	180/ 300	2	360/ 600	2	360/ 600
Youth development training (I-III)	1	300	1	300	1	300		
Citizen army training (IV)							1	300
Total	8	1620	8	1680/ 1800	10	1980/ 2220	10	1980/ 2220

(4) Present Condition of Science and Mathematics Teachers

1) Education of teachers

The students who wish to enter colleges including teacher's college are subject to take the common college entrance qualification examination called NCEE (National College Entrance Examination) and in addition are required to take the independent entrance examination of each university one wishes to enter.

Admission is then determined based on the results of the two examinations and the scholastic achievements of the student in secondary school.

In 1984, about 430,000 students out of 750,000 candidates for the NCEE qualified for entrance into college.

According to statistics released by the Department of Education, Culture and Sports, as of 1984, out of 882 national, public, and private universities throughout the country, 471 universities offer teacher training courses.

The majority of teachers have been in service for more than 10 years and have charge of 12-28 units, i.e. approximately 21 units per term on average.

Most students enrolling in the teacher training courses fall in the lower grade in the order of the achieved performance records of NCEE with 83.4% being girls, 16.6% boys.

The number of graduates of the teacher's education course was 22,706 in 1984.

According to the general outline of guidance of the Department of Education, Culture and Sports, the required subjects and units that have to be completed before becoming a teacher of elementary and secondary school are as follows:

<u>Subjects to be completed</u>	<u>Elementary Course</u>	<u>Secondary Course</u>
. General education subjects	102 units	93 units
. Specialized education subjects	36 units (minimum)	30 units (minimum)
. Electives (optional) subjects	0	0
. Special study subjects		
a) Special study subjects	18 units	24 units
b) Secondary special study subjects	-	9 units
<b>Total</b>	<b>156 units</b>	<b>156 units</b>

Teaching practice is implemented in the high school affiliated with the university in the latter term of the third year and in the schools outside the university in the latter term of the fourth year in many cases.

In the case of Bachelor of Elementary Education (BEED) that becomes a qualification to be an elementary school teacher, the Department of Education, Culture and Sports prescribed a new curriculum in 1982 so as to give teachers the qualifications required for lessons in conformity with the application of the new elementary school curriculum, as follows:

<u>Subject</u>	<u>No. of Units</u>	<u>Percentage of the Total curriculum %</u>
English	21	14.6
Spanish	12	8.3
Pilipino	12	8.3
Science and health	11	7.6
Mathematics	9	6.3
Humanities	9	6.3
Social sciences	27	18.7
Home economics and practical arts	37	4.2
Professional education	37	25.7
Total	144	100.0

The curriculum for students working to be secondary school teachers is being studied together with a new secondary school curriculum, of which an increase in the specialized subjects, particularly in units to be completed for science, is being studied.

## 2) Teacher qualifications

To qualify to be a teacher, one has to graduate from a four-year course for teachers in college, and in addition must pass the national examination called the Board Examination for Teachers.

However, the door is also kept open for those who graduate university specializing in engineering and pharmaceuticals and who complete 18 units of educational subjects.

## 3) Present condition of science and mathematics teachers

Science and mathematics teachers are said to be unqualified to teach required subjects for many of them are not specialized in the subjects they teach.

According to a survey conducted by the Department of Science and Technology, the rate of science and mathematics teachers who majored in the subjects they teach is as follows:

<u>Subject</u>	<u>Rate of teachers majored in the subject (%)</u>
General integrated science	53.8
Biology	52.6
Chemistry	32.2
Physics	25.0
Mathematics	61.5

In other words more than 50% of the total are not specialized in the subjects they teach, suggesting that in-service training is badly needed.

Teachers who have been in service for more than 10 years, also need to acquire new knowledge, again suggesting the need for in-service training.

In this connection, the number of teachers who are required to be given in-service training for the above reasons is said to be 9,457 persons as shown in attached Supplement-1.

One of the reasons behind the insufficiency of science and mathematics teachers is a shortage of students who wish to be science and mathematics teachers. The percentage of students who wish to be science and mathematics teachers, particularly of chemistry and physics, is nearly the lowest among those who desire to be teachers.

Another reason is that pay for teachers is low compared with workers in private enterprises, and their social position is not highly evaluated. Therefore, it is

difficult to attract capable candidates, resulting in a lowering of the quality of teachers.

With regard to the quality of teachers, there are the questions of the quality of teachers educator in teacher education schools and the educational environment as well as the upgrading of the leaders who are in the position of giving guidance to teachers.

## 2-4 IN-SERVICE TRAINING OF SCIENCE AND MATHEMATICS TEACHERS

### (1) Training of Teachers Already In Service

To give guidance to teachers already in service, supervisors are assigned to the Regional Education Learning Center (RELC) of the Department of Education, Culture and Sports who engage in giving guidance to teachers on all subjects of education.

There is one of the above mentioned RELC in each locality and supervisors at 12 RELC in total have control over teachers throughout the country for guidance.

As for science and mathematics education, the Department of Science and Technology, whose jurisdiction covers science and technology education, is deeply involved in addition to the above mentioned authorities and local major universities have their Regional Science Teaching Centers-RSTC, which are being financially assisted by the Department of Science and Technology. At present there are 11 RSTC's throughout the country. Fig. 2 (page 49) shows the posting of supervisors of RELC and RSTC.

The success of the in-service training of science and mathematics teachers is considered to depend largely on the depletion of the local agencies of MECS and RSTC's.

(2) Institute for Science and Mathematics Education Development - ISEMD

The in-service training of science and mathematics teachers started in 1969 in line with the national policy and has been carried out with ISMED as a center.

This Institute belongs to the University of the Philippines and is a science education organization whose main role includes the development of curriculum and teaching materials for science and mathematics education, research on education, training of teachers, provision of services to teachers and those who are concerned with education.

Its present condition and records of experience for in-service training of science and mathematics teachers are as follows:

1) History

1964 Established as the Science Teaching Center. With the assistance of the Ford Foundation, it started to compile 40 volumes of textbooks on science and mathematics education, guidance manuals for teachers, etc., the first generation of textbooks edited by this Center.

1967 Renamed the Science Education Center (SEC)

1969 SEC was attached to the University of the Philippines. At the same time the textbooks compiled by SEC were adopted as official textbooks for use in public schools and SEC became the central organization of the Regional Science Education Centers.

- 1971 To support the activities of SEC, the Science Education Promotion Fund (Pundasyon) was established.
- 1974 SEC was appointed as a curriculum development center under the National Textbook Project and prepared 20 different types and 40 volumes of textbooks in total, the second generation of textbooks edited by this Center.
- 1979 With the assistance of professionals dispatched by JICA (for one year) SEC engaged in research on audio-visual education.
- 1983 Renamed as Institute for Science and Mathematics Education Development (ISMED). Received JICA professionals (for 3 years) and a microcomputer group was formed.

To present.

From 1979, a number of pieces of equipment have been given and JICA professionals have been dispatched to contribute to the Center by cooperating in science education and the research and development of teaching materials.

## 2) Main activities

1. Research and development of curriculum for science and mathematics education.

Development of curriculum meeting the actual circumstances of the Philippines with editing of textbooks a center has been implemented.



2. Research and development of education and teaching materials.

With 9 working groups actively doing research in their respective specialized field.

3. In-service training of teachers

In-service training has been implemented not only for teachers in general, but for a wide range of people including principals, supervisors of science and mathematics education, and leaders of the Regional Science Education Center. The records of performance will be described later.

4. Activities for spreading education

Activities, such as holding open lectures, participating in science exhibitions, publishing official bulletins (of ISMED), etc., have been performed.

5. Cooperation with related organizations

Close cooperation between the Science Promotion Institute, scientists and the Department of Education, Culture and Sports has been maintained by participating in various activities. For example, a periodic Toys and the Mathematics Olympiad as part of the activities related to science and mathematics, establishment and cooperation in implementing the in-service training program of science and mathematics teachers, etc.

Its cooperation extends to that with the Regional Science Education Centers, College of Education and

College of Science of the University of the Philippines.

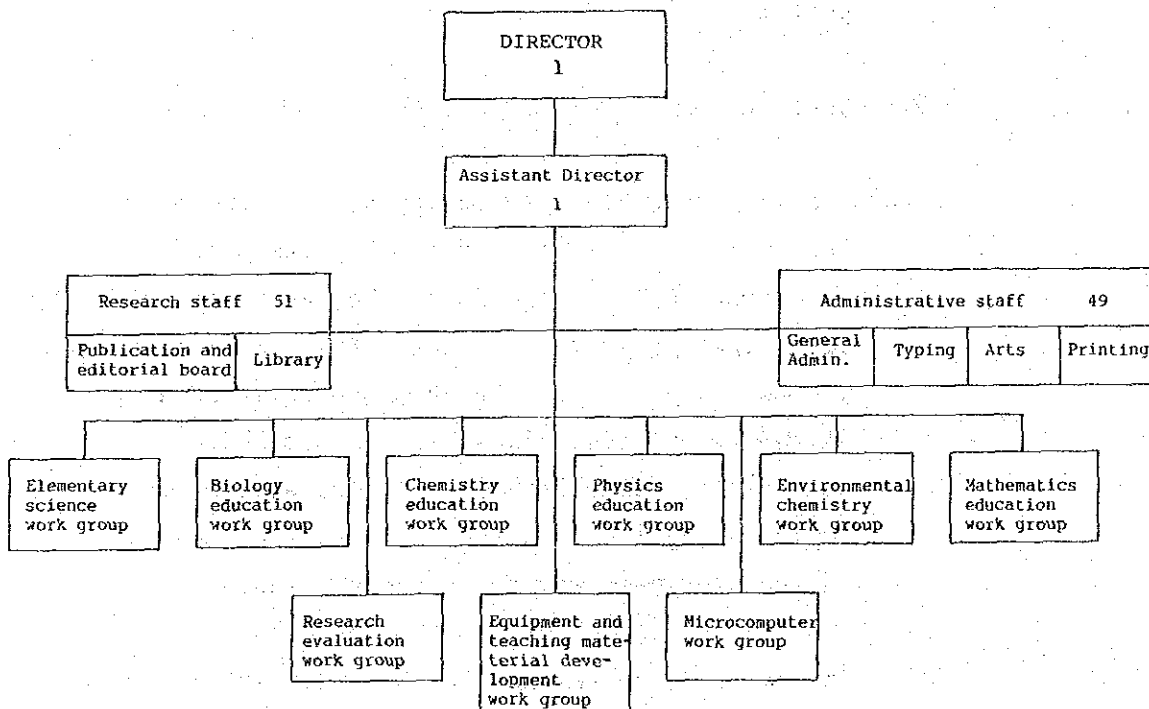
6. Cooperation with foreign countries.

An exchange of staff members with SEAMEO-RECSAM in Malaysia has been in practice. In addition, activities, such as participation in seminars sponsored by UNESCO, receiving of trainees, etc., have been undertaken.

3) Staff and Organization

At present, the organization is composed of 51 research staff members, 49 administrative staff members, 100 in total with Dr. Jesuita as a director, which is divided into the following groups to engage in various activities:

Organization Chart of ISMED



4) Records of performance of in-service training of science and mathematics teachers

The number of teachers who have been given in-service training during the past several years was, as follows:

1983	24 courses	1,077 in total (including 600 during circuit training)
1984	19 courses	294 in total
1985	20 courses	289 in total

In 1986, 670 including 74 trainees from other countries in 20 courses were trained through packaged courses, mini-courses and seminars, etc.

Supplement-2 lists the contents, period, and the number of participants of each course in 1986.



## CHAPTER 3 CONTENTS OF PROJECT



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### 3-1 PURPOSE OF PROJECT

The Government of the Philippines, in order to cultivate the human resources required for higher productivity in the Philippines, is trying to achieve the re-education of science and mathematic teachers who are directly involved in the improvement of the level of science and mathematics education.

The project aims at the establishment of the Science and Mathematics Teacher Training Center for re-education of science and mathematics teachers who cannot be fully active with existing facilities and equipment as well as for development and preparation of teaching materials to meet the current requirements.

### 3-2 SUMMARY OF PROJECT

#### (1) Target of this Center

- 1) To bring science education in the Philippines to a level closer to that of world standards.
- 2) To undertake widespread quality science and mathematic programs without corresponding dilution of content and style of methodology.
- 3) To improve science teacher training that will produce efficient teachers who in turn will be able to develop Filipino citizens better suited to cope with the society of the 21st century.
- 4) To train science and mathematic educators in the use of multi media for greater effectiveness of instruction, deeper understanding as well as better retention of learning.

