EDUCATION IN THE COMMONWEALTH

# SCHOOL BUILDING AND DESIGN IN THE COMMONWEALTH

COMMONWEALTH SECRETARIAT

EDUCATION IN THE COMMONWEALTH

Number Four

# SCHOOL BUILDING AND DESIGN IN THE COMMONWEALTH

Commonwealth Secretariat
Marlborough House
London, SW1Y 5HX

Other titles in this series:

1. Examinations at Secondary Level.
2. Directory of Educational Provision for Handicapped Children in Developing Commonwealth Countries.
3. Education in the Developing Countries of the Commonwealth - Research Register 1970-71.



Published by the
COMMONWEALTH SECRETARIAT

To be purchased from the
Commonwealth Secretariat
Printing Section
Marlborough House
London SW1Y 5HX

I.S.B.N. 0 85092 044 2

SCHOOL BUILDING AND DESIGN IN THE COMMONWEALTH

CONTENTS

# INTRODUCTION

During recent years, many Commonwealth countries have developed new ideas on school building and design, have introduced innovations, and have accumulated valuable experience of planning, managing and executing school building programmes suited to their own educational needs and economic means.

Some of these projects have been publicised but many have not. Educational planners, architects and others concerned with the design and building of schools are not always aware of the experience that has been gained in other countries, and of solutions which have been successfully devised elsewhere for the very problems with which they themselves are confronted.

For climatic, economic, social, educational, cultural and other reasons, school designs, school furniture and building methods which have proved successful in one country may be quite unsuitable for another country. Nevertheless, a fuller exchange between Commonwealth countries of information and ideas in these fields, as recommended by the Fifth Commonwealth Education Conference which met in Canberra in February 1971, may well yield beneficial results. This Occasional Paper is a contribution towards Commonwealth co-operation in school building and design through such information exchange.

The articles fall into three broad sections - planning of school building, the execution of building programmes, and the quality of school building.

## Planning of school building

School building must be related to the general political, cultural, economic and technical climate in particular places at particular points in time. Professor Notley argues the case for including designers of school buildings in the macro-planning processes and for a continuing dialogue between the users and designers of school buildings. The importance of an inter-disciplinary approach is also stressed by Shri J.P. Naik in his account of the development groups which have been established at national and state levels in India and which constitute an important step in facilitating the planning and implementation of school building programmes which combine quality, efficiency and economy. With a similar aim in view, Malaysia is planning to establish an educational facilities development group. The planning of Malaysia's current school building programme is described by Mr. Murad.

School plant is frequently under-utilised. Through the more intensive utilisation of school spaces, valuable economies can be effected and educational opportunities can be given to larger numbers of children. Mr. Srivastava's article describes a study on the use-efficiency of primary school spaces undertaken at the Central Building Research Institute, Roorkee, India, while Dr. El Jack, drawing on experience in Africa, demonstrates the contribution that optimum space utilisation at the secondary level can make to reducing capital cost per pupil.

Execution of school building programmes

The fostering of a healthy, competent building industry, covering all aspects of the building process, is an urgent development priority in many countries. Miss Pearson suggests strategies which governments can employ in encouraging the growth of locally based construction activities.

The school building activities of the British Development Division in the Caribbean, which aim at achieving collaboration, flexibility, realism and economy, are outlined by Mr. Wood. Imported steel frames with local cladding have been used in many schools built in the Caribbean. In other island communities, in the Pacific, prefabricated construction methods may have their disadvantages. These are described in Mr. Honey's article which proposes an approach that takes account of the local limitations in skills, transport and money and allows decisions to be made locally on the facilities to be provided and the order in which improvements may be effected.

Self-help forms an important element in many educational building programmes and this is particularly true in Kenya. Mr. Muraya's account of "Harambee" school building shows how the efforts of local communities have contributed to the expansion of educational facilities in Kenya. "The buildings" writes Mr. Muraya, "form an important part of the accumulated assets of the nation in education; they are also monuments to the faith the common man has in education."

Two articles describe unusual projects. From Hong Kong comes a description of the building of multi-storied schools which have been necessitated by a shortage of building land. Brother Hortensius gives an account of the Project for the Education of the Deaf in Malawi.

Quality in school buildings

In countries where the provision of "roofs over heads" is of over-riding concern, resources cannot always be spared to improve the physical environment of the classroom. In many countries it is only when an extensive building programme has been successfully executed that attention can be turned to qualitative development. Ceylon has sufficient school spaces for the bulk of its population of school-going age. Dr. Udagama gives an account of the steps taken to gain maximum advantage from the open-hall-type schools which have been built in large numbers, and to provide desk and chairs constructed by lower secondary schoolboys. The importance of school furniture "as part of the ethos of the school, and as a starting point in school design" is the burden of Mr. Medd's contribution which describes changing ideas on school furniture and contends that the provision of a wide range of furniture is increasingly the means whereby a school becomes an educational instrument.

Few innovations in schools during the last decade have aroused more excitement and interest than the open area teaching concept. Mr. Ryan outlines the advantages and problems of "wide open spaces". He reminds us that all those who have a part in building a school must take into consideration recent advances in our knowledge of child growth and development, and the psychology of learning, and in teaching methods and aids.

Mr. Nottle, a teacher in Australia, gives his views on the facilities which will encourage, permit and inspire teachers and pupils to do

their best work, and pleads that those who design schools should give adequate consideration to the views of those who will use them. Finally, Mr. Orlowski describes the work of the office of School Planning and Building Research in Ontario, Canada, which, amongst other activities, arranges workshops where architects, planners, engineers, teachers, administrators and representatives of the community discuss the problems of planning and building educational facilities.

These articles, of course, describe only a small cross-section of a multitude of activities which are going on throughout the Commonwealth to increase the quantity and to improve the quality of school building. That many topics have not been included in this Occasional Paper is all too evident. Nevertheless, the Paper will have served its purpose if it stimulates further exchanges of information among those who work in this field and leads to increased sharing of the professional, technical and administrative skills which, collectively, the Commonwealth possesses in abundance.

# THE BIGGER PICTURE

Professor Donald Notley

Dean, Faculty of Architecture, University of Singapore

School building can rarely, if ever, be considered in isolation, but must be related to the general political, cultural, economic and technical climate in particular places at particular points in time. The combinations of these four variables are unique to each situation, and they are always present. The first two especially operate to influence the thinking of administrators, and the latter two, usually at operational level, influence the thinking of those concerned with our built environment, more particularly the architects among them.

School building programmes do not originate with architects, but with statesmen, politicians, and administrators, who provide the necessary drive and have the necessary powers to see that programmes do not collapse by being given too low a priority in competition with other desirable programmes. They tend to see the architects, who design the buildings they need, more or less as technicians at professional level who are able to tell them, quickly, how much their projects are going to cost and how soon they can be realised, given the money, and how costly they are going to be to maintain. They assume that architects are not interested in the complex preliminary decisions of policy or, if they are interested, even so they are not competent to engage in these matters which are outside their own professional field.

To a large extent this is true. The person who designs a school may not be interested, professionally, in where the teachers are coming from or how they are trained (unless he is called upon to design a teachers' training college) but, by the very nature of his own training, he is able to see the bigger picture, and also, by the nature of his training, he is aware of social problems of which school building is a significant manifestation.

What is really important about school building programmes is not the buildings themselves. They are simply manifestations of ideas in the form of space containers, within which foreseeable (and to some extent unforeseeable) educational activities can take place. If the spaces are so arranged that changes in educational policy or teaching method can be accommodated during the life of the building, so much the better. The most important consideration is whether the overall educational plan for a country, region, district, or city is a good one and can be implemented. As with the buildings themselves, an educational plan must be adaptable and flexible, and comprehensive in the sense that it must embrace the full range of educational services required.

