

SUMMARY OF COUNTRY REPORTS

SCIENCE EDUCATION IN SCHOOLS IN COMMONWEALTH SOUTH PACIFIC COUNTRIES

In order to achieve a good exchange of information at the workshop, participating countries from the South Pacific region were asked to provide country papers on science education programmes, including efforts being made to equip schools with suitable apparatus. These country reports were presented by representatives from Australia (Northern Territory), Fiji, New Zealand, Papua New Guinea, Solomon Islands, and Tonga. The Inter-Regional representative from Guyana also provided a similar report.

As expected, there are similarities in the structures of the education systems within the region. Curriculum development units, where these exist, are responsible through permanent secretaries or secretaries of education to politically appointed ministers. Also, high turnover of staff, difficulties relating to equipping and maintaining school science laboratories and over-dependence on expatriate teachers especially at the secondary level are common problems.

Summaries of country reports based on papers presented and results of workshop discussions are as follows:

Australia (Northern Territory)

There are approximately 50 non-aboriginal and 60 aboriginal primary schools, eight secondary and three residential aboriginal secondary schools, and one primary teachers' college in the Territory. The school children come from a variety of backgrounds, speak a plethora of languages, are scattered sparsely over a large area and suffer from unemployment when they leave school.

Primary School Level: Science, has until recently not been actively promoted in primary schools. The Primary School Science of the Territory (PSST) is at present being developed and will be systematically phased into the non-aboriginal primary schools. The aboriginal community and out-station schools do not have a Territory-wide science programme.

Secondary School Level: Secondary students undertake five years of schooling leading to the year 12 South Australian Public Examinations Board's matriculation examinations. Generally, the students take a general science course for the first three years. Some integrated science is taught and many approaches and types of materials, both Australian and overseas, are used. In the last two years of secondary schooling (i.e. years 9 and 10) students specialize in the usual disciplines of Biology, Geology, Chemistry and Physics.

Aboriginal secondary students attend one of the three residential colleges before enrolling in the "normal" secondary schools under the guidance of counsellors.

Teacher Education: Primary school teacher training with a significant component of science education recently commenced at the Darwin Community College.

All secondary school science teachers receive their training either in other Australian states or overseas. There are at present few full-blood aboriginal school teachers although a large number are employed as teacher aides and can with experience and further training become full-time teachers.

Science Equipment: There appears to be little effort directed towards the development of science teaching equipment at the local level.

Non-aboriginal primary schools are beset by cumbersome ordering procedures and inadequate storage facilities. Secondary schools generally order equipment through the bulk ordering system of the South Australian Education Department, and are generously supplied with laboratory assistants who also carry out repair and maintenance of equipment.

Two national science curriculum projects - the Australian Science Education Project (ASEP) and the Australian version of the American Intermediate Science Curriculum Study (ISCS) - have resulted in the production of some low-cost equipment for Australia-wide usage.

Fiji

There are about 650 primary schools in the country.

A Nature Science course has for many years been part of the primary education curriculum. In 1973 development commenced on a new primary science programme known as Elementary Science and based closely on the Papua New Guinea primary science curriculum. The course is discovery-oriented, activity-based and rooted in the environment, and has been implemented in all years 1 to 3 classes. Development of years 4 to 6 material is planned.

Secondary Science Education: There are two types of secondary schools, namely Junior Secondary Schools (years 7 to 10) and Senior Secondary Schools (years 7 to 11) or (years 7 to 12).

All schools follow the Basic Science programme in years 7 and 8. This is an integrated science programme developed for regional implementation by the University of the South Pacific. Some schools follow a separate science programme in years 9 and 10, but most continue with the Basic Science programme. Students write the Fiji Junior Examination at the end of year 10.

At the end of year 11 students sit for the New Zealand School Certificate examination in Physical and Biological Sciences or in separate science subjects.

Year 12 students study separate science subjects leading to the New Zealand University Entrance Examination (NZUE).