(2) Purpose of Activities of this Center,

- 1) To improve training programs for key educators in science and mathematics through an expanded teacher training program that incorporates new developments in content, methods, equipment, educational technology, research and evaluation and use of information science equipment.
- 2) To integrate current educational reforms at elementary and secondary levels with the training of key personnel in science and mathematics education particularly as these pertain to the training in the use of the new curriculum and instructional materials being prepared by the Instructional Materials Corporation (IMC, formerly Textbook Board Secretariat).
- 3) To improve the competence of teacher educators, administrators, supervisors, science/mathematics department heads in science and mathematics content to more updated levels.
- 4) To develop the competence of teacher educators, supervisors, department heads in producing relevant learning materials more appropriate for their respective regions.
- 5) To develop the competence of teacher educators in conducting educational researches as are needed to provide fresh inputs into the science and mathematics teaching programs.

(3) Execution Plan

The implementation of this project will be such that the University of the Philippines will cooperate in the joint





. Roles

- . Implement policies and procedures for promoting coordination among the concerned agencies and institutions.
- . Promotes cooperation among parties involved in teacher training as well as with other educational bodies and institutions.
- . Monitors and evaluates the project.
- . Reviews the reports of the Coordinating Committee.

② Coordinating/Management Committee

. Constituent members (10)

- . Undersecretary of DECS --- Chairman
- . Undersecretary of DOST --- Chairman
- . Undersecretary of DECS in charge of overseas cooperation --- Vice-Chairman
- . Director of INNOTECH
- . Director of ISMED
- . Chief of Higher Education Bureau of DECS
- . Chief of Secondary Education Bureau of DECS
- . Chief of Elementary Education Bureau of DECS
- . Chief of Department of Education of UPS
- . ISMED Staff

. Roles

- . Provides the implementing guidelines for the various activities of the project in accordance with the policies set forth by the steering committee.
- . Evolves a 5-year plan of action.
- . Sees to the implementation of planned programs for the full utilization of the center.
- . Coordinates, monitors and evaluates the various activities of the project.
- . Reports to the Steering Committee on items relating to the project.

. Plays roles assigned by the Steering Committee.

2) Various Organizations Concerned and Their Roles

① DECS

- . Selects participants (teacher leaders, supervisors, science educators) for the training programs at the NLRCTT.
- . Provides financial support to the public sector participants (salary, travel, allowance) for national and regional level training programs.
- . Follows up participants. (Including issuance of requests for participation in training, ranking after training, etc.)
- . Conducts training programs at the division and school levels.
- . Bureau of Elementary Education, Secondary Education and Higher Education of the Department of Education, Culture, and Sports will play the above-mentioned rolls. Refer to Supplement-4 for the Organization Chart.

② DOST

- . Contributes funding to national training programs at the NLRCTT (cost of training and related financial support --- per diem, book allowance).
- . Provides financial support to the training program in the regional centers.
- . Coordinates and supervises the contents of the training program.
- . Provides science and technology policy into the training program.

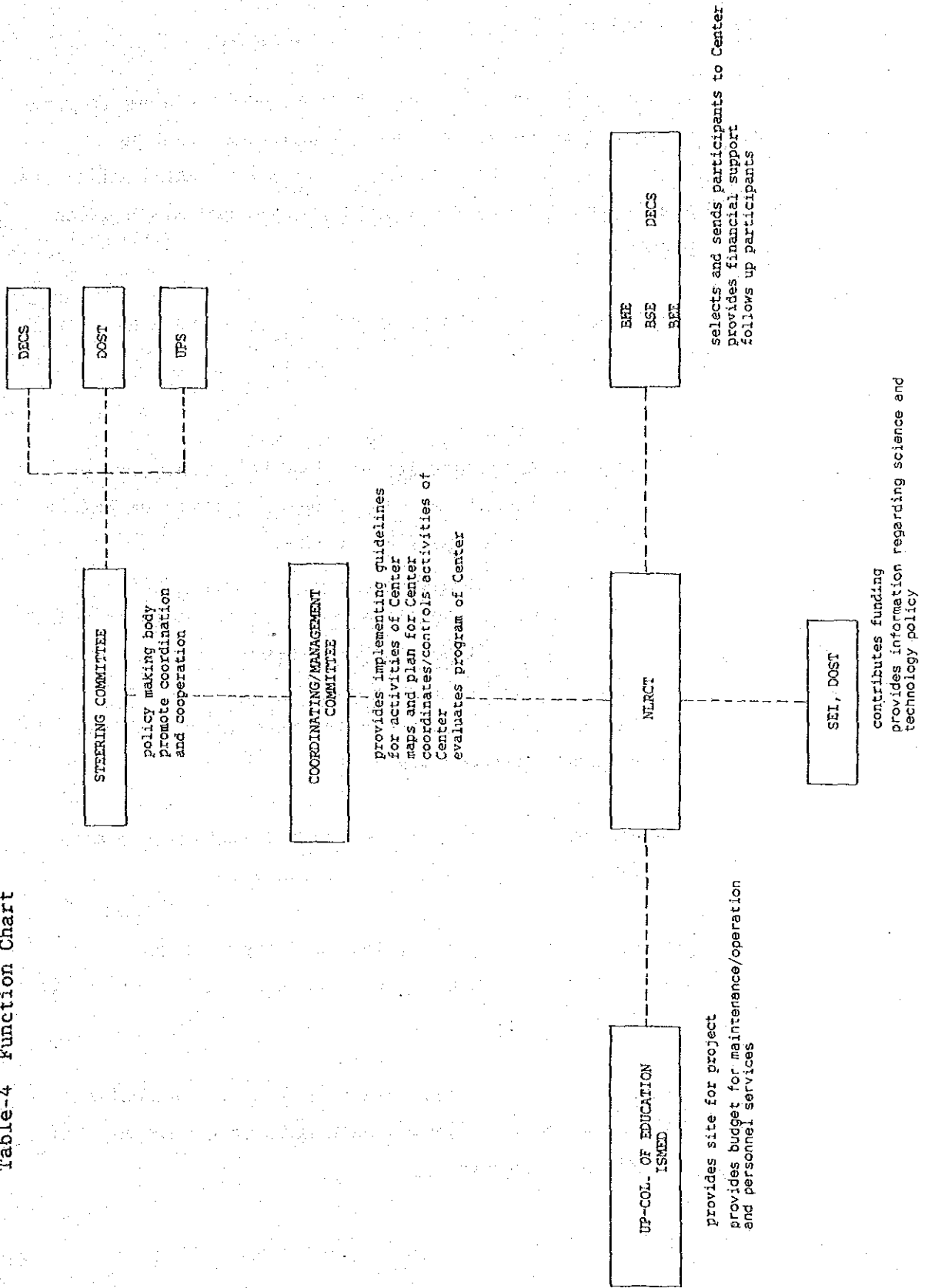
- . The Science Promotion Institute of the Department of Science and Technology will play the above roles. Refer to Supplement-4 for the Organization Chart.

③ UP System

- . Provides a site for the PROJECT.
- . Provides financial support for MOE and personnel services of the project.
- . Operates the project and reports to the Coordinating/Management Committee. (ISMED Director)
- . Provides secretariat support to project. (ISMED)
- . Implements/conducts the training programs at the Center. (ISMED)
- . Initiates/organizes new science/science education courses for teachers which are lab/activity oriented. (ISMED)
- . Conducts activities/programs designed for public education, upgrades teaching competencies of teachers and their knowledge and avails its experts and information to the public and the teachers. (ISMED)
- . Participates in the programming, conduct and accreditation of courses. (College of Education)
- . Of the four campuses of the UP System, the Diliman Campus will play the aforementioned role and the ISMED located on the Diliman Campus will be the direct implementing organization. Refer to attached Supplement-4 for the organization of UP System, for the Diliman Campus of UP System and for ISMED.

Table 4 shows the Function Chart of various organizations concerned and committees.

Table-4 Function Chart



#### (4) Training Activities

##### 1) Objective

The overall and major objective of the training programs is to modernize science and mathematics teaching by concentrating effort at key personnel: teacher educators, head teachers, supervisors of science and mathematics programs.

Specifically, the training programs seek to achieve the following:

- ① Train teacher educators to use new approaches/strategies in teaching, e.g., use of games, simulations, issue-based science education (multi-disciplinary approach).
- ② Train teacher educators and head teachers in using new types of laboratory equipment.
- ③ Train teacher educators in improvising equipment for laboratory demonstrations.
- ④ Improve the skills of science/mathematics teacher educators in educational technology.
- ⑤ Train head teachers, teacher educators and supervisors in using personnel computers effectively in teaching.
- ⑥ Train teacher educators with a better education guidance that focuses on cognitive development of Filipino children.

- ⑦ Train supervisors in new developments in science and mathematics and in effective supervisory techniques relative to these developments.
- ⑧ Train teacher educators/supervisors/teachers in the use of accessible and appropriate materials in teaching; familiarize them with the concept of community-based science education instruction.
- ⑨ Train teacher educators/supervisors for knowledge of research operation in all areas of science and mathematics education.
- ⑩ Train teacher educators in developing instructional materials for use in their own schools in training other teachers.
- ⑪ Train teacher educators in developing necessary A-V instructional materials for use in teacher training in the Regional Science Teaching Centers and other teacher education institutions.

## 2) Contents of training

A revision of the curriculum for science and mathematics is in progress and that for elementary schools will be completed in 1988. From 1989 a new curriculum will also be used in secondary schools. In the first year the curriculum requires the study of general science and then introduces biology, science and physics in higher grades. Most hoped for awaiting the completion of the new center is the training for leader education in general science.

In the in-service training of teachers, while the contents of the curriculum will be given serious consideration, the general topics of natural science that form the background of the curriculum will be taken up and will also include the learning of skills for basic handling of experiments and for development of teaching materials to be used for metalwork, woodwork, glasswork, etc.

The general view of the training in each subject centered around the curriculum is as follows:

### Physics:

Physical quantity measurement, physical properties, dynamics, electricity, electric batteries, electrolysis, magnetism, light, the spectrum, lasers, wave motion, sound, molecular movement, atoms, atomic nuclei, nuclear reaction, nuclear power generation, etc.

### Physical Volcanoes, Geography:

Topography, geology, rock, earth, topographical changes, climates, weather maps, atmospheric circulation, atmospheric pressure, clouds, meteorological observation, typhoons, astronomical observation, handling the telescope, air pollution, water and soil, ecology,



treatment of water and sewage, circulation of materials, consumption of energy, food chains, etc.

**Chemistry:**

The periodic table of elements, material quantity, atoms, molecules, solutions, colloids, equilibrium, reaction, bonds, electro chemistry, energy, organic chemistry, polymer chemistry, petroleum, nucleic acids, proteins, fermentation, etc.

**Biology:**

Basic handling of the microscope, cells, embryology, ecology, heredity, evolution, optical composition, respiration, micro-organisms, fermentation, etc.

**Primary Mathematics:**

Numbers, forms, addition, subtraction, multiplication and division, proportion, percents, graphs, angles, area, volume, etc.

**Mathematics:**

Plane geometry, solid bodies, logarithms, quadratic equations, probability, differentials, integral calculus.

The use of computers, the use and preparation of audiovisual aids, training in workmanship skills and micro-teaching, etc. in each subject will be used from time to time as needed during the training course for each subject.

3) Training course

The following categories of courses will be offered in the NLRCTT.

- ① Training courses for upgrading and updating trainers' background in subject matter (mathematics,

biology, earth science, chemistry, physics, and elementary science)

- ② Training courses in instructional materials development, both print and non-print including low cost materials and equipment
- ③ Training courses on approaches, strategies and techniques in science/mathematics teaching
- ④ Training courses in supervision of science and mathematics
- ⑤ Training courses in research and evaluation
- ⑥ Training courses that develop specific competences

4) Duration of training

① Short-term training:

This is called a mini course. The duration will be about a week more or less and Saturdays will frequently be used. Half-day lessons or full-day lesson will be available to make it convenient for teachers to attend training. Those who will take this type of training are expected to be teachers from schools within 4 hours one way of Manila to allow them to visit Manila and return in one day. This type of training in many cases will be given on one theme only. The courses include the following:

Lecture mini course ..... 18 hours  
Combination of lecture and  
experiments mini course .. 30 hours

② Long-term training

This is called a packaged course. Normally, the duration of this type of training is one month as a

unit. The training given for regional teachers is in principle this type of course. The course consists of a combination of several mini courses. The courses include the following

1-unit lecture mini course + 2-unit  
lecture and experiment mini courses  
.... 78 hours

3-unit lecture mini course + 1-unit  
lecture and experiments mini course  
.... 84 hours

3-unit lecture and experiments  
mini courses .... 90 hours

In addition, the DECS packaged course shall include time for guided project work or individual study wherein the participants can make use of the well-equipped, up-to-date library, workshops and other facilities.