In order to utilise the maximum amount of available talent, it would seem to be a sound move to include designers of school buildings in the macro-planning processes. This does not ensure that the resulting buildings are going to be successful, but it does help to create favourable

conditions for relating school building to other building efforts, and for those concerned with microplanning of school buildings to be given a good chance of appreciating their own contribution to the total building programme and receiving intelligent instructions, or briefs.

Macro-planning, which involves political, economic, and social objectives and resources, must relate school building to urban and rural situations in general, and to other community buildings and housing. As far as the school buildings themselves are concerned, the problems are mainly connected with the built form, with location and with communications and services, and educational objectives.

A multi-disciplinary planning team

All of these require associated micro-planning efforts, and these may be defined as being related to administrative, educational and architectural problems. All three require, ultimately, what the medical profession prescribes as TLC, or tender loving care. For the administrators and educators, this has to be a continuing process. From the architect it has to be concentrated in the period between being commissioned and handing the building over, having provided all that is necessary to bring the building into operation, fully serviced and equipped.

Naturally, in any process described as 'planning', physical planners are assumed to be involved and, although some of them may also be capable of designing buildings, it is not being suggested that architects may be dispensed with. All are necessary. The problem is how to make a multi-disciplinary team work creatively, once the general objectives have been appreciated by its members.

No solutions can be offered, but they must be found. However, a start can be made by each concerned making a conscious effort to understand the motivations of his colleagues, and the pressures to which they are subject, and to explaining his own.

One is assuming that in nearly all Commonwealth countries school building is the responsibility of a government department. This makes collaboration more easily contrived, and it also ensures machinery for feedback being possible. For young architects government service often does not possess the glamour or economic opportunities of private practice and, for gifted handlers of form, time spent in getting to know the minds of colleagues in other fields may be considered as time wasted. All means of pressing the available talent into service should be used. It is not necessary even for 100% of all school building to be done by the government. A government organisation is indispensable, of course, but it can utilise, particularly in a school building programme, other resources, including economic ones.

Whichever way one looks at it, the overall problem is not easy. For a city-state, like Singapore, governmental educational objectives might more easily be translated into reality because of shorter physical and mental communication channels. But a small, multi-racial society has pressures to which larger, more homogeneous societies are not subject. A country which is accelerating its pace of development cannot let up, in any direction. Acceleration itself brings its own problems which impinge on the existing ones.

Having had the opportunity to consider one limited aspect of school building, namely high rise buildings, in the Asian region, with particular reference to Singapore, one becomes conscious of the need for some sense of perspective, especially on the part of building designers, and of the need for utilising to the maximum the resources already available.

At the invitation of the Government of Ceylon a UNESCO-sponsored body based first in Bandung, then Bangkok, had a home made available in Colombo. The Asian Regional Institute for School Building Research, which is the body in question, is chiefly interested in school building in a region comprising nineteen countries, twelve of which are in the tropics. Many Commonwealth countries are also in the tropics, and much of the data which the Institute, over the years, has amassed would be of interest to other tropical Commonwealth countries in particular. One wonders, however, whether it is routine practice for ARISBR's publications to reach these countries, and to be studied, and whether in other continental regions like Africa, Canada, and Australia there are bodies performing the same functions. If there are such, one wonders how much of their work is being utilised. By asking a question in this way, the implication is that the answer is going to be in a negative sense. The consideration of high rise school buildings, referred to above, arose because ARISBR had, as part of its interests, become concerned with the amount of land required for school buildings in Asian cities, and wished some thought to be given to one obvious solution, namely, high rise school buildings. Even this apparently straightforward proposition revealed, on examination, many other general school building considerations and special ones related to Singapore itself, apart from the implications of resorting to high rise school buildings.

Design effort and expectations

It is not the intention here to reproduce extracts from the study. What might be more relevant is to conclude by a discussion of what is expected of school designers, what is the effect of the performance of their buildings, and the active contribution which school administrators can make in the successful use of what is a costly and immovable teaching aid.

Designers usually assume that they are contributing towards the total built environment something which is going to improve the educational process. The actual influence upon the intelligence of pupils by their surroundings has not been measured, but there is a tendency on the part of the designers to over-rate the importance of the aesthetic environmental climate. In less doubt are the creature comforts which the building designer is supposed to assure, so that at the very lowest, the users of his building have properly lit working spaces, are heated or cooled to an acceptable degree, can hear what they are intended to hear clearly (and are not subjected to unwanted extraneous audio-visual distractions), can see enough to do their tasks properly, and are able to make necessary moves from one point to another conveniently. Finally, his building has to accommodate all the necessary services to enable the building to function and it must allow the educator's equipment to be conveniently arranged. By taking thought, all this can be done within a building envelope which might consist of a more or less permanent part, and parts which can be removed or adapted or improved, providing an upgraded version in terms of performance of the original article.

This is not very difficult to achieve technically, but it does require thought and design effort. The design effort has also to provide for assessment of the functioning of the building, and, assuming a school-building

organisation with a continuing programme, some means of correcting past design inadequacies in future buildings.

It is in the determination of the kind of spaces to be provided and in the use and adaptability of the finished product that is the area yielding the most easily detectable results of a real dialogue between users and designers.

The special user, in a building which provides all the creature comforts referred to and the areas asked for, who is most affected by inflexibility in the usage of space and by inadequate provision for movement is the school administrator, usually the head teacher. A directive coming from the top can pose severe problems to him, if it means that all his carefully contrived movement control exercises are to be done all over again - sometimes they cannot be done at all - satisfactorily, that is.

To sum up, perhaps one might say that even the simplest school building programme needs, right from the time when it is a factor in bigger plans - political, social, economic, and physical - to the time when it has been translated into an instrument in use, the keenest and most imaginative brains which can be found.

# NATIONAL DEVELOPMENT GROUP FOR EDUCATIONAL BUILDINGS IN INDIA

Shri J.P. Naik

Educational Adviser, Union Ministry of Education, India

There is an urgent demand for a larger number of school buildings in India due to the rapid growth and expansion of education. Huge planning and building efforts are being made to provide proper educational facilities, yet fifty per cent of the schools at primary and middle stages do not have buildings of their own and are housed in totally unsuitable accommodation. The Indian school system is short of nearly fifty crore* square feet of space and about Rs. 600 crores is required to clear this backlog, even at a very modest rate of construction cost. In addition, buildings have to be provided for the fast growing additional enrolments. Economy in the cost of construction is, therefore, of cardinal importance to the success of the educational programme. There is another aspect also and that is to ensure the quality of buildings to cope with the changing educational technology.

It is now largely accepted that the efficient utilisation of money for educational facilities requires a proper study of educational, functional, physical, constructional, economical and environmental requirements, and this calls for an inter-disciplinary approach.

Education in India is primarily the State Government's responsibility. The Union Government co-ordinates it and formulates aims and objectives, assesses the prevailing position and draws up future plans in the national context.

The Education Commission in its report on schools buildings recommended the need for the reduction in building costs to the minimum level possible and also for the formation of educational building development groups in the States and at the Centre for implementing the building programme expeditiously and economically. The Central Building Research Institute, Roorkee, which is engaged in school building research and is also interested in the above objective, followed up the recommendations. It urged the State Governments to give high priority to the formation of development groups.

## Development Group-Composition and Functions

The first development group in the country was formed in December 1967 by the Government of Maharashtra. The Union Territory of Goa Daman and Diu and the States of Uttar Pradesh and Kerala followed suit. In 1968, the Union Ministry of Education, with the active collaboration of CBRI, formed the National Development Group at the Centre. The composition of the National Group includes the Chairman of the State Development Groups in addition to educationists, engineers and educational administrators. The group was formed under the chairmanship of the Educational Adviser, Union Ministry of Education. The research architect of CBRI works as member-secretary. The CBRI supports the

* 1 crore = 10 million.

National Group in its technical and research activities.