Training of Teachers: Primary school teachers are trained in primary teachers' colleges. At these colleges most students undergo a two-year training programme which includes a course in science education.

To combat a severe shortage of teachers in rural areas, a licensing system exists by which untrained, unemployed school leavers are allowed to teach in primary schools. These teachers can, on gaining some years of experience, undertake a one-year teacher training course.

The introduction of the Elementary Science programme in primary schools has required considerable re-orientation of the existing teaching force. Hence, since 1977, extensive in-service programmes at which, amongst others, teachers are taught how to use certain items of equipment, have been organized throughout the country.

All secondary science teachers are trained at the University of the South Pacific. Courses offered are:

- (a) Diploma in Education - a three-year course for post-NZUE students.
- (b) Concurrent B.Sc. with Graduate Certificate in Education - a five-year course for post-NZUE students.
- (c) B.Ed. - a four-year course for post-NZUE students or a two-year course for holders of a Diploma in Education.
- (d) Postgraduate Certificate in Teaching for untrained holders of a B.Sc. and teaching experience.

Science Equipment: The Elementary Science course in primary schools is an activity-oriented one, and as such requires various items of equipment. 700 kits of equipment consisting of several items supplied by UNICEF and others purchased locally have been distributed to all primary schools. The distribution of these kits is carried out during in-service courses for teachers.

Teachers are also encouraged to make simple items of equipment, following instructions found in teachers handbooks, from locally available materials.

All secondary science equipment is purchased from overseas. In the absence of a central procurement and distribution centre, schools order their individual requirements. Government schools receive a financial allocation for the purchase of equipment.

New Zealand

There are some 2500 primary schools and 300 secondary schools in New Zealand, attended by about 520,000 and 234,000 students respectively.

Primary schools (years 1-8), contributing schools (years 1-6) and intermediate schools (years 7 and 8) are classified as primary institutions. Area schools (years 7-13) and high schools (years 9-13) are classified as secondary schools.

Seven three-year primary teachers' colleges train teachers for the primary schools. In association with local universities some colleges run courses leading to diplomas and degrees in education. There are two secondary teachers' colleges.

Primary School Level: Originally primary school science was associated with Nature Study or biological science. However, recent years have seen the evolution of a new science syllabus for years 1-6. This new, integrated science course is planned around four broad areas of scientific knowledge and experiences - matter, energy, time/space, and living things. Objectives are the development of process skills, interests and attitudes, communication skills, concepts and acquisition of knowledge.

A major feature of this development is the production of units of work including statements of objectives, suggested activities and teacher notes. Equipment has also been supplied.

Years 7 and 8 students at primary schools study the first two years of a newly developed middle school science syllabus.

Secondary School Level: In recent years the years 7 to 10 science syllabus developed in the '60s has been under revision. A new draft syllabus with guide was distributed to schools in 1978, and combined primary/secondary working parties are preparing teacher guides for the syllabus. It is planned to issue sets of equipment when the syllabus and guide are completed.

Year 11 students may choose to take general science and/or biology or chemistry or physics. At present 40 trial schools offer courses in Biological Science, Physical Science and Alternative Science.

Years 12 and 13 students elect to take one or more of Physics, Chemistry or Biology.

Training of Teachers: Most primary teachers enter a teachers' college with University Entrance or a Higher School Certificate. The three-year training period includes a minimum of approximately 30 hours related to science education in primary schools, and some students elect to take science as a major course.

Prospective secondary school science teachers take a three- or four-year degree before undertaking a one-year course of teacher training at a teachers' college.

Some teachers' colleges conduct in-service courses ranging from one day to several weeks' duration. Science teachers' organizations run workshops during evenings and week-ends. Besides, there are 27 full-time primary science advisors and two secondary advisors who conduct in-service courses, mostly in schools.

Science Equipment: Equipment is supplied to all schools by the Department of Education. The basic equipment supplied to individual schools is determined by a committee representing all interested groups and is periodically reviewed and updated. In addition, schools receive yearly capitations, part of which may be used in acquiring additional equipment.