- ③ Mobile training out of the Center:  
The training using small bus loaded with training materials and moving to local areas.

5) Training schedule

The table below shows the yearly schedule of long-term training (packaged course-P) and short-term training (mini course-M):

Table of Yearly Training Schedule

	Physical geography	Biology	Chemistry	Mathematics	Physics	Primary Mathematics	Primary science	Total
Jan	P	M			P	M		2P+ 2M
Feb		P	M			P	M	2P+ 2M
March			P	M			P	2P+ 1M
Apr-May	M2	M2	M1	M2	M1	M1	M1	4M
July	M			P	M			1P+ 2M
August	P	M			P	M		2P+ 2M
Sept		P	M			P	M	2P+ 2M
Oct			P	M			P	2P+ 1M
Nov				P	M			1P+ 2M
								14P+18M

For reference, the table below shows the schedule to be implemented in the future.

A Maximal Schedule

	Physical geography	Biology	Chemistry	Mathematics	Physics	Primary Mathematics	Primary science	Total
Jan	P		M	P		M	P	3P+ 2M
Feb	M	P		M	P		M	2P+ 3M
March		M	P		M	P		2P+ 2M
Apr-May	P		M	P		M	P	3P+ 2M
July	M	P		M	P		M	2P+ 2M
August		M	P		M	P		2P+ 2M
Sept	P		M	P		M	P	3P+ 2M
Oct	M	P		M	P		M	2P+ 2M
Nov		M	P		M	P		2P+ 2M
								21P+21M

6) Number of trainees

① Fixed number of trainees for each course:

In principle, 30 trainees, but in some cases it will be possible to accept 50 trainees.

② Number of scheduled yearly trainees:

According to the Table of yearly training schedule, 30 trainees x 14 courses = 420 trainees of which a little less than 400 subtracting the number of trainees from the greater Manila Region (about 30 trainees) accounts for local participants in long-term training. The number of local participants scheduled per month is 60.

For short-term ..... 30 trainees x 18 courses  
training = 540 trainees, 960 in  
total yearly

The table below shows the number of trainees scheduled by month to be received yearly:

	Jan	Feb	Mar	Apr-May	Jul	Aug	Sep	Oct	Nov	Total
Long-term training	60	60	60		30	60	60	60	30	420
Short-term training	60	60	30	120	60	60	60	30	60	540

The table below shows the scheduled number of elementary and secondary school teachers (for elementary school teachers, yearly scheduled number):

National level  
 (Number of teachers to participate in long-term training at this Center)  
 ... 2 x 13 regions x 8 courses = 208 teachers

State level  
 ... 2 x 127 divisions x 5 courses = 1,270 "

Regional level  
 ... About 20,500 "

(For secondary education, yearly scheduled number of teachers to be trained between 1988 and 1992)

	<u>1988-1989</u>	<u>1989-1992</u>
Required No. of instructors (scheduled No. of trainees for long term training at this Center)		
National level - Public	468 (10.4)	1,872 (416)
Private	468 (104)	1,872 (416)
Required No. of instructors		
Regional level	4,572	18,288
Required No. of teachers to be trained	22,270	76,177

Numbers in parenthesis are the scheduled number of science and mathematics teachers in the secondary education for the long term training. The number of trainees by subject in the secondary education is shown on next page. (Table-5)

Table-5 The breakdown of trainees for long-term training is shown below:

<p><u>I. English &amp; Pilipino</u></p> <ol style="list-style-type: none"> <li>1. Dept. Head (English)</li> <li>2. Dept. Head (Pilipino)</li> <li>3. Regional English Supervisor</li> <li>4. Regional Pilipino Supervisor</li> <li>5. TTI English Specialist</li> <li>6. TTI Pilipino Specialist</li> <li>7. Teacher English Specialist</li> <li>8. Teacher Pilipino Specialist</li> </ol>	<p><u>II. Math. &amp; Science</u></p> <ol style="list-style-type: none"> <li>1. Dept. Head (Math.)</li> <li>2. Dept. Head (Science)</li> <li>3. Regional Math. Supervisor</li> <li>4. Regional Science Supervisor</li> <li>5. TTI Math. Specialist</li> <li>6. TTI Science Specialist</li> <li>7. Teacher Math. Specialist</li> <li>8. Teacher Science Specialist</li> </ol>
<p><u>III. HMT &amp; Work Experience</u></p> <ol style="list-style-type: none"> <li>1. Dept. Head (HMT)</li> <li>2. Dept. Head (Work Experience)</li> <li>3. Regional HMT Supervisor</li> <li>4. Regional WE Supervisor</li> <li>5. TTI PA Specialist</li> <li>6. Teacher HMT Specialist</li> <li>7. Teacher WE Specialist</li> <li>8. TTI WE Specialist</li> </ol>	<p><u>IV. SS, PEHM, &amp; Values Education</u></p> <ol style="list-style-type: none"> <li>1. Dept. Head (SS)</li> <li>2. Dept. Head (PEHM)</li> <li>3. Dept. Head (Values)</li> <li>4. Regional SS. Supervisor</li> <li>5. Regional PEHM Supervisor</li> <li>6. Regional Values Supervisor</li> <li>7. TTI SS Specialist</li> <li>8. TTI PEHM Specialist</li> <li>9. TTI Values Specialist</li> <li>10. Teacher SS Specialist</li> <li>11. Teacher PEHM Specialist</li> <li>12. Teacher Values Specialist</li> </ol>

Abbreviation:

TTI ..... Teacher Training Institute  
HMT ..... Home Management and Technology  
SS ..... Social Studies  
PEHM .... Physical Education, Health and Music

The number (104 teachers) of science and mathematics teachers in the secondary education for the long-term training at this center is calculated based on the following.

The number of trainees in science and  
mathematics ----- 8 (Table II)  
The number of regions in the Philippines ----- 13 regions  
Therefore, 8 x 13 regions = 104 teachers.

7) Participants in training

① Long-term training:

The participants are selected from the RELC and RLS of each region by the DECS and DOST.

All the expenses for training will be borne by the DECS and DOST.

In the case of private school teachers, expenses may be borne by individuals, subsidized by the DOST or financed by private funds, etc.

② Short-term training:

To be applied individually after distributing guide books to schools. Expenses for training will be borne by participants.

The flow of the selection of participants in the training of elementary, secondary and higher school teachers is shown below:

Since elementary education is under the jurisdiction of the BEE of DECS, in-service teachers, teacher educators and supervisors are selected from each elementary school, District Learning Resource Center (DLRC) and Regional Education Learning Center (RELC).

In the case of secondary education, since it is under the jurisdiction of the BSE of DECS similarly to elementary education, in-service teachers, teacher educators and supervisors and selected from each secondary school, Leader



School of division level and Regional Leader School (RLC).

Since the national and public schools of higher education are under the jurisdiction of the BHE of DECS, teacher educators will be selected from the Teacher Training Institute. With regard to private schools, as they are under the jurisdiction of the DOST, teacher educators will be selected from each private university and Regional Science Teaching Center (RSTC).

The flow of the participants aforementioned is shown in Table 6, the position of RELC and RSTC in Fig.2 and names and number of RLC in Table 7, respectively.