With the purpose of achieving the maximum advantage in the functioning of the National Development Group the following functions were determined:

(a) to remain in touch with the development groups established in other countries with a view to exchanging information and technical know-how and adapting them to Indian conditions;

(b) to promote the establishment of development groups for school buildings in the States and Union Territories of the country;

(c) to co-ordinate, assist and help the works of State development groups;

(d) to act as a clearing house for information regarding programmes for reduction of costs in school buildings which are being developed in different States;

(e) to promote and co-ordinate research on school buildings in the country.

Activities of the National Development Group

In India, the planning, design and construction of school buildings is the responsibility of State Governments. They execute the school construction work through their own agencies at State, district or village level. State Governments have their own school building regulations, codes, standards and type plans. In a majority of cases, they were formulated fifty years ago or even more. Although the States have a large school building construction programme, they are not all aware that the development group idea would be of great value in improving amenities and producing better schools with the latest building techniques available in the country. On the other hand, the Central Building Research Institute, Roorkee, is working on school building problems in India and has already produced much useful information in the field of design, anthropometric data and information on intensive utilisation of space and on the more economic use of materials, and elements of construction in schools. The National Development Group took up the task and made efforts to convey to the State Governments and Union Territories all the information regarding the research work done in the CBRI, with a view to reducing the cost of school buildings and making them more functional. Seminars and exhibitions are arranged and the advisory services of CBRI are made available to State Development Groups. State Governments are requested to produce the research literature of CBRI in their regional languages for the use of official and local agencies.

The National Development Group has prepared a work plan, defined the functions, and suggested a procedure of work for the State Development Groups, after a careful study of the pattern and structure of administration in the States. The two-tier working system of the development group has worked successfully in the States which have formed such groups. The National Development Group has helped eight State and Union Territory Governments to set up development groups in their States. These States are Maharashtra, Goa, U.P., Punjab, Tamil Nadu, Delhi and NEFA.

In view of the lack of resources for technical personnel and finances at State level for the functioning of development groups, and also due to lack of appreciation of the utility of such groups, the State Groups now established are working on a part-time basis and have personnel drawn from State Public Works Departments and Departments of Education. The National Group and CBRI thus play a major role at the initial stages in the activities of such groups. A few of the State Groups, having realised the advantages, have now made moves to set up full-time development groups in their States. The National Group is paying special attention to setting up development groups in the backward States and also in States which have huge programmes of school building construction. Due to the continuous efforts of the National Group, the CBRI, and the interest taken by the Planning Commission, and also due to the encouraging performance of the existing groups in the States, the development group concept has attracted the attention of a number of States and they have shown interest in the work of development groups. The Group at the Centre has approached the Union Government to provide financial assistance to State Governments for setting up their groups.

Through the advisory services of CBRI, the National Development Group helps the State Development Groups in their development work, e.g. in selecting a project, the solution to the problems of which will be of wide application; in clarifying the educational, architectural and cost objectives for the type of school selected for development; in developing the prototype design of school; in the construction of prototype buildings; and in evaluating the prototype both from educational and architectural viewpoints.

As a result of developmental activities the State Development Groups have identified priority projects and have developed and constructed prototypes. These have produced encouraging results as advantage has been taken of research and new ideas in planning and construction technology to make school buildings more functional and more economical.

Research study in Marathwada

The National Group and CBRI in collaboration with Maharashtra State Development Group took up an interesting study on the development of school buildings for Marathwada region, a comparatively educationally backward area of the State of Maharashtra. A survey of 2200 schools, covering the whole region, was undertaken with a view to studying the existing situation and provisions and to identifying the types of schools required. The study also aimed:

(a) to investigate and identify the educational requirements for various school types;

(b) to establish a minimum schedule of accommodation in order to increase the use factor of schools;

(c) to establish basic design criteria, taking into account the educational, constructional, economic and climatic requirements;

(d) to evolve functional and technical prototypes of school buildings;

(e) to formulate a consolidated building programme for planned development and expansion.

The study included a careful probe into educational, administrative and architectural requirements. It worked out standards of accommodation and design criteria, evolved functional prototypes and constructional details, and made suggestions on the mode of financial assistance to individual schools and the policy for construction programmes for the entire region. Since the construction of schools on a large scale is envisaged, a consortium approach for the prefabricated roofing units has been suggested. A seminar to discuss the recommendations of the study was arranged. Educationists, educational administrators, engineers and officials of the region who are responsible for the execution of the programme in the region took part. The programme of action was finalised. The prototype construction of different school types has subsequently been completed and reached evaluation stage. The study for the development of school buildings for Marathwada has led to the formulation of a scheme to afford employment to unemployed engineers and technicians through a programme of construction of school buildings throughout the country. The Ministry of Education has shown interest in the scheme. It may lead to a major programme of action for the National Group if finance is made available. This will serve a dual purpose in providing employment and constructing schools on a large scale.

Liaison with other bodies

The National Group maintains liaison with the Asian Regional Institute for School Building Research in Colombo. Information on research and development work from the ARISBR is disseminated to State Development Groups. In collaboration with CBRI, it undertook the evaluation of prototypes of schools in Goa and the development of furniture for schools in the Punjab. Members of the National and State Development Groups, at the invitation of the Asian Institute, have visited the Institute at Colombo to discuss and exchange views on problems of mutual interest. Several collaborative studies with ARISBR are proposed for the future. The National Development Group will welcome similar exchanges of views and experience with other Commonwealth countries also.

The Indian National Group is planning a quarterly news-letter with a view to disseminating the development activities of various groups at home and abroad to those interested in the subject. It has plans to organise seminars, get-togethers and exhibitions for the better and more effective dissemination of experiences.

An assessment of the impact of development group work in this country will be made in due course. It is already apparent that the establishment of development groups is an important step in the direction of facilitating the planning and implementation of school building programmes which combine quality, efficiency and economy.

# SCHOOL BUILDINGS AND DESIGN IN MALAYSIA

Murad bin Mohammed Noor

Director, Planning and Research Division,
Ministry of Education, Malaysia

The Ministry of Education manages administratively and financially the entire school building programme for the whole country. Until 1962, the Ministry had its own architectural works division, which either designed its own school projects or requested local consultant firms to execute the work.

Since then, however, the design work and construction has been the responsibility of the Public Works Department, which is part of the Ministry of Works, Posts and Telecommunication.

The establishing of programmes for school building work is somewhat recent in this country and was introduced in 1960 when the first five year plan, known as the First Malaya Plan, was introduced. The table below shows the current school building programme.

Table I

Current School Building Programme ($ M million)

| Programme | 1966-70 $ | 1971-75 $ |
|---|---|---|
| (I) West Malaysia only | | |
| (a) Primary | 48.5 | 55.09 |
| (b) Secondary | 100.7 | 154.43 |
| (c) Technical education | 10.8 | 42.86 |
| (d) University | 24.4 | 87.05 |
| (e) Teacher training | 9.7 | 3.00 |
| (f) Other programmes | 19.0 | 27.68 |
| (II) East Malaysia | 42.5 | 78.37 |
| Total Expenditure | 255.6 | 448.48 |

## Planning Procedures

The education budget for the year is included in the National Budget that is passed by Parliament around November/December of the previous year. Capital items are voted and approved in very much the same way as the recurrent expenditure, except that in the case of capital items these have to be approved first by the Finance Committee of the National Development Planning Committee (NDPC), which operates within the framework of

the Prime Minister's Department. However, it must be noted that the total development annual expenditure for the next five years cannot exceed the ceiling approved under the Second Malaysia Plan without the approval of the NDPC. Funds are directly controlled by the Ministry of Education, which in turn allocates funds either to the Public Works Department (PWD) for the construction of buildings or to the Chief Education Officers of the States for expenditure on furniture and equipment.