Equipment kits related to the new primary syllabus have recently been issued to schools. These kits contain some locally-made items. The Rehabilitation League (an organization which provides employment for physically and mentally handicapped people) have been responsible for making many of the items in the sets, and for their packaging and distribution. Similar kits are planned for years 7 and 8. All new schools receive a basic issue of equipment and a setting-up grant.

Science Inspectors and Curriculum Officers specify minimum standards and specifications for equipment, test samples of goods from tenders, and decide which is the "best" for each school level.

Papua New Guinea

There are 2050 Community Schools (years 1-6), about 100 Provincial High Schools (years 7-10) and four National High Schools (years 11 and 12). Ten teachers' colleges prepare teachers for the Community Schools, and the University of Papua New Guinea trains secondary teachers at its Goroka Campus. All science curriculum development, evaluation and examinations are co-ordinated by one officer of the Curriculum Unit.

Primary School Level: The science course, introduced into some schools in 1968 under a UNESCO/UNDP project, has gradually replaced an existing Nature Science programme. It consists of one 30 to 40 minute lesson/activity per week and introduces children to both biological and physical science. The material available includes teachers' handbooks, an equipment kit, and a set of basic reference books for teachers. There is also a weekly radio broadcast for children in years 5 and 6.

Secondary School Level: In all Provincial High Schools integrated science is a core subject leading up to Schools Certificate Examinations at the end of year 10. The development of the current course, which began in 1971 under the auspices of a UNESCO/UNDP programme, was preceded by a situation in which there were a variety of overseas courses. The government adopted the course in 1975. The production of relevant and suitable material for teachers and pupils is one characteristic of the course.

Selected students undertake separate sciences in years 11 and 12 at the four National High Schools.

Training of Teachers: Ten teachers' colleges train teachers for Community Schools. All these colleges follow a common core science course developed in 1977. In-service programmes for Community School teachers focus on basic concepts and processes of science and aim at building the teachers facility and confidence in teaching science. Most entrants to the two-year course are year 10 graduates.

Science teachers for Provincial High Schools are trained at the Goroka campus of the University of Papua New Guinea. The course is of three year duration for year 10 graduates. 80% - 90% of years 7 and 8 classes and about 40% - 50% of year 9 and 10 classes are taught science by Papua New Guineans.

All science staff for National High Schools (i.e. years 11 and 12) are at present recruited from overseas.

Science Equipment: The primary science programme is an example of an integrated science course which uses a mixture of standard and local resource materials. The standard kit of equipment consists of about 16 items originally supplied by UNICEF, and another two dozen or so items purchased locally. Each kit caters for 40 pupils and is housed in a lockable cabinet.

Two thousand kits and large quantities of replacement parts have been purchased and distributed. But the problems of distribution, storage, security, and maintenance, contribute largely to the fact that to date many schools are not fully equipped. Secondary science equipment has been received through international and bilateral aid programmes. Unfortunately many of the items received are relevant only to western science curricula and teachers.

Facilities for repair and maintenance of equipment are either non-existent or, where they exist, very expensive. This, coupled with the inability of teachers to improvise and modify equipment, means that large quantities of equipment now lie idle and are deteriorating in schools.

National High Schools were given large establishment grants which have been followed by generous annual budgets. Community School Teachers' Colleges purchase science equipment out of their normal budget allocation, and the Goroka Teachers' College has and continues to receive generous budget allocations for science.

Teachers in Community Schools have always been encouraged to make simple pieces of equipment from local materials. This practice has been encouraged in the teachers' handbooks, the Community Schools science syllabus and during all in-service programmes.

Teachers' guides, teacher training, and in-service programmes for high schools teachers, also emphasize the making of simple items of equipment.

The Ministry's newly established equipment production centre is producing prototypes of equipment which are needed to teach the secondary science course.

Solomon Islands

There are about 200 Primary Schools, 15 sub-junior or Provincial High Schools and six National Secondary Schools.