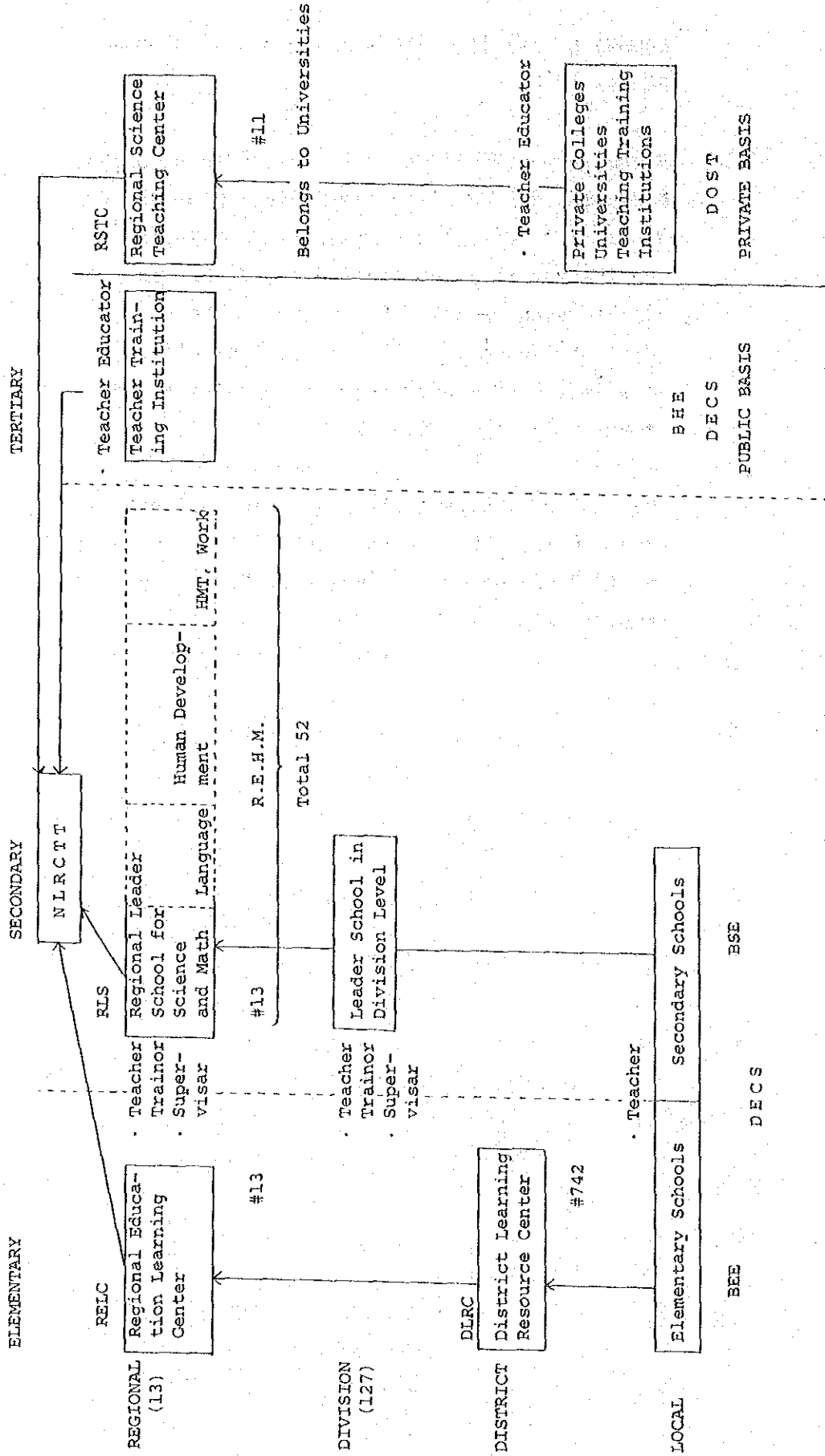


Table-6 Flow of Participants

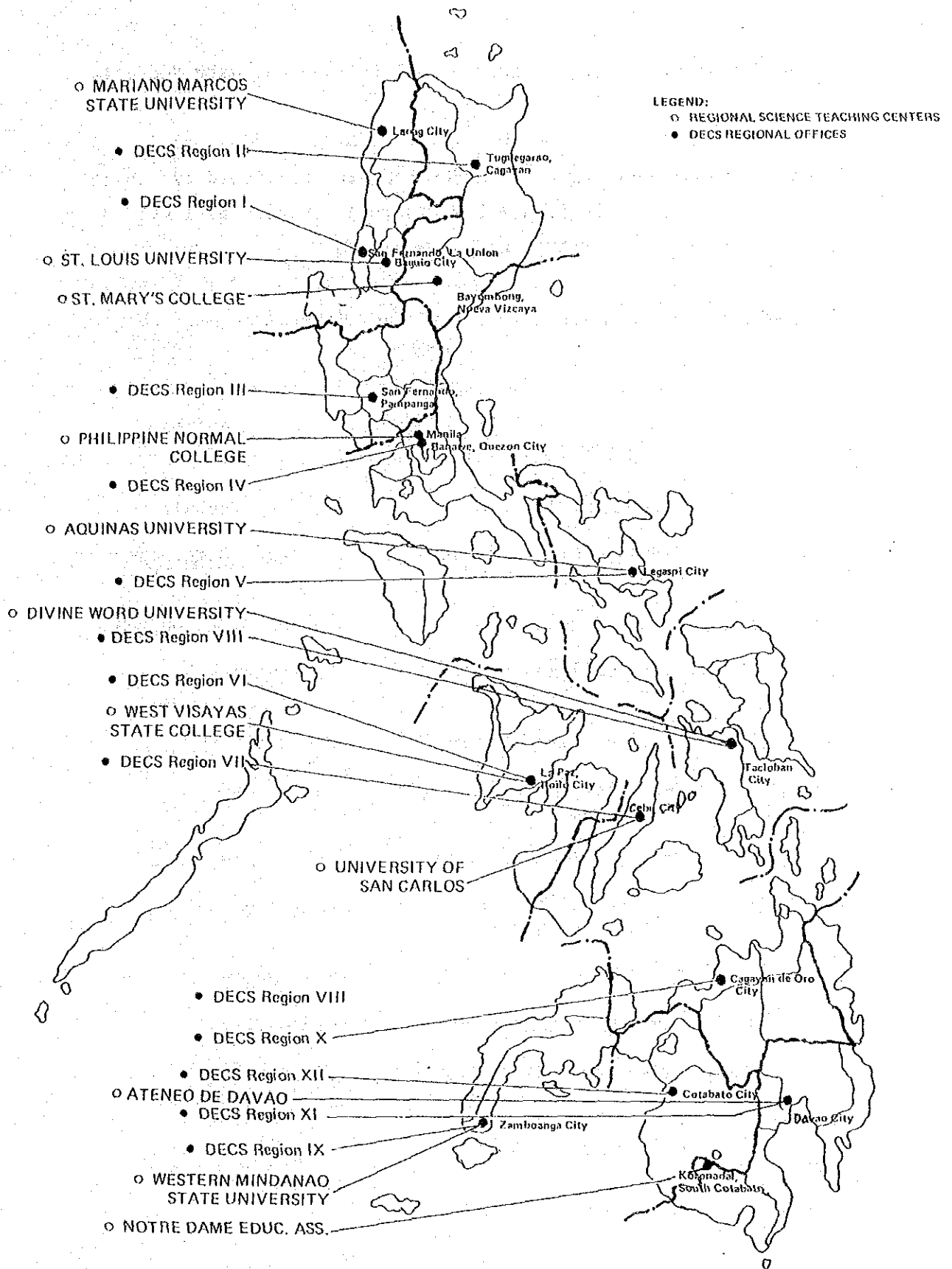


Fig-2 Location of RELC and RSTC

Table-7 List of Regional Leader School in the Secondary Education

In each region, four Regional Leader Schools are listed by subject. Subjects include 1 English & Pilipino, 2 science & Math., 3 Social Studies Values PEHM, and 4 HMT & WE.

The regional leader schools in science and mathematics are shown below.

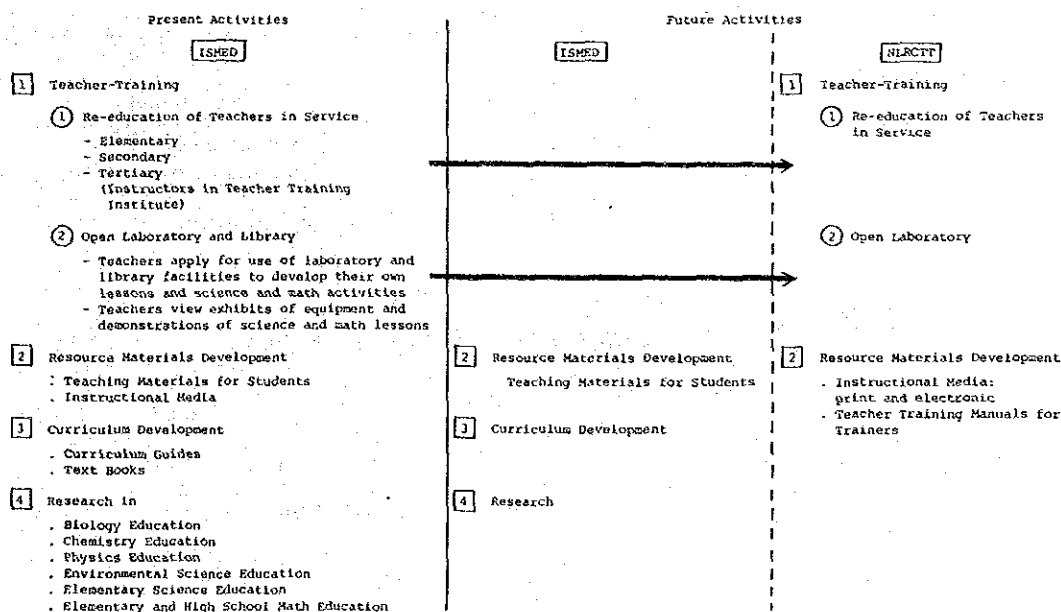
		Address
Region I	Ilocos National H.S.	Laoag City, Ilocos Norte
Region II	Isabela National H.S.	Ilagan, Isabela
Region III	Olongapo City National High School	Olongapo City, Zambales
Region IV	Quezon National H.S.	Lucena City, Quezon
Region V	Bicol College of Arts & Trades (H.S. Dept.)	Naga City
Region VI	Bacolod City National H.S.	Bacolod City
Region VII	Cebu City National Science High School	Cebu City
Region VIII	Samar National H.S.	Catbalogan, Samar
Region IX	Zamboanga del Norte National High School	Zamboanga del Norte
Region X	Bukidnon National H.S.	Malaybalay, Bukidnon
Region XI	Davao City High School	Davao City
Region XII	Kidapawan National H.S.	Kidapawan, North Cotabato
National Capital Region	Quezon City Science High School	Quezon City

(5) Sharing of Activities Between UP-ISMED and this Center

Of the activities of ISMED, this Center shares the activities of 1 training for teachers: i.e. 1 in-service training of science and mathematics teachers of elementary and secondary schools and in-service training of supervisor lecturers who engage in activities at the Teacher Training Institute of higher education, 2 self-development activities of science and mathematics teachers and opening of laboratories and libraries for opening and inspection of experiment equipment and materials and demonstration, etc. ISMED also shares the remaining activities: 3 Curriculum development 4 Continuing of research activities on education of science and mathematics subjects.

For the 2 development of teaching materials, ISMED will share the development of new teaching materials while this Center carries out practical exercises with the teaching materials developed by ISMED, improvement and trial fabrication focusing on materials that are readily available locally and training in teaching method using those teaching materials.

Table below shows the aforementioned sharing of activities:



(6) Organization and Personnel Assignment Plan

50 people are scheduled to be assigned after the establishment of this Center of which the position of director will be held by the director of ISMED as an additional duty and 3 people will be transferred from ISMED as laboratory technicians, but other personnel will be newly employed.

Table 8 shows the organization chart and Table 9 shows the personnel assignment plan of this Center. The budgetary measures for the personnel assignment plan will be appropriated in the budget of the UP for the year 1989.