Special proformae are prescribed by the Treasury for the submission of development projects for approval. Each project must be fully prepared and set out in accordance with the basic format laid out below. This is done after consultation with Chief Education Officers of the various States or other relevant authorities, who in turn would have consulted the respective local authorities and school boards. The proposal must establish that the project has been soundly conceived, taking into consideration the technical, engineering, economic, financial and organisational aspects.

The type of information which must accompany each proposal is indicated hereunder:

(a) Background information on the projects (e.g. the contribution the project will make towards the fulfilment of the general objective of the Ministry).

(b) The project:
  (i) Description of the project and its location, etc.
  (ii) The stage of preparation of the project.
  (iii) The limiting factors and special problems e.g. suitability of soil, transportation, etc.
  (iv) The proposed implementation schedule of the project.
  (v) The organisational and administrative arrangements of the project.

(c) Cost estimates:
  (i) Capital costs.
  (ii) Recurrent costs.

(d) Manpower requirements.

(e) Benefits and justification - this section is really the heart of the brief. Here should be presented an objective and comprehensive statement regarding the importance of the project.

(f) Foreign assistance requirements.

Design and construction

The size of the school site generally depends upon the type of school and the educational programme. Table II below gives the minimum areas required for the various types of school.

Table II

Minimum Area Required for Schools

| Level | Average |
|---|---|
| Primary | 6 acres |
| Lower secondary | 6 acres |
| Upper secondary | 8 acres |
| Upper secondary vocational | 20 acres |
| Upper secondary technical | 20 acres |

The building design and pattern of school buildings are based upon educational, sociological, and sanitary requirements, taking into account such factors as climate, surroundings, economic situation and building techniques. Therefore the design of school buildings in this country is the result of close collaboration between educators, architects, cost engineers, surveyors, civil and structural engineers, and health officers. In designing new buildings, possible changes in teaching methods are also taken into consideration.

Generally speaking, standard plans are used in all school building construction, but the component units of the buildings are quite flexible and adaptable to meet the varying local conditions and also the evolution of educational ideas.

The standards used in school planning are summarised below in reference to particular examples (all sizes are given as net area):

(a) Room sizes (Secondary schools)

| Accommodation unit | Maximum no. of students per unit | Total area in sq.ft.(net) | Area per student in sq.ft. (net) |
|---|---|---|---|
| Standard classroom | 40 | 710 | 18 |
| Science room | 40 | 950 | 24 |
| Domestic science room | 24 | 1190 | 50 |
| Needlework room | 24 | 950 | 40 |
| Metalwork shop | 24 | 1700 | 75 |
| Electrical workshop | 24 | 1000 | 42 |
| Woodwork shop | 24 | 1190 | 50 |

(b) Window areas in relation to room sizes

Standard natural light for educational rooms (window area including screened ventilation area) is about 37% of the room's net floor area.

(c) Floor to ceiling heights

Classrooms, Science rooms, Workshops, Home economics room, Administration room — Average height about 10' 0"

For specialised rooms such as assembly halls, gymnasia, etc., no standard plans exist.

(d) Sanitary standards

| Unit | No. of people per unit | |
|---|---|---|
| | Minimum | Maximum |
| Girls' toilet | | |
| Water closets | 35 | 55 |
| Wash basins | 24 | 38 |
| Boys' toilet | | |
| Water closets | 45 | 120 |
| Urinals | 29 | 45 |
| Wash basins | 22 | 35 |
| Changing rooms | | |
| Showers | 53 | 84 |
| Staff (female) | | |
| Water closets | 7 | 10 |
| Wash basins | 7 | 10 |
| Staff (male) | | |
| Water closets | 15 | 20 |
| Urinals | 4 | 4 |
| Wash basins | 7 | 10 |

Water supply

Average daily consumption per head per day:
(a) Boarding school - maximum 40 gallons for the boarders.
(b) Day school - about 10 gallons per school session.

Water in urban areas is provided by the government (either the Public Works Department or the municipalities). In rural areas, where there is no public water supply, it comes from the schools' own wells. There is no problem in getting an adequate water supply throughout West Malaysia.

Drainage and sewage disposal

Sewage and drainage of wastes and storm water is done in urban areas through the public sewage, where this exists. In areas without public sewage, it is done through the school's own septic tank.

Artificial lighting

Electrical light is normally used during the rainy seasons and for evening classes.

The voltage is 230-240 v, 50 cycles AC.

In some remote parts of the country, schools depend on their

own generators for their supply of power. The table below indicates the standards used for light levels for different units:

| | | |
|---|---|---|
| (a) | Classrooms, Assembly room, Laboratories, Home economics | General lighting - 1/5 Watt per square foot. |
| (b) | Workshop, Art room | Localised lighting for each work area. |
| (c) | Administration rooms, (e.g. general office) Headmaster's office & staff room, library | $\frac{3}{10}$ General lighting Watt per sq. ft. |

Sun-screening and protection

In order to provide minimum interference from the sun, and hence maximum thermal comfort conditions both for the pupils and the teachers, all the classroom blocks are oriented East-West. Where this is not possible, due either to site difficulties or shape of the lot, every effort is made to keep any variation to within $10^{o}$ of this line.

For further protection from the sun, screening and protection of window walls are effected by louvres, and/or overhanging floor slabs at first floor level.

Ventilation

All teaching rooms have natural cross ventilation. The ventilated area - wire mesh screen - is about fifteen per cent of the room's floor area. This percentage does not include the ventilated area obtained from louvred windows.

Artificial ventilation is only used in very rare cases, e.g. the library and/or administration area may have ceiling fans provided.

Once these standard plans have been designed and approved, copies are sent to all the State and District Engineers, who must utilise them for all school buildings irrespective of their locality. Any deviation or alteration to the standard plans must meet with the approval of the Assistant Director, Public Works Department, in charge of the Education Works section of the P.W.D.

Once the layout of a school has been designed and approved by the Head Office of the P.W.D. and the respective Chief Education Officer, and after the Bills of Quantities/specification have been prepared by the Quantity Surveying Branch, the P.W.D. then invites tenders from appropriate grades of contractors registered with it.

However, any intended change in the school curriculum is conveyed to the P.W.D. which in turn modifies the building plans to meet the new needs. These plans are then sent to the relevant sections of the Ministry for approval. As soon as approval is obtained, the standard plans are then modified. A few examples where standard plans have and are being

modified to meet such innovations in teaching methods and curricula are:

(a) Workshops

The content of Industrial Arts in secondary schools has been enlarged recently. Power mechanics and electricity have now been introduced in addition to metal and wood-work. This has given rise to the need to modify the old workshops and the existing standard plans to accommodate the additional activities.

(b) Science laboratories

The teaching of science in Malaysia is at present undergoing changes with emphasis on practical work in which the pupils themselves endeavour through experiments to find out for themselves the principles relating to the topics under study, rather than verification of principles explained in lessons. This is what is commonly known as integrated science. Action is now being taken by the Ministry's science centre to design new laboratories which will provide space for group work, facilities for display of audio-visual aids, etc. Various types of movable furniture for these laboratories are also under consideration.

## Conclusion

In Malaysia, the school building programme has kept pace with demand for education. However, recent trends in education indicate that there is a need for more specialist types of teaching space, particularly at the upper secondary level. The Ministry and the P.W.D. are now actively engaged in studies on the need to build more schools, more economically, and with more intensive utilisation of specialist teaching space so as to offset additional costs.

It may also be relevant to note that a seminar on Costs and Utilisation of Secondary Schools in Malaysia was held in March 1971 in collaboration with Unesco experts from the Asian Regional Institute for School Building Research.

Among other decisions taken at the seminar, it was agreed that, if Malaysia is to take advantage of the changes and innovations resulting from the development of technology, it would be necessary to look into the possibility of establishing an Educational Facilities Development Group. This group, which is essentially an inter-disciplinary team, will consist of educationalists, architects, engineers and cost officers. The function of this group will be to study school programming, space utilisation and costs to the ultimate advantage of the school building programme. Malaysia is at present seeking the assistance of the Asian Institute for School Building Research in establishing this unit.

