Philippines

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Estimated population (1996)	69,282,000 (1)
Public expenditure on education as a percentage of gross national product (1997)	3.4
Duration of compulsory education (years)	10 (2)
Primary or basic education	
Pupils enrolled (1997)	12,159,495
Teachers (1996)	341,183
Pupil/teacher ratio	18:1
Gross enrolment ratio (1997)	
—Total	117
—Male	—
—Female	—
Estimated percentage of repeaters (1985)	2
Secondary education	
Students enrolled (1997)	4,979,795
Gross enrolment ratio (1997)	
—Total	78
—Male	—
—Female	—
Third-level enrolment ratio (1995)	29
Estimated adult literacy rate (2000)	
—Total	95
—Male	95
—Female	95

Note: in each case the figure given is the last year available.
Sources: All data taken from *UNESCO statistical yearbook, 1999*, Paris, UNESCO, 1999, with the exception of (1) Population Division, Department for Economic and Social Information and Policy Analysis of the United Nations and (2) *World data on education*, Paris, UNESCO, 2000.

I. INTRODUCTION

Basic education in the Philippines is composed of six years of elementary and four years of secondary education or a total of ten years, one of the shortest in the world. Within ten years, Filipino youth complete basic education at the age of 16 or 17 years. They then proceed to institutions of higher learning, to obtain a degree or a certificate from a post-secondary vocational/technical institution, or enter the world of work. Basic education in the Philippines is free at both levels but compulsory at the elementary level only.

On the basis of funding, schools are either government-supported or privately funded. The number of government schools in the elementary level is 91% of the total number and 60% in the secondary level.

The school year in the Philippines begins on the first Monday of June and ends on the last Friday of March the following year. The school year for the elementary and secondary levels runs from Monday through Friday, consists of not less than 40 weeks or 200 days, and is divided into four grading periods.

In the Philippine education system, the central office forms policy and sets standards that are implemented by the regional and division offices. Supervision of schools, therefore, is the function of the regional and sub-regional offices.

II. SCIENCE AND TECHNOLOGY EDUCATION IN THE PHILIPPINES

Curriculum development at the basic education level is the responsibility of the Bureaux of Elementary and Secondary Education, Curriculum Development Divisions at the Central Office. The bureaux define the learning competencies for the different subject areas, conceptualize the structure of the curriculum and formulate national curricular policies. These functions are exercised in consultation with other agencies and sectors of society, e.g. industry, socio-civic groups, teacher training institutions, professional organizations, school administrators, parents, students and other stakeholders.

The subject offerings, credit points and time allotments for the different subject areas are determined at the national level. In this sense, there exists in the Philippines a national curriculum. Schools, however, are given the option to make modifications/adaptations on the curriculum (e.g., content, sequence and teaching strategies) to ensure that the curriculum responds to local concerns. Table 1

shows who is doing what in science and technology curriculum development.

The programme at the basic education level sets out to meet the needs of the students and society as a whole. The curriculum is designed to ensure that the student upon graduation from a secondary school will be able to learn more independently, acquire academic excellence, and develop the capability to cope with new knowledge and technology. On the other hand, elementary schools prepare students to cope with the challenges of secondary education.

Science is one of the subject areas in the elementary and secondary education curricula. Science and health is offered forty minutes daily from grade I at the elementary level. In the secondary level, it is offered as science and technology and is taken eighty minutes daily.

Since there is no streaming, or grouping of students according to their intellectual capacity, at the higher levels of secondary school, there are science schools or schools with science and technology-oriented classes/ sections. Following are brief descriptions of these schools/classes:

- The *Engineering and Science Education Project* (ESEP) was a project of the Department of Science and Technology (DOST) funded by World Bank through which science and technology classes were organized in 110 secondary schools. These schools also received a two-room science laboratory, science equipment, and scholarship grants for the teachers, and implemented a science and technology-enriched curriculum.
- The *Philippine Science High School System* is a network of seven secondary schools funded by DOST implementing a science and technology-enriched curriculum with a highly selective admission process.
- The sixteen *Regional Science High Schools* supervised by the Department of Education, Culture and Sport (DECS) offer a science-enriched curriculum, similar to that of the Philippine Science High Schools.
- A *Learning Resource Center* is established in six secondary schools. This was a joint project of the local government unit and US Agency for International Development (USAID). The schools, like the 110 ESEP schools, have two or more classes per year level offering a science and technology-oriented curriculum.