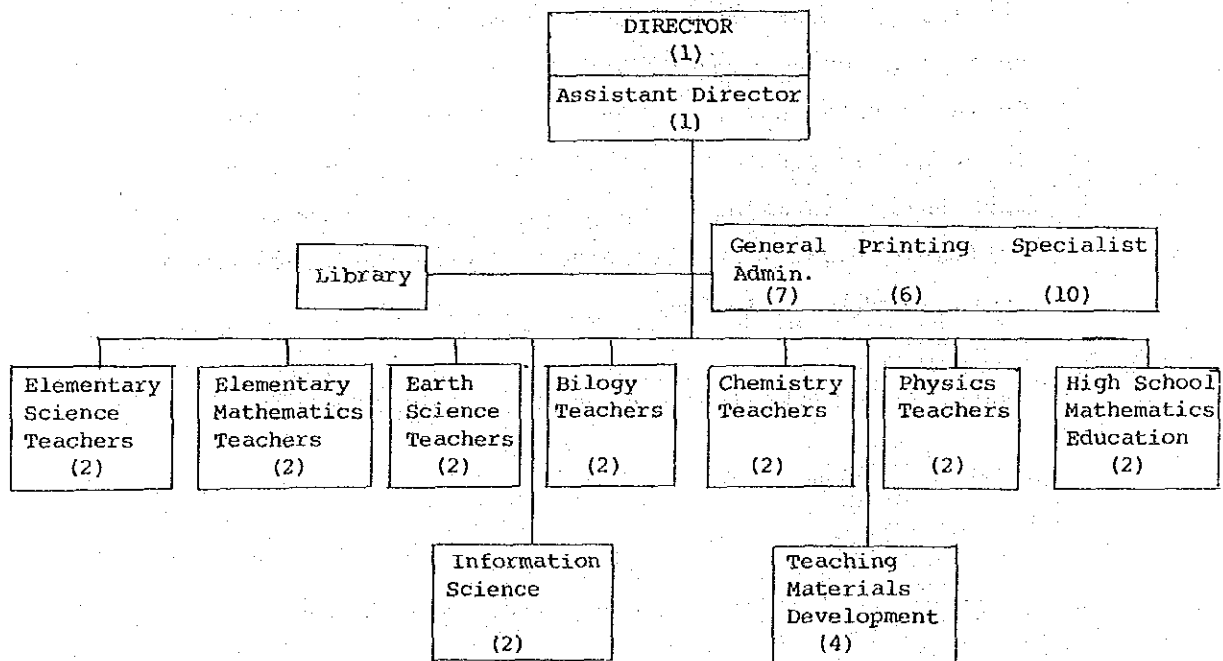


Table 8 Organization Chart of NLRCTT

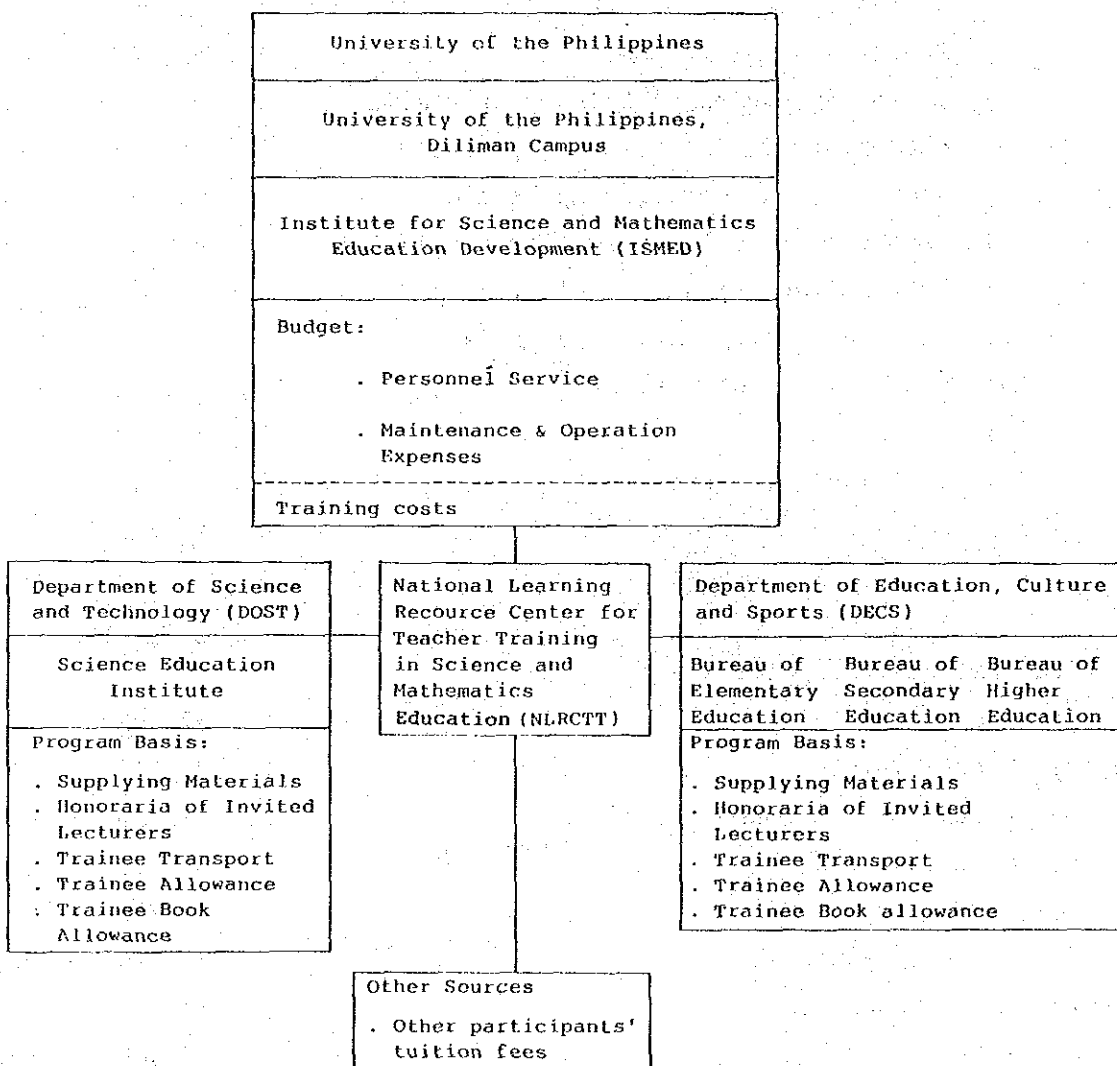
Table 9 NLRCTT Staffing Pattern

Position	No.	Annual salary (Peso)	Total (Peso)
I. Academic			
A. Director	1	82,428	82,428
B. Assistant Director	1	68,196	68,196
C. Teaching Staff			
1) Biology Education Specialist	1	65,064	65,064
2) Chemistry Education Specialist	1	65,064	65,064
3) Physics Education Specialist	1	65,064	65,064
4) Earth/Environmental Science Specialist	1	65,064	65,064
5) Elementary School Science Specialist	1	65,064	65,064
6) Elementary Mathematics Specialist	1	65,064	65,064
7) Secondary School Mathematics Specialist	1	65,064	65,064
8) Information Science Specialist	1	65,064	65,064
9) Materials Development Specialist	2	65,064	130,128
10) Teaching Assistants	10	37,440	374,400
11) Librarian	1	34,236	34,236
12) Assistant Librarian	1	31,116	31,116
13) Part-time Lecturers	10	200/hr.	75,600
Subtotal	34		1,316,016
II. Administrative Support Staff			
1) Secretary	2	32,388	64,776
2) Clerk-Typists	2	31,116	62,232
3) Precision Instrument Technician	2	32,388	64,776
4) AV Technician	2	31,116	62,232
5) Laboratory Technician	6	31,116	186,696
6) Printing Supervisor	1	35,796	35,796
7) Press Operators	2	32,388	64,776
8) Artists	3	32,388	97,164
9) Property Custodian	1	31,116	31,116
10) Utility Man	3	26,580	79,740
Sub-total	24		749,304
Grand Total	58		2,065,320

(7) Budgetary Measures

The chart below shows the relationship between the sharing of expenses for maintenance and operation, and training of this Center.

Budget Flow of NLRCTT





As can be seen from the Chart, the expenses required for personnel services and operation and maintenance of facilities, equipment and materials will be borne by the University of the Philippines.

The expenses required for training programs (per diem, transport, accommodation, training materials, etc.) will be borne by the organizations (DECS or DOST) which plan the program or borne by individual trainees in the form of tuition.

The budgetary measures to be taken by each organization concerned are described below:

- 1) The total budget appropriated for the year 1987 amounts to 8,335,306,000 Pesos, 9,468,642,000 Pesos for the year 1988, respectively of which about 93% accounts for personnel expenses for the Primary Education Bureau of DECS. The expenses for training of this Center after its establishment are scheduled to be appropriated including expenses for trainees, such as per diem, transport, materials, in the amount of 5,300 Pesos x 208 = about 1,100,000 Pesos in the light of the number of trainees, i.e. 208 per year after the establishment of this Center.

For the Secondary Education Bureau of DECS, budgetary measures will be taken for 4 years from 1988-1989 in consideration of the fact that the timing of shifting to the new curriculum and the starting of activities of this Center approximately coincide with each other.

The budget table is shown below:

	1988-89	1989-90	1990-91	1991-92	Total
Required no. of trainees - (the scheduled number of trainees for long-term training at this Center)					
national level - Public	468 (104)	468 (104)	468 (104)	468 (104)	1,872 (416)
Private	468 (104)	468 (104)	468 (104)	468 (104)	1,872 (416)
Required no. of trainees - regional level	4,572	4,572	4,572	4,572	18,288
Required no. of teachers to be trained	22,270	19,516	18,039	16,352	76,177
<b>Cost of Training</b>					
<b>National level</b>					
Fees - national level	P 900,000 (200,000)	P 900,000 (200,000)	P 900,000 (200,000)	P 900,000 (200,000)	P 3,600,000 (800,000)
Per Diem, airfare, etc. @ P4,350 (Public)	2,035,800 (904,800)	2,035,800 (904,800)	2,035,800 (904,800)	2,035,800 (904,800)	8,143,200 (2,619,200)
Per Diem, airfare, etc. @ P4,350 (Private)	2,035,800 (904,800)	2,035,800 (904,800)	2,035,800 (904,800)	2,035,800 (904,800)	8,143,200 (3,619,200)
	P 4,971,600 (2,009,600)	4,971,600 (2,009,600)	4,971,600 (2,009,600)	4,971,600 (2,009,600)	P 19,886,400 (8,038,400)
					(training expenses at the Center)
<b>Regional level</b>					
Honorarium - regional level*	P 2,808,000	P 2,808,000	P 2,808,000	P 2,808,000	P 11,232,000
Materials @ P300/participant	1,371,600	1,371,600	1,371,600	1,371,600	5,486,400
Per Diem, @ P2,800	12,801,600	12,801,600	12,801,600	12,801,600	51,206,400
	P 16,981,200	P 16,981,200	P 16,981,200	P 16,981,200	P 67,924,800
<b>Divisional level</b>					
Honorarium - divisional level**	P 27,432,000	P 27,432,000	P 27,432,000	P 27,432,000	P 109,728,000
Materials @ P300/participant	6,881,000	5,854,800	5,411,700	4,905,600	22,853,100
Per Diem, @ P2,100	46,767,000	40,983,600	37,881,900	34,330,200	159,971,700
	P 80,880,000	P 74,270,400	P 70,725,600	P 66,676,800	P 292,552,800
	P 102,832,800	P 96,223,200	P 92,672,400	P 88,629,600	P 380,364,000

\* 8 hours x P100/hr x 30 days = P24,000 x 9 subject areas x 13 regions  
 \*\* 8 hours x P100/hr x 30 days = P24,000 x 9 subject areas x 127 divisions  
 Figure in ( ) shows budget for science and mathematics education

- 2) The table below shows the amount of total budget for the science education program and the ratio thereof to the gross amount of the budget for the years between 1984 and 1987 for the Science Educational Center of DOST.

Total for Science Education Program	P 18,610,000	P 24,217,000	P 26,696,000	P 21,544,000
SEI Funds	P 26,658,000**	P 34,536,000**	P 38,738,000**	P 46,932,000**
Ratio of SEI Funds in Science Education Development Funds	69.8%	70.12%	69.81%	45.9%

Of these, the budget appropriated for the training of science and mathematics teachers was 3,882,000 Pesos for 1987 and 4,600,000 Pesos for 1988, respectively. The said budget is planned to be increased after the establishment of this Center.

- 3) From the University of the Philippines, budgetary measures will be taken for the expenses for personnel services and for operation and maintenance in a manner similar to those of ISMED. 2,065,320 Pesos are planned to be appropriated for expenses for personnel services, which has been confirmed to be appropriated for the budget of the University of the Philippines for the year 1989. With regard to expenses for operation and maintenance 4,921,000 Pesos are planned to be appropriated and a request therefore will be submitted to the University for Funds.

The Table below shows the budget for ISMED.

	1984	1985	1986
Expenses for personnel services	1,734,700	2,258,353	2,764,152
Expenses for operation and maintenance	804,000	675,360	723,600
Total	2,538,700	2,933,713	3,487,752

Unit Pesos

It has been confirmed that budgetary measures will be taken by the University of Philippines for the expenses to be incurred in the construction of this Center.

The budgetary measures of this center from each organization is shown below.

DECS Bureau of Elementary Education	P 1,100,000 (Training cost)
Bureau of Secondary Education	P 2,009,600 (Training cost)
DOST Science Education Institute	P 4,600,000 (Training cost)
University of the Philippines	P 2,065,320 (Personnel expenses)
	P 4,921,000 (Maintenance/control cost)
Total	P14,695,920/year

### 3-3 STUDY OF CONTENTS OF REQUEST FOR GRANT

#### (1) Contents of Requested Facilities

The facilities requested at the time of the preliminary study included a 3-storey training building, a one-storey auditorium and a 2-storey dormitory, 3 buildings in total. The facilities requested in the current basic design study included a 3-storey training building enclosing an auditorium and a dormitory which can accommodate 60-90 trainees, two buildings in total.

The contents of the requested facilities are shown below:

##### 1) Training building

###### 1st Floor

Workshop	1 room
Printing room	1 "
Photography room	1 "
Seminar room	1 "
Auditorium	1 "
Library	1 "
Office	1 "
Toilet, etc.	

###### 2nd Floor

Biology laboratory (including, preparatory room, materials and specimen room)	3 rooms in total
Chemistry laboratory (including, preparatory room, chemical storage room and research room)	4 rooms in total
Physics laboratory (including, preparatory room, apparatus storage)	3 rooms in total
Mathematics laboratory (including, preparatory room)	2 rooms in total
Conference room	1 room

Dark room 1 room  
Toilet, etc.

### 3rd Floor

Physical geography laboratory  
(including preparatory room,  
warehouse) 3 rooms in total  
Elementary School Science (includ-  
ing preparatory room, warehouse) 3 rooms in total  
Micro-teaching room (including  
observation room) 2 rooms in total  
Information science laboratory  
(including staff room) 2 rooms in total  
Audio-visual room (including studio,  
control room, staff room) 4 rooms in total  
Trainee rest room 1 room  
Toilet, etc.

### Rooftop Floor

Astronomical observation room 1 room  
Planetarium 1 room  
Outdoor laboratory 1 room

## 2) Dormitory building

Sleeping accommodation for 60-90 trainees  
Dining hall with a capacity of about 100 persons  
(including a kitchen)  
Toilet, etc.

## (2) Study of Contents of Facilities

In studying the contents of the facilities, existing ISMED facilities and the facilities to be constructed by this Project were studied comprehensively, the plan for use will be established from the viewpoint of the training program for science and mathematics teachers.

1) Training building

It is necessary that this facility be composed of the laboratory departments, such as physics, chemistry, biology, physical geography, mathematics, information science, primary science, primary mathematics, etc. the teaching materials preparation departments, such as the workshop, printing room, audio-visual room, etc., the learning and materials storage and display departments, such as the library, display room, etc., the lecture departments, such as the seminar room, auditorium, etc., and administration and management departments, and so arranged that organic cooperation among the departments may be attained.

Taking into account the path of flow of the instructors and trainees in the lectures and experiments, each laboratory will be made up of one unit consisting of a laboratory, a preparatory room, a staff room and a storage room, and the premises will be made such that the traffic of people and transport of equipment and materials may be performed smoothly within the unit.

With regard to the workshop, printing room, audio-visual room, etc., they will be planned for convenient of trainee research and preparation of teaching materials to be used upon their return to their place of work and for preparation of teaching materials for the trainees and will have a layout of appropriate size and grade of equipment and area to achieve the objective. In consideration of the moving in of materials, noise, vibration, weight of apparatus, etc. the workshop and printing room will be on the 1st floor.

The library will have a total of 12,300 books and will be used for the perusal of trainees, instructors and visitors and for learning by individual groups.