# INTENSIVE UTILISATION OF PRIMARY SCHOOL SPACES

R.D. Srivastava

Scientist - Co-ordinator, Architecture & Physical Planning Division,
Central Building Research Institute, Roorkee, India

Shortage of school premises for the existing population, a continuously increasing demand for more spaces to cope with the unprecedented increase in population, coupled with lack of resources to provide the same is, in a nutshell, the problem faced by any developing country. Millions of school-going children are required to be housed in school buildings to meet their urge for education. This naturally requires a very large number of school buildings. It is therefore necessary that every possible economy be achieved in the design of new schools.

There are many ways of tackling this problem: more places can be provided by reducing the gross covered area per student; by lowering the cost of construction; by arranging for the building to be used in shifts. Another way is to ensure that no underused spaces are provided in the design of future school buildings.

With the above objective in view, a study on the use-efficiency of school spaces was undertaken at the Central Building Research Institute, Roorkee, India, to examine how economy in spaces could be effected through the continuous use during the school day of spaces in school buildings and on the school site.

## Use-efficiency

There are several ways of estimating the relative economy of a building:

(a) by comparison between the gross area available for teaching and the remaining area of the school;

(b) by comparison of a number of schools in respect of areas of different spaces;

(c) by comparison of covered area per pupil considering various functions;

(d) by comparison of cost per student place.

None of the above mentioned methods indicates the degree to which the spaces are used. It was therefore necessary to study the teaching time-table in relation to the plan of the building. From this it was possible to express the actual use of each space in relation to the length of the school day during which the building was in use. The use-efficiency was defined as the ratio between actual and ideal use per square feet per hour. The actual use was area of space used multiplied by time, and the ideal use was total area of space multiplied by total school time.

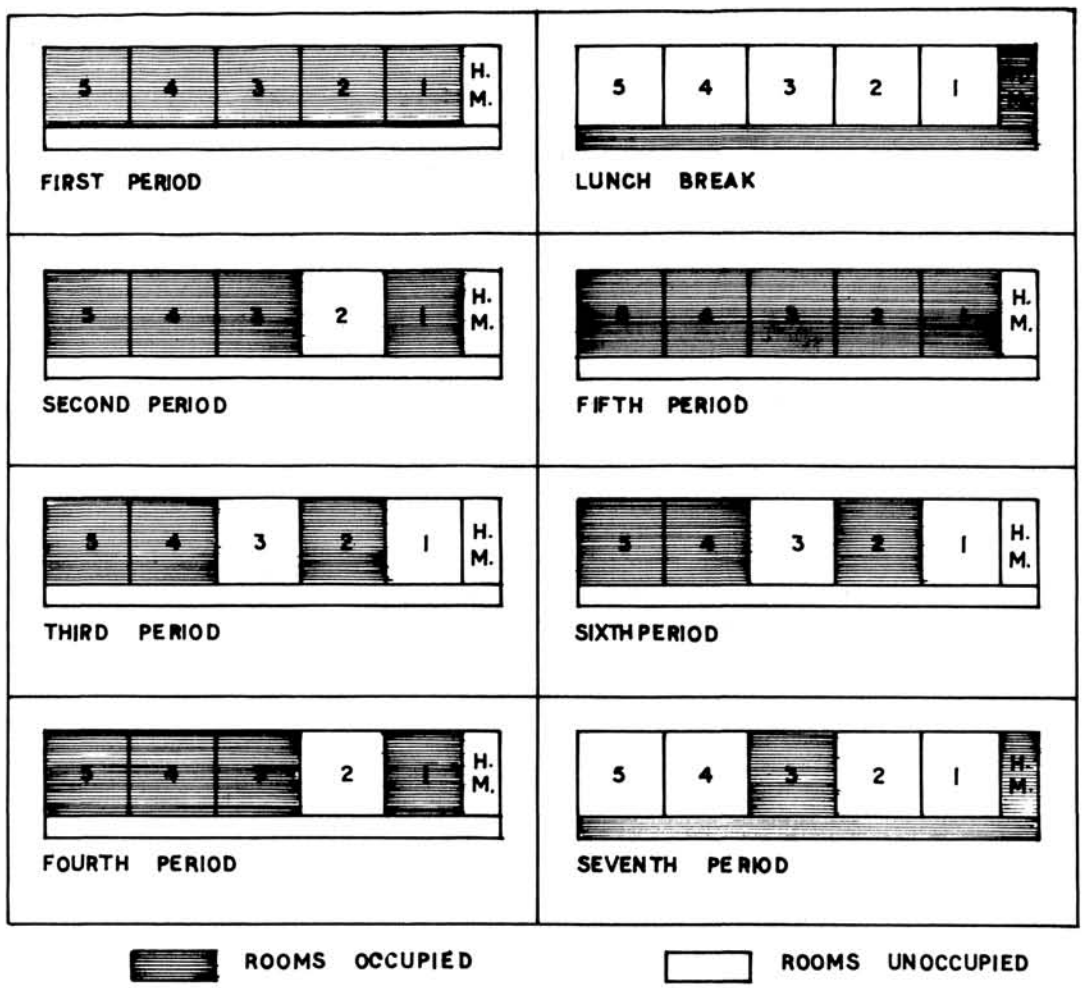



Fig.1. School building plan for 5-classroom school related to the time-table

TEACHING PERIODS

| Class | Inside periods | Outside periods (including 1 lunch period) |
|---|---|---|
| I | 4 | 4 |
| II | 4 | 4 |
| III | 5 | 3 |
| IV | 6 | 2 |
| V | 6 | 2 |

Area of each classroom 7.32 x 6.1 M = 44.55 $M_2^2$
Area of verandah 39.62 x 1.52M = 60.22 $M_2^2$
Area of H.M. room 3.05 x 6.1 M = 18.60 $M^2$

USE-EFFICIENCY OF SPACES

Class I: Actual use 44.55 $M_2^2$ used for 2.7 hours = 120.40$M_2^2$ hours
Ideal use 44.55 $M^2$ for 5.25 hours= 234.11$M^2$ hours

$$\text{Use-efficiency} = \frac{120.40}{234.11}$$

U.E. Class I = 0.51
" " Class II = 0.51
" " Class III = 0.63
" " Class IV = 0.76

U.E. Class V = 0.76
" " Verandah = 0.25
" " H.M. room = 0.25
Use-efficiency of the school = 0.52

A typical school building plan of five classrooms (Fig. 1) was related to the time-table being followed in local primary schools. The time-table in terms of outdoor and indoor periods is also indicated in the figure. The $5\frac{1}{2}$ hours (10.00 a.m. to 3.15 p.m.) teaching day with eight periods of forty minutes each (including one lunch period) was the general pattern. The study revealed that the use-efficiency of the school building was 52 per cent and the occupancy of the verandah and the headmaster's room was as low as 25 per cent. The use-efficiency of classes ranged from 51 to 76 per cent.

Increased use-efficiency

To achieve economy in buildings, increased use-efficiency was attained by eliminating the less used spaces, and by a rational application of teaching periods in the school plan. By eliminating the verandah and the headmaster's room, use-efficiency of the school building increased to 63 per cent and an economy of 25 per cent in space was obtained. These spaces may be desirable features of schools but since their elimination does not strictly affect education, they may be left out until more funds for construction are made available.

In an effort to achieve optimum use of classroom spaces, the time-table was analysed and rearranged. The rational application of the time-table to the school building plan (Fig. 2) indicated that a primary school could very well function with three classrooms only. It increased use-efficiency to 85 per cent and also economised 40 per cent in the overall teaching-space requirements.