1. Aims and objectives

The government recognizes the importance of developing its science and technology capability as a means of addressing the concerns of industrialization and globalization. The education sector, along with other government agencies, is tasked to contribute to the achievement of the national development goals. As such, DECS has focused its efforts towards programmes and projects aimed at improving English, science, and mathematics education in basic education.

The objectives of elementary and secondary school science:

At the end of grade VI, the child is expected to apply scientific knowledge and skills in identifying and solving problems pertaining to health and sanitation; nutrition; food production, preparation and storage; environment and the conservation of its resources; and evolving better ways and means of doing things. (Bureau of Elementary Education, 1998)

The Secondary Science Education Programme aims to develop understanding of concepts and key principles of science, science processes, skills and desirable values to make the students scientifically literate, productive and effective citizens (Bureau of Secondary Education, 1998).

These objectives are contained in the preface for the learning competencies.

2. Curriculum plan

The approach to curriculum design in the country is content-topic-based and competency-based. The school children are expected to master a list of competencies at the end of each grade/year level and at the end of elementary/ secondary schooling. The Bureaux of Elementary and Secondary Education develop, publish, and issue to the field the learning competencies.

The content in science and health is organized in increasing complexity from grade I to grade VI, in categories on people, animals, plants (and environment), matter (mixture and solutions, physical/chemical change, materials at home), energy, Earth, and the sun (the solar system, beyond the solar system). In secondary school, science includes general science (first year), biology (secondary year), chemistry (third year) and physics (fourth year). To provide for additional competencies for fast learners, enrichment is added in some topics (BSE, 1998).

3. Teaching methods and learning activities

The curriculum plan does not include teaching methods for the teachers. It is in the teacher's manuals or guides that higher-level content and suggestions for teaching and assessing instruction are included. Being able to plan and use the appropriate teaching-learning activities are challenges to the creativity of the teachers.

Learning materials such as textbooks, supplementary materials and science equipment are provided. Learning activities are not confined to the classrooms.

4. Evaluation and examination

One of the subject areas tested in the nationally administered National Elementary Achievement Test (NEAT) and the National Secondary Assessment Test (NSAT) is science. These examinations are based on the learning competencies and are administered towards the end of the school year. The results serve as bases for policy formulation and educational reforms.

Examinations are also administered to a sample by the regional and divisional offices. School-based assessment is conducted to determine performance and/or achievement of the students in science and to report progress to parents and other officials.

III. PROBLEMS ENCOUNTERED IN TEACHING SCIENCE AND TECHNOLOGY

Problems in teaching science and technology are encountered in curriculum, learning materials, teachers, and student performance.

TABLE 1. Who is doing what in curriculum development?

	CENTRAL LEVEL	REGIONAL/PROVINCIAL LEVEL	SCHOOL LEVEL
AIMS AND OBJECTIVES	Formulates and determines educational aims and objectives that support national development goals.	Formulates and determines specific vision, mission and objectives of the region/division or district.	Formulates the vision, mission and objectives of the school. Determines specific cognitive, affective and psychomotor instructional aims and objectives.
CURRICULUM PLAN	Develops national education policies, standards and programmes for curriculum implementation. Formulates learning competencies.	Monitors the implementation and adaptation of educational programmes suited to regional and provincial needs and cultures.	Implements budget of work based on learning competencies. Modifies/adapts the S&T programme to learners of different needs, cultures and abilities.
METHODS AND APPROACHES TO TEACHING	Conducts research/studies on innovative approaches and recommends effective ones. Recommends strengthening of and continued use of effective methods.	Conducts teacher-training programmes on strategies found to be effective. Conducts research, trial and demonstrations on new methodologies for teachers.	Uses appropriate methodologies and innovative approaches. Employs activities that enhance lifelong and life-wide competencies.
MATERIALS	Exercises control over evaluation and distribution of textbooks and other instructional materials.	Supervises the selection and distribution of instructional materials to divisions and schools. Ensures the availability and adequacy of instructional materials.	Procures materials based on approved list. Supervises the use of instructional materials by learners and teachers. Adopts indigenous learning materials.
EVALUATION AND EXAMINATION	Formulates policies based on nationally administered examinations. Conducts studies/research on student performance.	Conducts supervisory visits. Provides technical assistance. Monitors achievement level of students within region/division/district through administration of tests.	Administers formative and summative tests; uses results to improve teaching/learning process. Makes report of student performance to parents and school officials.