The breakdown of the approximate volume of books to be kept is shown below:

Breakdown of the Approximate 12,300 Volume  
Collection Planned

Subject area	Total volumes
General Science	1,100
Mathematics	1,100
Computer	1,100
Astronomy	1,100
Physics	1,100
Chemistry	1,100
Geology/Geography/Earth Science	1,100
Biology	1,100
Botany	500
Zoology	500
Health Sciences	250
Agriculture	130
Technology	250
Bibliography and Library Science	130
Arts and Photography	130
Education	1,220
General Reference Works (Encyclopedias, Almanacs, Directories, etc.)	130
Psychology and Philosophy	130
Sociology and Statistics	130
<b>Total</b>	<b>12,300</b>

The display room will be used for displaying teaching materials and text books for teachers, both those which are researched and developed by the trainees for



learning and those which are developed by ISMED for students.

As an auditorium is not included in the existing ISMED facility, inevitably the auditorium of the neighborhood has to be borrowed for use when it is not in use, putting ISMED to inconvenience.

After the establishment of this Center, the auditorium will be fully utilized for general lectures for both long-term and short-term training, for opening ceremonies, for general meetings of the teachers organization, etc. with a capacity for 60-250 persons.

The capacity of the auditorium planned is for 250 persons. In consideration of cases where the number of participants exceeds 250, desks and chairs will be made movable so as to cope with the situation merely by adding extra chairs to accommodate participants. Floors will be made flat without stairs for multi-purpose use.

Table-10, shows the purpose of use and scheduled yearly use.

#### Purpose of use for the Auditorium

1. 2 - 4 teacher training classes combine together to listen to a common lecture
2. Science and mathematics teachers are invited to listen to a well-known lecturer expound on his/her innovative ideas and/or research results in science and mathematics education

3. Big delegations of summer institute participants come for a day's visit to learn about the teacher training programs of the Center
  
4. Teachers' professional organizations hold their annual or biennial conventions. The teacher organizations which have kept in touch with the Center and had, at one time or another expressed desire to hold conventions here but could not due to limited accommodations and facilities are the following:
  - . Biology Teachers Organization (BIOTA) - over 300 members
  - . Philippine Association of Physics Teachers (PAPT), secondary level teachers - over 200 members
  - . Philippine Association of Physics Instructors (PAPI), tertiary level - over 200 members
  - . Mathematical Association of the Philippines (MAP), secondary level - over 300 members
  - . Mathematical Society of the Philippines (MSP), tertiary level - over 400 members
  - . Philippine Association of Chemistry Teachers (PACT), secondary level - over 300 members
  - . Kilusan ng mga kimiko sa Pilipinas (KKP), tertiary level - over 200 members
  - . Organic Chemistry Teachers Association - over 200 members
  - . Integrated Chemists of the Philippines (ICP) - an umbrella organization of three organization of chemists and chemistry teachers
  
5. Pre-service science/math education students come to the Center for one day lectures.

Table-10 Schedule of NLRCTT Auditorium Use

	No. of People	Jan.	Feb.	Mar.	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Packaged course, DECS	90	5 d*	5 d	5	5	5	5	5	5	5			
Minicourses	60		2 d	2				2	2		2	2	
Special lectures for Metro Manila S & M Teachers, supervisors	200	3 d		3	3	3	3	3	3	3	3	3	3
Visit of RSTC summer Institute participants	300				5	5							
Conventions/Conferences of Teacher Professional Organizations	300	5 d			10	10			10		10		
Visit of Pre-service student teachers	100			1						1			
Presentation of research/project reports by ISMED staff	200	1 d	1	1	1	1	1	1	1	1	1	1	1
ISMED-NLRCTT staff meeting	200	1 d											

\* d - days

2) Dormitory building

1 Present condition and problems

There is no dormitory available for trainees and part-time lectures for teacher training at ISMED and therefore the students dormitory of the University of the Philippines and hotels nearby will be used for accommodation.

It is essential to provide a sleeping facility as the number of courses will be increased and astronomical observation experiments are also planned after the establishment of this Center.

2 Establishment of plan

The participants in the long-term training package course are scheduled to stay in the dormitory. They are teachers who are to be dispatched from 12 regions except the national capital region.

The number of participants scheduled for accommodation is as shown below according to the training schedule, which is to be described later.

Ave. No. of Participants/ course	No. of courses per month	No. of courses per year
30	2-3*	14-21*
	Ave. No. of participants at NLRCTT/month	Ave. No. of participants at NLRCTT/year
	60-90	420-630

\* Considering maximal and optimal schedules.

Monthly occupancy of the dormitory will be as shown below according to the number of long-term training courses and months in which such courses are held.

Distribution of Participants by Months

Jan.	Feb.	Mar.	Apr.-May	July	Aug.	Sept.	Oct.	Nov.
60-90	60	60	90	30-60	60	60-90	60	30-60

The capacity of the dormitory is planned to be 45 rooms, therefore capable of coping with a maximum number of 90 participants, i.e. two persons per room. Because of the area of the site, the building will have 4 storeys with the 2nd, 3rd and 4th floors used for this purpose. As about 90% of the scheduled participants are women, a shower unit with a wash basin is to be provided in each room, but the toilet will be used commonly and washing space will be provided. On the 1st floor a cafeteria, kitchen and custodian's room will be provided. The cafeteria will be opened for use by trainees and staff of this Center in addition to staff of ISMED, about 200 people in total. The services will be in two shifts, each with an approximate capacity of 100 people.

(3) Contents of Requested Equipment and Materials

The contents of requested equipment and materials are shown below.

1) Laboratory equipment and materials

- |   |   |              |
|---|---|--------------|
| ①   | Equipment and materials for the<br>biology laboratory   | complete set |
| ②   | Equipment and materials for the<br>chemistry laboratory   | complete set |
| ③   | Equipment and materials for the<br>physics laboratory   | complete set |
| ④   | Equipment and materials for the<br>physical geography laboratory                                | complete set |
| ⑤   | Equipment and materials for the<br>mathematics laboratory                                       | complete set |
| ⑥   | Equipment and materials for the<br>information science laboratory                               | complete set |
| ⑦   | Equipment and materials for the<br>primary science laboratory                                   | complete set |
| 2) Equipment and materials for the fabrication of<br>teaching materials |   |              |
| ①   | Equipment and materials for the<br>fabrication of teaching materials<br>for practical exercises | complete set |
| ②   | Equipment and materials for photo-<br>graphy and printing                                       | complete set |
| ③   | Audio-visual equipment and<br>materials   | complete set |
| 3) Auxiliary equipment and materials                                    |   |              |
| ①   | Equipment and materials for clerical<br>and managerial use                                      | complete set |
| ②   | Equipment and materials for the<br>library  | complete set |
| 4) Vehicles   |   |              |
| ①   | Micro bus   | 2            |
| ②   | Light van   | 1            |

#### (4) Study of Contents of Equipment and Materials

The aforementioned detail of requested equipment and materials has been screened in consideration of items of experiments, methods of teaching, maintenance after training, etc. in accordance with each training program. Screening was done by discussing and studying with the counterpart of each section, by replacing with more suitable equipment for the training at this Center, deleting equipment and materials that were not incorporated in the training program, deleting those which were considered less than necessary or supplementing equipment and materials that were considered effective for the training (including accessories). Particularly the maintenance structure after opening, such as the procurement of expendables and supply of spare parts, etc., was taken into account to ensure that equipment and materials that can be used widely in the Philippines were selected.

##### 1) Laboratory equipment and materials

###### ① Biology laboratory

The equipment and apparatus for experiments are laid out such that each participant may train himself through learning by experience with experiments at a Center. The emphasis will be placed on basic learning, eliminating experiments of a higher level. Therefore, an electron microscope was deleted.

###### ② Chemistry laboratory

From the curriculum in high schools, a carbon analyzer and a MNR spectrophotometer were excluded and one set of basic laboratory

apparatus will be provided at each laboratory table so that everybody can actually use them.

③ Physics laboratory

Although this laboratory embraces a wide range of fields, such as dynamics, electricity, electronics, optics, etc., only basic laboratory apparatus will be provided. A dark room will be provided for dark room experiments.

④ Physical geography laboratory

It has already been mentioned that the slogan of this Center was "learning by experience" through experiments and practical exercises. In this connection, the planetarium was decided to be deleted after discussion with the Philippine side due to the reason that it is imitation learning by experience and there is an existing facility in Manila and it has been fully utilized. The request was made for an astronomical telescope from the viewpoint of the importance of learning by experience and as it is felt important to observe the actual physical objects described in the astronomy text book, it will be included in the list.

⑤ Mathematics laboratory

The introduction plan will be established for equipment that satisfies the curriculums from elementary to high school and that can be prepared at the site of education if an idea is used.



⑥ Information science laboratory

The use of personal computers has progressed rapidly in the Philippines and the development of software has been carried out actively. For the purpose of processing mathematical, chemical and biological data, for demonstration and for improving guidance for those students who are low in their scholastic performance and at the same time giving them a basic understanding of computers that are to be introduced in the future, the most handy personal computers will be provided.

⑦ Primary science laboratory

In the Philippines, health education is included in the science curriculum in elementary education, which is different than in Japan. Laboratory apparatus of basic learning fields including health education will be introduced.

2) Equipment and materials for preparation of teaching materials

① Equipment and materials for fabrication room of teaching materials for practical exercises

The processing equipment for metal, wood, glass, etc. may be considered as equipment for preparation of teaching materials in the process of educational training. The criterion of the selection of equipment is primarily placed on equipment that is small and can be operated by the participants.

Since glass processing is used for the purpose of preparing chemical experiment equipment, the

glass lathe, glass drill, etc. have been omitted due to the low frequency of use.

② Equipment and materials for photography and printing

These will be used for the preparation of guide books, text books that are to be distributed to the trainees and printed matter to be distributed from time to time during lectures for training conducted in this Center. Particularly, there is a plan to have the trainees take back text books for public relations to each region at the rate of 50 text books per trainee after the completion of the training course, requiring considerable number of text books to be printed. The printing machine that will become the center of operations will be the type that is capable of printing 4 A-4 size sheets simultaneously. It appears that the request made for photographic equipment including the number of cameras, etc. is somewhat more than necessary. Therefore the number was reduced after discussion and study. The equipment for photoengraving request is highly accurate. The optimum equipment will be selected for use after the whole system is thoroughly studied.

③ Audio-visual equipment and materials

The application of audio-visual equipment and materials is widespread in the Philippines, and in fact they are well applied. Heavy emphasis is also placed in the request on the preparation of video teaching materials in reflection of the plan to have trainees take back software of the method of experiments and results etc. to be used for following-up their training after their

return to regional centers or schools.

Therefore, it is considered necessary to provide a small size studio, AV equipment that can be used in each laboratory room and on AV library.

Of the video projectors, those which can will be replaced by TV.

3) Auxiliary equipment and materials

① Clerical and managerial equipment and materials

Personal computers, etc. will be introduced as equipment necessary for the administration and management of this Center.

② Equipment and materials for library

12,300 general books and 5,600 magazines are planned. Therefore a library with book shelves, reading tables, etc. is planned.

4) Vehicles

The vehicles will be used for outdoor observation and the fabrication of video teaching materials, etc. As one course will consist of 30 trainees and two courses will be in session simultaneously in some cases, 2 micro buses are necessary. Also 1 light van will be necessary for transporting equipment.

(5) Location and Present Condition of Proposed Site for Construction

The proposed site for construction of this Center is located on the south side of the campus of the University of the Philippines and is adjacent to the existing site of ISMED.

The site faces Tavera St. on the north, Kalaw St. on the west and Roces Av. on the east and the staff housing site of the University on the south.

The entire site is wooded and is a promenade for botanical observation. It is relatively flat on the north side while the south side slopes gently an adobe layer is exposed.

1) Present condition of infrastructure in the peripheral area

① As there is no extra capacity in the wiring within the campus, electricity will be received from the MERALCO (Manila Electric Power Company). Wires can be lead in from the sides of Tavera St. and Roces Av. with a voltage of power transmission of 3 diameter - 3 W - 3.45 KV at 60 Hz.

② A water main of Manila City water is buried along Tavera St. and Roces Av. (12" - 300 diameter), from which water supply can be drawn. The water supply pressure is 40 l b/inch<sup>2</sup> (2.8 kg/m<sup>2</sup>).

③ Drainage piping can be connected in both directions above, but the sewage treatment facility is not completed and therefore wastewater must be treated in a simplified septic tank and discharged into the piping system.