Study of educational problems

Due to increased use-efficiency and the reduction of overall teaching space, it was considered necessary to ensure that the standard of instruction should not suffer on account of this economy. With this in view, the study of educational efficiency was undertaken in collaboration with education officials of the Education Department of the State of Uttar Pradesh. During the first stage of the study an effort was made to identify the subjects which could easily be taught in open spaces on the basis of actual performance of instructional practices. It was observed that the activity programme, such as physical culture (including games for lower classes), basic crafts, and the teaching of multiplication tables to lower classes (through clay balls, sticks and other activity methods), could easily be taught in open or in sheltered spaces.

With the existing pattern of instruction, grades I and II are required to attend school at 10.00 a.m. and continue up to the closure of school. It is a long and strenuous period for a child of six or seven years of age. In the new time-table, grades I and II were let off in the last period.

Having identified the subjects which could be taught in the open, and after studying carefully the educational specifications, a time-table was evolved to suit the new special provision. The time-table was prepared so that three classes were in the buildings and two outside, depending upon the subjects being taught.

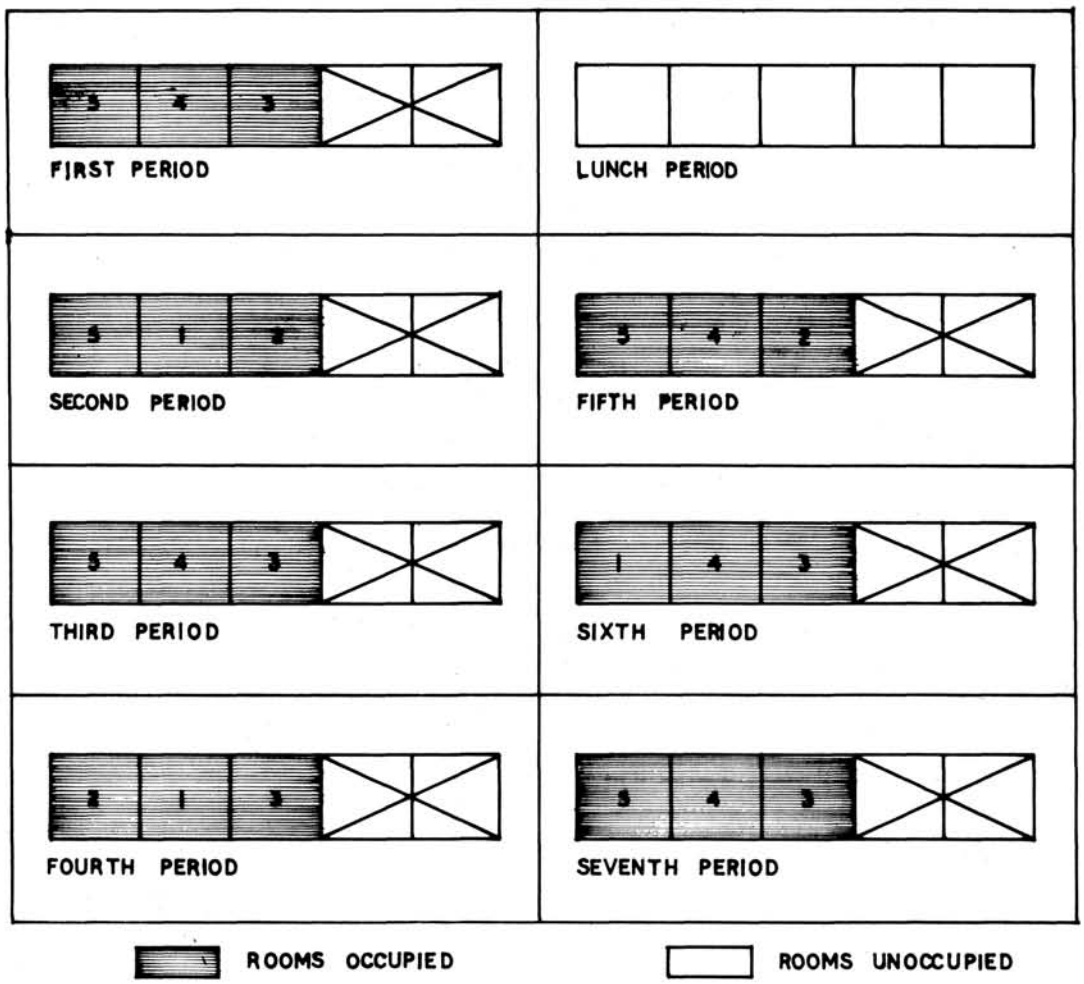



Fig.2. Rational application of time-table to the school building

TEACHING PERIODS

| Class | Inside periods | Outside periods (including 1 lunch period) |
|---|---|---|
| I | 3 | 4 |
| II | 3 | 4 |
| III | 5 | 3 |
| IV | 5 | 3 |
| V | 5 | 3 |

USE-EFFICIENCY

Actual use 133.77 $M^2$ used for 4.6 hours = 615.34 $M^2$ hours
Ideal use 133.77 $M^2$ used for 5.25 hours = 702.3 $M^2$ hours

$$\text{Use-efficiency} = \frac{615.34}{702.3}$$

$$= 0.85$$

## Actual trials in schools

Before any final conclusions could be drawn from the above study it was considered necessary to study the implications by actual observation. This was done in forty schools in and around Roorkee, all having the same basic education curriculum. The experiments were conducted on both rainy and clear days.

## Experiments on rainy days

Since outdoor teaching was not possible, it became necessary to accommodate all students in the building itself. It was decided, under such conditions, to combine two classes, keeping in view their teaching standards. Combinations of grade I with grade II were always troublesome because of the greater numbers of children in each class and also because of their childish habits. Combinations of grade IV and V and III and IV worked tolerably well. Obviously, the normal time-table was suspended during these days of class combination and certain work was undertaken which could sustain the interest of both the classes. For example, in language periods recitation and composition could be taught easily. In arithmetic periods recapitulation of multiplication tables and mental arithmetic was successfully undertaken. In social study periods, simple stories were narrated and the combined classes answered questions on these.

It was felt to be a poor compensation for the normal teaching work but, since the number of such days is very small against the economy in the huge amount to be spent on constructing school buildings, it was felt that the system could be made workable. The use-efficiency of the spaces was found to be 85 per cent.

## Experiments on normal days

Efforts were also made to achieve 100 per cent use-efficiency of spaces during school days by staggering the mid-day lunch-time but this did not find favour with the teachers. The time-table was therefore finally revised with the following considerations;

(a) the mid-day lunch break to be the same for all classes;

(b) three classes to be inside the building while two classes for outdoor teaching should have the same subject, such as gardening, physical training, crafts work or games;

(c) movement of classes to be kept to a minimum;

(d) no space was to remain unused.

## Observations

(a) Some space was required for keeping the satchels of students while changing classes. To solve this problem, the provision of shelves or pegs was recommended. An economical solution was found by providing matting outside in the open, marked with numbers, where students could keep their satchels. This worked fairly well.

(b) While the sun was high, outdoor teaching activities were uncomfortable. A need was felt for some sheltered spaces for outdoor activities during rainy or hot weather.

(c) Outdoor lessons for activity and creative work necessitated physical movement from the building to the site and from the site back to the building. A majority of teachers observed that students were refreshed and invigorated by the change of teaching location.

(d) On an average, five minutes were spent in changing classes. This made teachers unhappy. At the initial stages indiscipline amongst students was noticed while changing the classes. Later, students were guided to move in single file. After this systematic movement had been practised, room changes were performed in two minutes.

(e) A great responsibility was laid on the teachers to plan their lessons so as to finish within the prescribed time. Class movement from building to site and site to building and improved planning of the lessons by the teachers helped students to take more interest in their lessons.

## Findings of the study

(a) Three classrooms with a sheltered space, instead of five classrooms, are adequate for a school of five classes.

(b) Optimum use of spaces is attained with 85 per cent use-efficiency.

(c) Students undertake more outdoor activities which, though included in the curriculum, are often neglected.

(d) Standard of instruction had improved.