1. On the curriculum

Teachers often complain that the curriculum is overcrowded and that they are not able to finish the content in certain year levels and there are not enough teaching-learning materials. Some teachers complain some topics are too difficult to teach (Nebres & Vistro-Yu, 1998).

Concern also has been expressed about the placement of science subjects in the curriculum. Earth science, for example, is offered in the first year, although it requires knowledge about concepts in chemistry and physics that are taken up in higher year levels. Another example is chemistry (third year) and physics (fourth year). There are increasing suggestions that the courses be reversed because of the perception that chemistry is more difficult than physics (Mendoza, 1998).

2. On learning materials

Learning materials such as books and science equipment are either unavailable or inadequate in many schools. Also, very few schools have science laboratories.

Concern also has been expressed that teachers' manuals, intended to help teachers teach more effectively, are inadequate.

3. On teachers

In science, because of the shortage of science teachers in general, and majors in certain science disciplines in particular, a science teacher may be hired to teach a science subject that is not his major. Thus, a teacher must be multi-skilled to teach all science disciplines. But that is not the reality (Mendoza, 1998). Even teachers in science high schools find difficulty in teaching the integrated way (Reyes, 1998).

Future science teachers graduate from pre-service programs, yet few are competent enough to actually teach their subjects (Nebres & Vistro-Yu, 1998).

4. On student performance

Various assessments and surveys report downward trends in students' performance in science. The results are consistent, but a major concern is whether such results are used as a starting point when new programmes and activities in science and mathematics education are organized. In particular, it is not clear whether teachers are informed of the results of assessments (Nebres & Vistro-Yu, 1998).

IV. RECENT REFORMS IN SCIENCE AND TECHNOLOGY EDUCATION

Recent reforms in science and technology education are the products of foreign-assisted projects implemented in the country to improve instruction in science. Among these are:

- The *Science and Mathematics Education Manpower Development Program (SMEMDP)* of the Japan Bank for International Co-operation advocated the Practical Work Approach (PWA) in teaching science and mathematics. The programme focused on the training of elementary and secondary teachers on PWA and the development of appropriate instructional materials.
- The *Project in Basic Education (PROBE)*, funded by the Australian Agency for International Development (AusAID) supported the improvement of instruction in science and mathematics. The project promoted the creation of teacher support units for both pre-service and in-service teacher training, and the development of curriculum and teacher support materials.
- The *National Science Teaching and Instrumentation Center*, a project with the German government, produces prototype science equipment that is mass-produced and provided to public schools.
- Science teachers may upgrade their competencies through the *Continuing Science Education via Television* (CONSTEL), which is evolving into *Continuing Studies in Education via Television*, a joint project of DECS, DOST, PTV4 (the government TV station), University of the Philippines' Institute for Science and Mathematics Education Development (UP-ISMED) and the Foundation to Upgrade the Standards of Education (FUSE). The project will soon include teaching episodes in English and mathematics.

V. NON-SCHOOL RESOURCES IN THE TEACHING OF SCIENCE AND TECHNOLOGY

Science centres are good venues for enhancing a sense of curiosity and discovery among students. Through a well-co-ordinated programme of lectures and experiments in their classrooms and regular visits to the science centres for more instrument-intensive experiments or demonstrations, young students may become more excited about the wonders of science and the logic of mathematics (Nebres & Intal, 1998).

Visits to manufacturing companies and industrial sites also provide students with on-site knowledge and experiences of the various applications of science concepts and corresponding technologies.