Chemical wastewater from the chemical lab, the darkroom, etc. will be discharged via a neutralization tank to be installed outside.

④ Telephone lines may be lead in from the existing aerial wiring of PLDT.

- ⑤ Since there is no city gas supply available, gas will be supplied from an individual supply system using LPG gas cylinders.

The following drawings are given for reference:

- Fig. 3 Location and present condition of proposed site for construction
- Fig. 4 Elevation drawing of the site
- Fig. 5 Infrastructure in the periphery (Electric power)
- Fig. 6 Infrastructure in the periphery (Water supply)
- Fig. 7 Infrastructure in the periphery (Drainage)
- Fig. 8 Infrastructure in the periphery (Telephone)

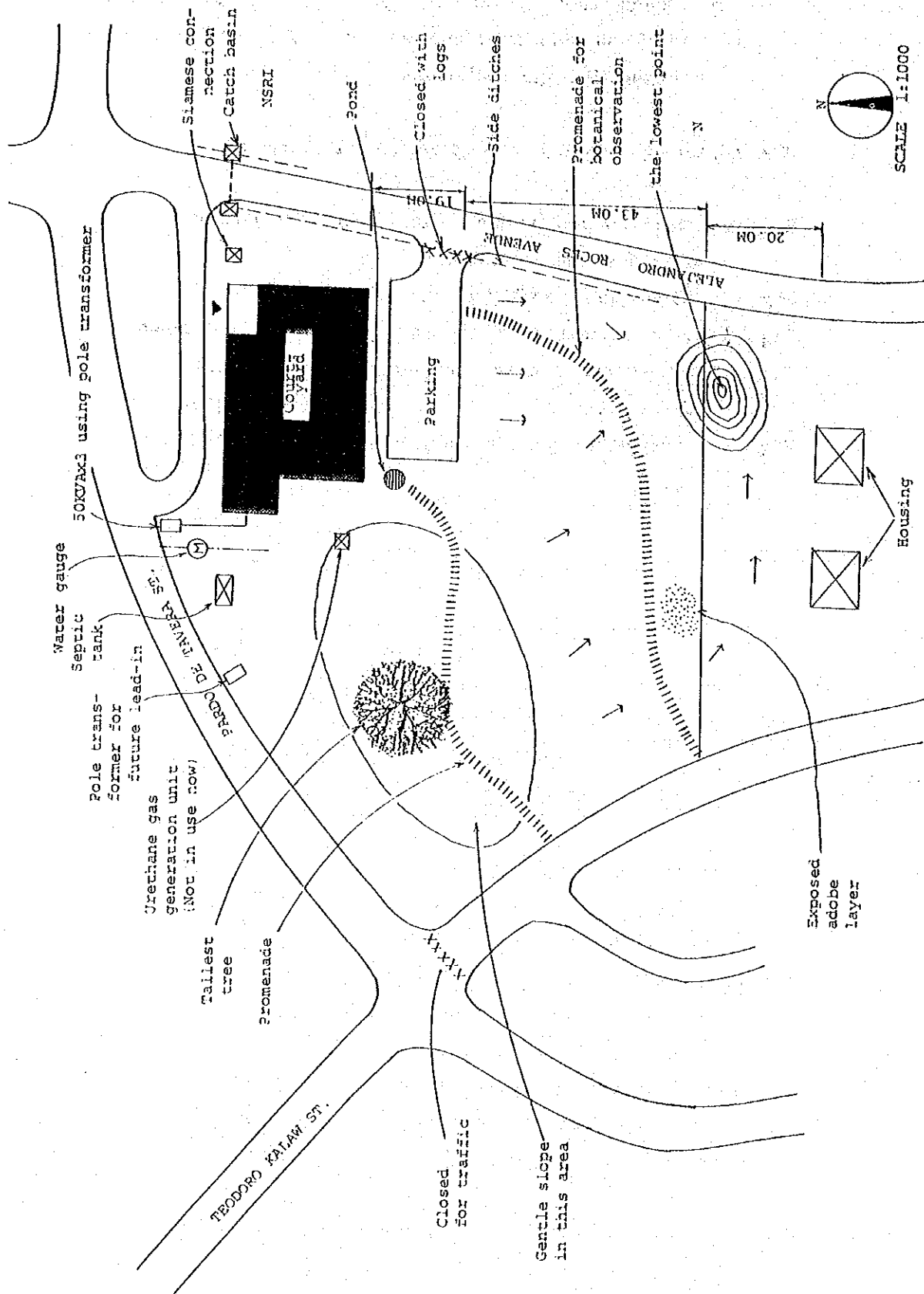


Fig. 3 Location and present condition of proposed site for construction

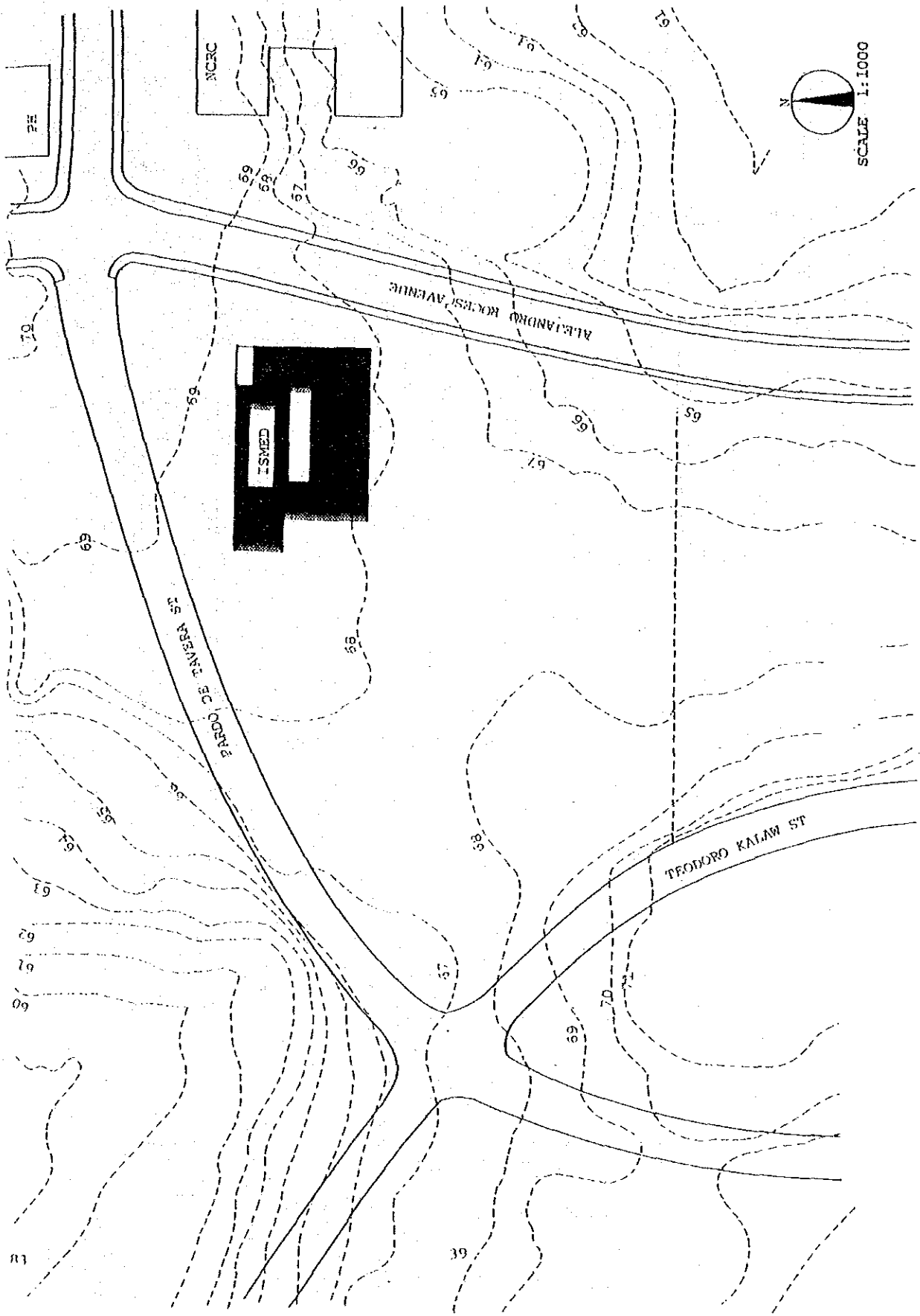


Fig. 4 Elevation drawing of the site

No allowance in the wiring within the campus (3Ø, 3W, 2.4KV 60 Hz)  
 Lead-in may be made from MERALCO wiring (3Ø, 3W, 3.45KV 60 Hz)

Wirings from the same pole

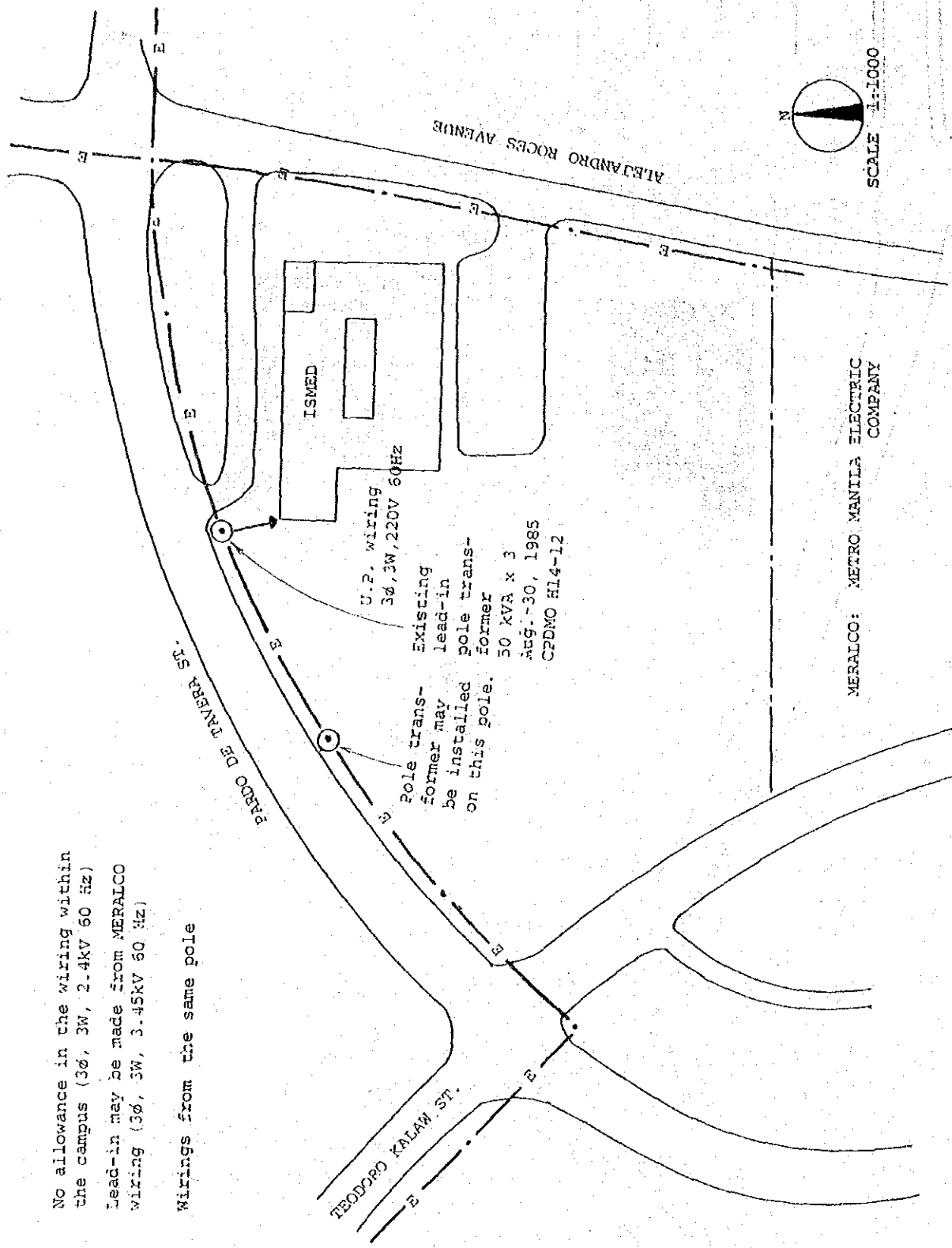


Fig. 5 Infrastructure in the periphery (Electric power)