(e) Students took more interest in their lessons.

As a result of these findings, and to cater for climatic requirements, school plans were developed. The observations indicated the need for a sheltered space in addition to three classrooms. This space is located at a point where, in combination with other classrooms, it can serve as a large area for combined activity. Since the doors of the classrooms open on to it, the need for a verandah for circulation is eliminated. A number of prototypes of such schools have been constructed in different parts of India and their performance has been evaluated with encouraging results.

## Acknowledgement

This study forms part of the normal research work of this Institute, and is published with the permission of the Director, Central Building Research Institute, Roorkee, India.

# SPACE UTILISATION AND THE REDUCTION OF SCHOOL BUILDING COSTS

Kamal El Jack

Director, Regional Educational Building
Institute for Africa, Khartoum

Rapid educational expansion is urgently needed in many countries. But the resources available to provide such expansion are severely limited, and costs are rising. As a result, a great deal of attention is being given to capital investment in education.

Among the many factors that affect capital costs, the aspect of space utilisation is one that deserves special mention. Not only is it related to reducing costs but the improvement of such utilisation can open the way for providing better solutions to school planning problems and make available funds for the improvement of the teaching environment.

In Africa enrolment at the first level of education rose from 8,511,000 in 1950 to 28,028,000 in 1967. In Asia the corresponding figures are 53,303,000 and 126,080,000 respectively.

World statistics for the three levels of education show that such expansion does not only apply to developing countries but also to developed ones and as such the problem is universal. However, in developing countries the problems faced are particularly acute since,in spite of the fact that the percentage of public expenditure being put into education is growing year by year, a large percentage of school age children cannot be accommodated.

The examples which are quoted are first hand experiences of the author in Africa and they demonstrate how the aspect of space utilisation can contribute substantially towards reducing the capital cost per pupil.

Recent surveys have shown that the traditional method of providing a general classroom as a permanent station for a class results in a low rate of use of the general classroom spaces provided because when pupils are in laboratories, library, gymnasium, etc. the general classrooms remain empty. It has also been shown that enrolment as a factor affecting the use of specialised spaces (which are the most costly) is not receiving the attention it deserves.

## Room and student station utilisation

Educational spaces should be considered in three dimensions, namely:-

a) the number and category of spaces provided
b) the time during which these spaces are available
c) the student stations which such spaces provide.

Thus it can easily be seen that for an intensive utilisation the rate of occupancy for both rooms and student stations must be raised to the

TABLE I

SUMMARY OF UTILIZATION DATA BY KINDS OF INSTRUCTIONAL ROOMS ON A WEEKLY BASIS

Weekly periods : 44

| Room Category | | | | | | | | Code:CG |
|---|---|---|---|---|---|---|---|---|
| Room identification | | Room utilization weekly basis | | | Student-station utilization weekly basis | | | |
| Block Number | Room Number | Weekly Class periods C | Weekly Room periods N | Percentage utilization U | No. of student stations A | Possible student station periods B | Student Station periods used C.A D | Percentage utilization $U_s$ |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
| Block A | 1/A | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| | 2/A | 32 | 44 | 72.7 | 40 | 1760 | 1280 | 72.7 |
| | 3/A | 30 | 44 | 68.2 | 40 | 1760 | 1200 | 68.2 |
| | 4/A | 30 | 44 | 68.2 | 40 | 1760 | 1200 | 68.2 |
| Block B | 1/B | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| | 2/B | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| | 3/B | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| | 4/B | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| Block C | 1/C | 27 | 44 | 61.4 | 40 | 1760 | 1080 | 61.4 |
| | 2/C | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| | 3/C | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| | 4/C | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| Block D | 1/D | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| | 2/D | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| | 3/D | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| | 4/D | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| Ass.Hall | 1/E | 32 | 44 | 72.7 | 40 | 1760 | 1280 | 72.7 |
| Block | 2/E | 30 | 44 | 68.2 | 40 | 1760 | 1200 | 68.2 |
| Masters house 1 | 1/F | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| " 2 | 2/F | 28 | 44 | 63.6 | 40 | 1760 | 1120 | 63.6 |
| Total | R = 20 | C = 573 | | | A = 800 | | | |

R = Total number of rooms (a count of the rooms of col. 2).

Total available room periods per week = N.R = 44. R = $\Sigma C$ max = 880

Total available student-station periods per week = N. $\Sigma A$ = 44. $\Sigma A$ = $\Sigma B$ max = 35200

highest possible allowed.

Computation technique

Table 1 gives data collected with respect to the actual utilisation of the general classroom category in a school which has twenty classrooms available for forty-four periods a week each and each accommodating 40 student stations.

Thus if N is the number of periods/week during which a room is available and C is the actual number of periods during which the classroom is used, and if U is the percentage utilisation, then:-

$$U = \frac{C}{N} \times 100$$

and for room 1 in Block A:-

$$U = \frac{28}{44} \times 100 = 63.6\%$$

Also if A is the number of student stations in the class, and B is the number of student station periods available, then:-

$$B = N \times A = 44 \times 40 = 1760$$

If Us is the percentage utilisation of the student station periods, then:-

$$Us = \frac{28 \times 40}{44 \times 40} = 63.6\%$$

It is to be noted that it is assumed here that all the stations are used and thus we have the same percentage utilisation for both the student station and the room. However, if classes are to be taken in smaller groups and some of these student stations remain unused, then a corresponding drop in the student station utilisation will occur. Thus for this room if only 20 student stations are occupied during 15 periods of the total of the 28 during which the class is used, then:-

$$Us = \frac{(13 \times 40) + (15 \times 20)}{44 \times 40} = 46.6\%$$

From this it can be seen that care should be given to making intensive use of the student stations through the provision of variously sized teaching spaces which will provide for various teaching situations. This can be achieved through mobile partitions, seminar rooms, etc.

It should further be pointed out that the analysis on Table 1 shows a rather low percentage utilisation for the general classroom category which can efficiently be used up to a maximum of 90%. Such low usage is attributed to the fact that the use of those rooms which have been assigned as permanent bases to each grade leaves them empty when these grades are being instructed in specialised areas such as science labs, etc. As such, if any intensive use is to be achieved, then lockers should be provided and the use of these rooms by the whole school population should be considered.

It can be seen that with 20 classrooms the number of periods during which these classes are available is 20 x 44 = 880, out of which only 573 are being used, giving an average utilisation for the whole general

classroom category of:-

$$U_{av.\ var.} = \frac{573}{880} = 65.1\%$$

The number of rooms actually required can be seen to be:-

$$\frac{573}{44} = 14 \text{ rooms}$$

allowing 43 periods in excess during which classes will remain empty, thus allowing a margin of flexibility to cater for timetabling difficulties.

Impact of enrolment on utilisation

In one of the African countries an investigation was made of their secondary schools with a view to determining the optimum enrolment that would secure a maximum utilisation. The following is a summary of findings for the boys' secondary schools.

Subject load table for a boys' academic secondary school

The weekly subject load was as given in the following table.

TABLE II

| Subject | 1st grade | 2nd grade | 3rd grade | 4th grade |
|---|---|---|---|---|
| Arabic | 6 | 6 | 6 | 6 |
| English | 9 | 9 | 9 | 8 |
| Science | 6 | 6 | 6 | 6 |
| Mathematics | 6 | 6 | 6 | 6 |
| Geography | 3 | 3 | 4 | 4 |
| History | 3 | 3 | 3 | 4 |
| Religion | 3 | 3 | 3 | 3 |
| Art | 4 | 4 | 3 | 3 |
| Physical Education | 2 | 2 | 2 | 2 |

Determination of optimum enrolment

To arrive at the optimum enrolment, the following facts were taken into consideration:-

a) that a stream is made up of four classes with forty pupils per class;
b) that subjects are under the responsibility of specialised departments namely:-

The Arabic department for Arabic and Religious subjects

| | | |
|---|---|---|
| The English department | for | English language and English literature |
| The Mathematics department | | |
| The History & Geography department | | |
| The Science department | | |
| The Arts department | | |
| The Physical Education department | | |

c) that Arabic, Religious subjects, English language, English literature, Mathematics and History are taught in general classrooms (CG);

d) that Geography and Arts & Crafts are taken in special classrooms (CS);

e) that Physics, Chemistry and Biology are taken in Science laboratories (SL);

f) that the English and Arabic library periods are taken in the library;

g) that Physical Education is given in the open air.