Primary School Level: Prior to 1971 primary schools followed a variety of natural science courses. The current course, the Solomon Islands Environmental Approach to Science (SIEAS) programme, is UNESCO-funded and emphasizes discovery-learning and the skills of communication, observation, measurement and classification of equipment.

Secondary School Level: The sub-junior or Provincial High Schools have until recently been extensions of existing primary schools. Recent policy to upgrade these institutions includes proposals to include the teaching of basic science principles and processes through the teaching of agriculture.

Integrated science is a core subject at National Secondary Schools, and the course leads to the year 11 Solomon Islands School Certificate examination. A few selected students go on to separate science courses in year 12 before writing the Cambridge Overseas Certificate examination. The development of resource materials, setting and marking of examinations, in-service training, and further development of the curricula for National Secondary Schools is undertaken for the Ministry of Education by a committee of practising science teachers.

Training of Teachers: The Solomon Islands Teachers College prepares teachers to teach the SIEAS programme in primary schools. The College also acts as a centre for in-service programmes to familiarize teachers with SIEAS, and as a storage and distribution point for UNESCO science equipment kits. The majority of science teachers for secondary schools are recruited from overseas.

Science Equipment: Primary and sub-junior secondary schools using the SIEAS programme are supplied with a kit of equipment by UNESCO. Teachers are expected to supplement this equipment and are provided with information in the teachers' guide on how to construct simple equipment using local materials, and of the sources of useful items such as wire, syringes etc. Self-reliance is encouraged and practised. Problems faced include lack of storage and repair facilities, teacher apathy and a shortage of top-up and replacement items.

All secondary science equipment is purchased from overseas. Schools at present make individual orders and are not able to take advantage of bulk buying.

Harsh climatic conditions and low levels of maintenance and repair skills take a heavy toll on sensitive equipment. The Secondary Science Panel runs in-service courses and attempts to co-ordinate the dissemination of information on the construction, procurement, and exchange of equipment.

Tonga

Primary education has been compulsory since 1876. All primary-age and 85% of secondary-age children attend the 133 primary and 48 secondary schools of this Pacific Kingdom. One teachers' college prepares teachers for the primary school level.

Science is included in the subject Nature Study at primary school; emphasis here is on direct observation of nature and on developing scientific attitudes. The teaching of science as a component of Nature Study has not been successful and this has led to efforts being made to develop, with Australian aid, an "Environmental Science" programme particularly for the fifth and sixth year classes.

The majority of secondary schools follow the long established General Science Syllabus, a traditional science course leading to the Tongan Higher Leaving Examination in the tenth year.

Tonga participated as an inaugural member country in the development of the UNDP/UNESCO basic Science Programme based at the University of the South Pacific in Fiji. Ten secondary schools began trying out this curriculum in 1971, and it was envisaged that all schools would gradually follow suit. For a variety of reasons however, this has not happened. Nevertheless, the Tongan Science Teachers Association still supports the programme and from time to time organizes activities including regular in-service courses aimed at promoting effective teaching and learning.

Less than 10% of tenth year students go on to the eleventh and twelfth years of schooling and undertake courses leading to the writing of overseas (particularly from New Zealand) examinations.

Teacher training at the one and only teachers' college is restricted to the preparation of primary school teachers; the two-year course produced with the help of UNDP emphasizes the acquisition of basic physical and biological science principles.

There is no specific training of secondary science teachers, and the Kingdom relies heavily on expatriates (principally American Peace Corps) and a few New Zealand-trained Tongans.

Most science equipment used in secondary schools and in the teachers' college is imported from overseas; the United Kingdom is the largest single supplier. A diversity of education agencies; the absence of central ordering, storage, maintenance and repair facilities; a shortage of trained, experienced science teachers; and geographic isolation, contribute to the existing school equipment problems. In 1972 a UNDP-sponsored investigative project demonstrated that a limited range of science equipment items could be constructed locally, but there has been little follow up to this exercise.