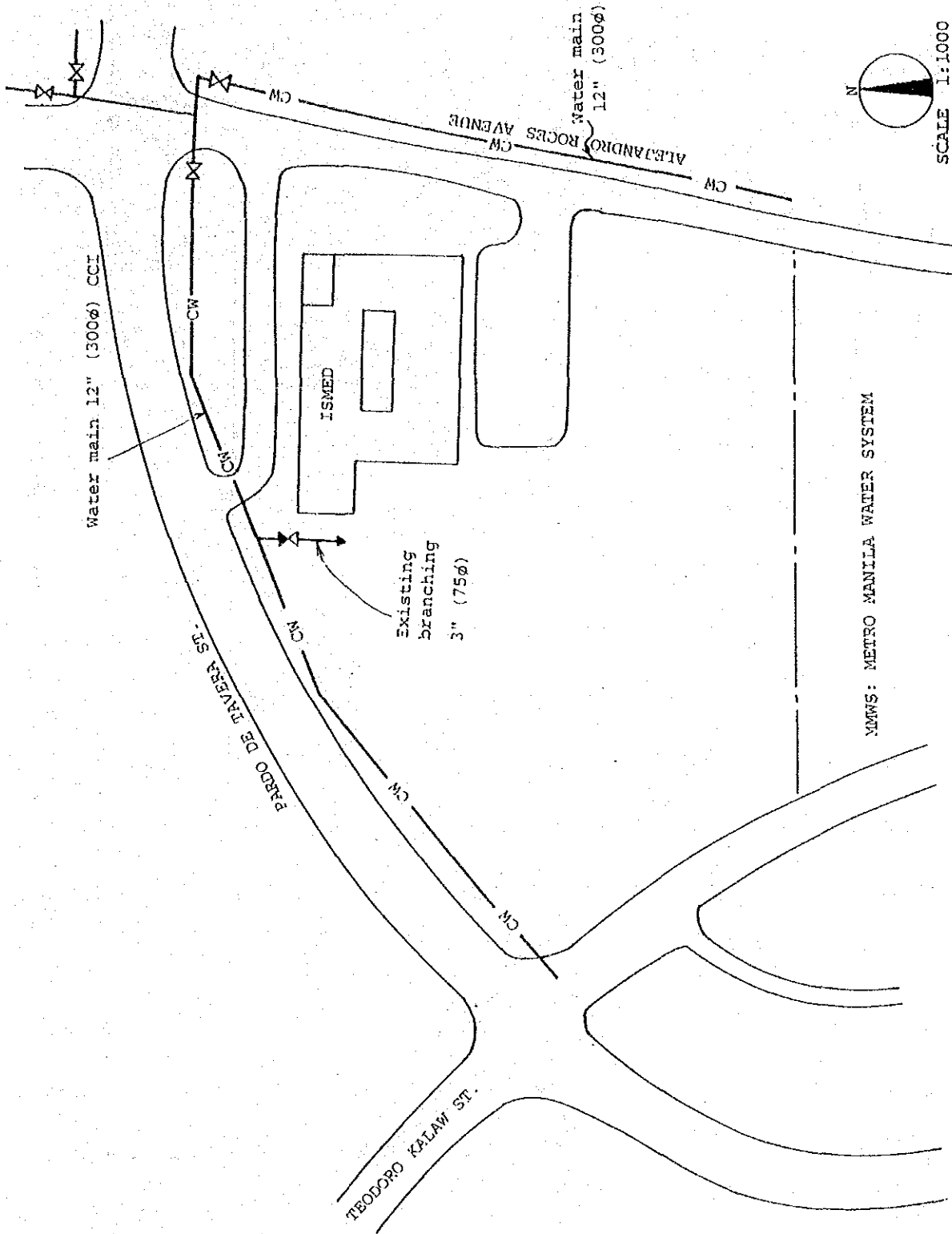


Fig. 6 Infrastructure in the periphery (Water supply)

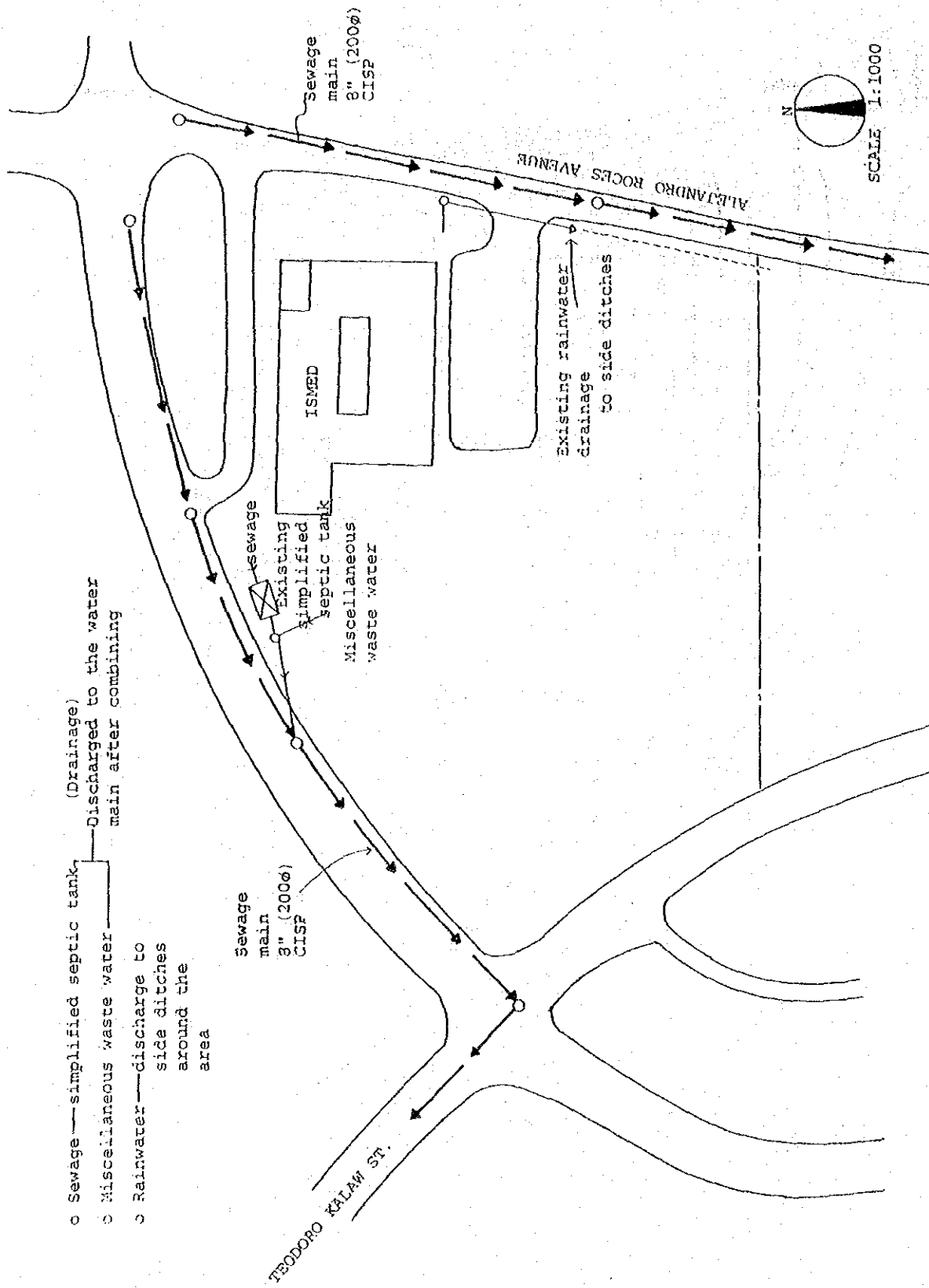


Fig. 7 Infrastructure in the periphery (Drainage)

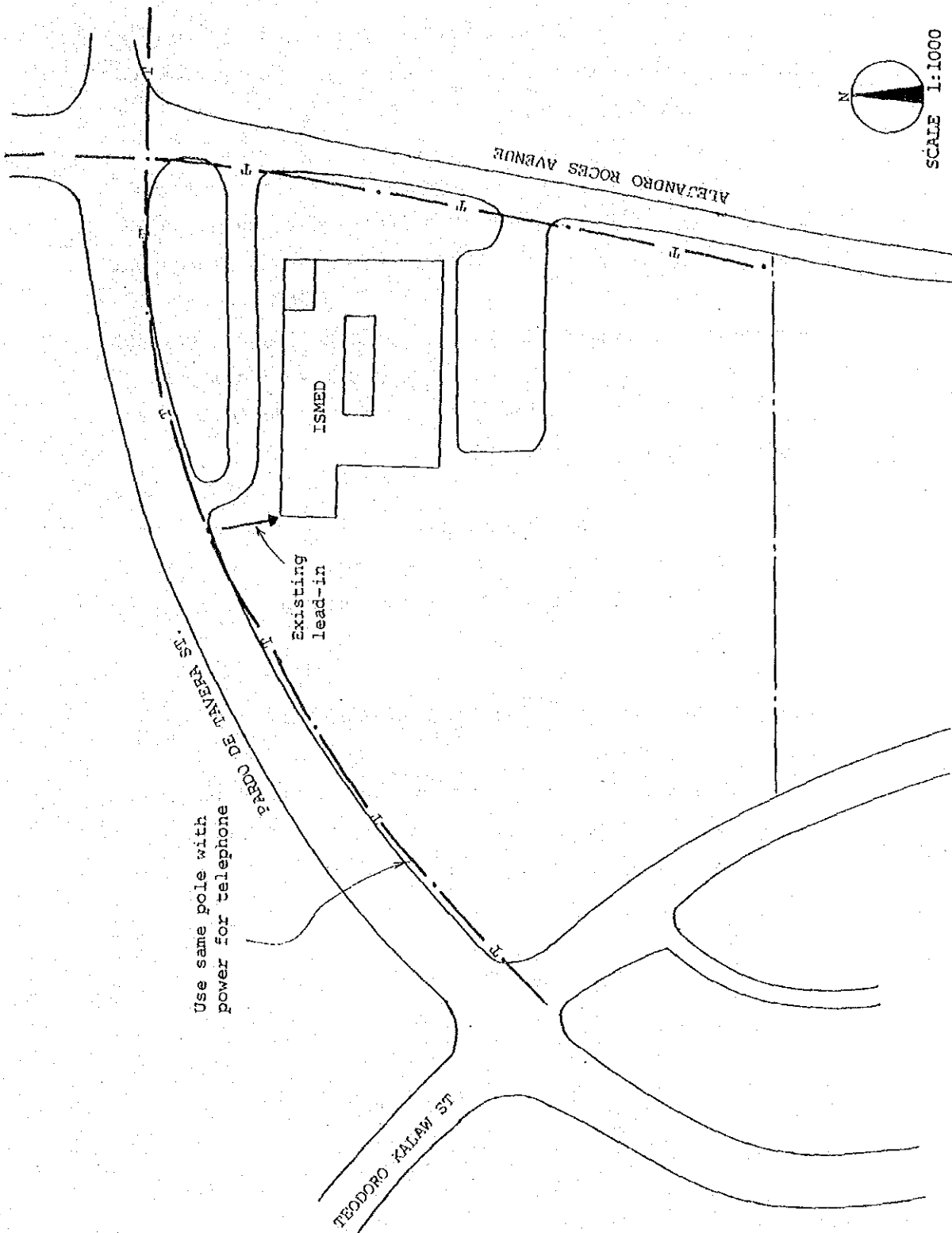


Fig. 8 Infrastructure in the periphery (Telephone)

(6) Study of Proposed Site for Construction

The proposed site for this Center is located within the same site as ISMED and is a wooded area which serves as botanical garden as shown in (5) above.

As a result of a field survey of the present condition of the site and the infrastructure in the periphery and an analysis of the proposed plan for construction in Japan, the site condition, area of the site, condition of development of infrastructures, construction of building, etc. are considered to present no problem, and it was concluded that the training and dormitory buildings can be constructed on the proposed site.

Due to the fact that this Center is planned to cooperate with ISMED organizationally, functionally and organically, it is considered suitable for this Center to be constructed near ISMED.

The site preparation before the commencement of the construction work, which is to be undertaken by the Philippine side, includes the felling of trees on the site. It has been confirmed that the University of the Philippines will undertake this work.