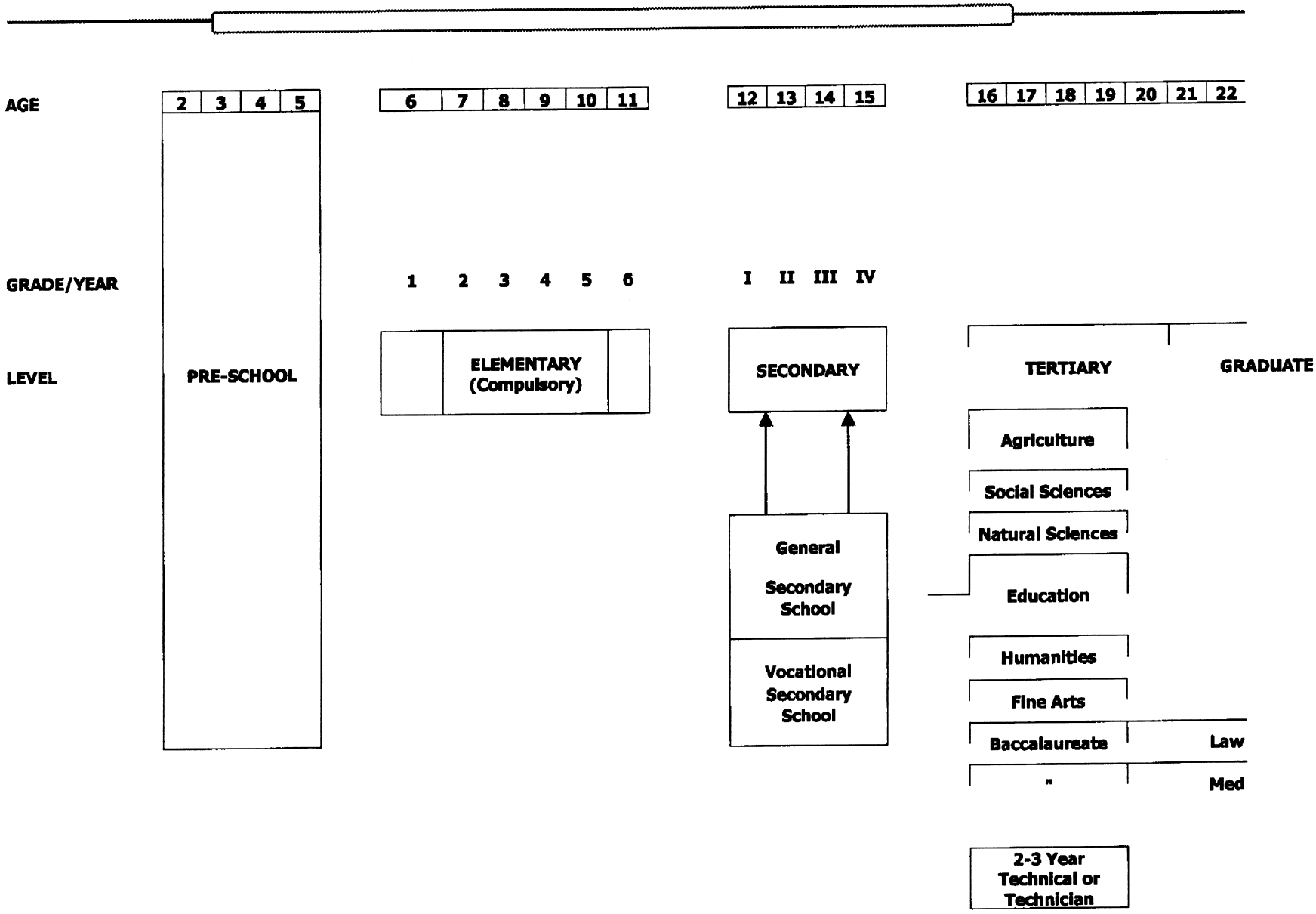
Science fairs/camps, product promotion by manufacturers, and industries and competitions provide students with alternative venues to present their investigatory and research projects.

VI. CONCLUDING STATEMENT

Education officials, especially those involved in science education, have a lot to do to raise the quality of science and technology education in the country. It is notable that government and non-government organizations have devised inter-agency programmes and projects to improve science and technology education. Curricular review of the science and technology programmes in both levels is on-going. Summer teacher training programmes are focused on science and technology.

The DECS registers its appreciation to the DOST, particularly the Science Education Institute for its programmes on science and technology manpower development and for promoting science and technology culture. Appreciation also goes to the University of the Philippines' Institute for Science and Mathematics Education Development for in-service teacher and materials development. They are DECS' partners in the quest for quality science and technology education.

FIGURE 1. Structure of the formal system of education



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