Table III gives the number of periods taught by various Departments calculated for schools with an enrolment of from one to six streams.

Practicable room utilisation values

To allow flexibility in timetabling and for the preparation and setting up of experiments and demonstrations, the following values were taken:

| Room designation | $u_{pr}$ (%) | $f = \frac{1}{u_{pr}}$ |
|---|---|---|
| General classrooms | 90 | 1.11 |
| Geography room | 100 | 1.00 |
| Art room | 100 | 1.00 |
| Science labs. | 85.7 | 1.17 |
| Library | 100 | 1.00 |

Thus the minimum number of rooms is calculated as follows:-

$$R \geq f.\frac{\Sigma Pr}{42} = f \frac{\text{Sum of periods per room category}}{\text{No. of periods during which the room is available}}$$

The average periods per room are:-

$$P_r = \frac{\Sigma Pr}{R}$$

TABLE III

SUBJECT LOAD TABLE FOR BOYS' ACADEMIC SECONDARY SCHOOLS WITH DIFFERENT NUMBERS OF STREAMS

1 stream: 4 classes, 40 pupils per class, design enrolment 4 . 40 = 160 pupils.

| Room category | Subject | Department | Periods per grade | | | | Periods per school | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | 1. | 2. | 3. | 4. | 1 stream 4 classes 160 pupils | | 2 streams 8 classes 320 pupils | | 3 streams 12 classes 480 pupils | | 4 streams 16 classes 640 pupils | | 5 streams 20 classes 800 pupils | | 6 streams 24 classes 960 pupils | |
| CG | Arabic | Arabic & Religion | 6+ | 6+ | 6+ | 6+ | 24 | 36 | 48 | 72 | 72 | 108 | 96 | 144 | 120 | 180 | 144 | 216 |
| | Religion | Dpt. | 3 | 3 | 3 | 3 | 12 | | 24 | | 36 | | 48 | | 60 | | 72 | |
| | English | English Dpt. | 6+ | 6+ | 6+ | 5+ | 23 | 35 | 46 | 70 | 69 | 105 | 92 | 140 | 115 | 175 | 138 | 210 |
| | Engl. Literature | | 3 | 3 | 3 | 3 | 12 | | 24 | | 36 | | 48 | | 60 | | 72 | |
| | Mathematics | Mathematics Dpt. | 6 | 6 | 6 | 6 | | 24 | | 48 | | 72 | | 96 | | 120 | | 144 |
| | History | Hist. & Geogr. Dpt. | 3 | 3 | 3 | 4 | | 13x | | 26x | | 39x | | 52x | | 65x | | 78x |
| | E Periods | | 27 | 27 | 27 | 27 | | 108 | | 216 | | 324 | | 432 | | 540 | | 648 |
| CS | Geography | Hist. & Geogr. Dpt. | 3 | 3 | 4 | 4 | | 14x | | 28x | | 42x | | 56x | | 70x | | 84x |
| | Arts & Crafts | Arts & Crafts Dpt. | 4 | 4 | 3 | 3 | | 14 | | 28 | | 42 | | 56 | | 70 | | 84 |
| | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | |
| SL | Physics | Science Dpt. | 2 | 2 | 2 | 2 | | 8 | | 16 | | 24 | | 32 | | 40 | | 48 |
| | Chemistry | | 2 | 2 | 2 | 2 | | 8 | | 16 | | 24 | | 32 | | 40 | | 48 |
| | Biology | | 2 | 2 | 2 | 2 | | 8 | | 16 | | 24 | | 32 | | 40 | | 48 |
| | E Periods | | 6 | 6 | 6 | 6 | | 24 | | 48 | | 72 | | 96 | | 120 | | 144 |
| — | Phys. Education | Phys. Ed. Dpt. | 2 | 2 | 2 | 2 | | 8 | | 16 | | 24 | | 32 | | 40 | | 48 |
| | EE Periods | | 42 | 42 | 42 | 42 | | 168 | | 336 | | 504 | | 672 | | 840 | | 1008 |

+) 1 library period included

x) The values in the same columns have to be added to obtain the periods per History & Geography Department.

The percentage of possible room periods is:-

$$U = \frac{P_r + 100}{R + 42} = \frac{\text{Sum of periods per room category x 100}}{\text{Number of rooms x Number of periods per week}}$$

Tables IV to IX show calculations for schools with enrolments ranging from one to six streams.

Graphs I to VI have been prepared for easy comparison of the data contained in these tables.

## ROOM REQUIREMENTS OF BOYS' ACADEMIC SECONDARY SCHOOLS

Table IV

No. of streams of school : One  Enrolment acc. to design : Ai = 160

| ROOM REQUIREMENTS | | | | | | |
|---|---|---|---|---|---|---|
| Room | Periods per room-category $\Sigma P$ | Flexibility factor f $= b \frac{1}{u_{pr}}$ | Min. No. of rooms required R $= f. \frac{\Sigma P}{42}$ | Average periods per room $p = \frac{\Sigma P}{R}$ | Percent. of poss. room periods u $= \frac{\Sigma P . 100}{R . 42}$ | Pupil/ room ratio $\frac{\Sigma Ai}{R}$ |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| GEN. CLASSR. | 100 | 1.11 | 3 | 33.3 | 79.29 | 33.3 |
| GEOGRAPHY ROOM | 14 | 1.00 | 1 | 14.0 | 33.33 | 160.0 |
| ART ROOM | 14 | 1.00 | 1 | 14.0 | 33.33 | 160.0 |
| SCIENCE LABS | 24 | 1.17 | 1 | 24.0 | 57.14 | 160.0 |
| LIBRARY | 8 | 1.00 | 1 | 8.0 | 19.05 | 160.0 |
| TOTAL | 160 | - | 7 | 22.9 | 54.52 | 22.9 |

Table V

No. of streams of school : Two  Enrolment acc. to design : Ai = 320

| ROOM REQUIREMENTS | | | | | | |
|---|---|---|---|---|---|---|
| Room | Periods per room-category $\Sigma P$ | Flexibility factor f $= b \frac{1}{u_{pr}}$ | Min. No. of rooms required R $= f. \frac{\Sigma P}{42}$ | Average periods per room $p = \frac{\Sigma P}{R}$ | Percent. of poss. room periods u $= \frac{\Sigma P . 100}{R . 42}$ | Pupil/ room ratio $\frac{\Sigma Ai}{R}$ |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| GEN. CLASSR. | 200 | 1.11 | 6 | 33.3 | 79.29 | 53.3 |
| GEOGRAPHY ROOM | 28 | 1.00 | 1 | 28.0 | 66.67 | 320.0 |
| ART ROOM | 28 | 1.00 | 1 | 28.0 | 66.67 | 320.0 |
| SCIENCE LABS | 48 | 1.17 | 2 | 24.0 | 57.14 | 160.0 |
| LIBRARY | 16 | 1.00 | 1 | 16.0 | 38.10 | 320.0 |
| TOTAL | 320 | - | 11 | 29.1 | 69.29 | 29.1 |

## ROOM REQUIREMENTS OF BOYS' ACADEMIC SECONDARY SCHOOLS

Table VI

No. of streams of school : Three  Enrolment acc. to design : Ai = 480

| ROOM REQUIREMENTS | | | | | | |
|---|---|---|---|---|---|---|
| Room | Periods per room category $\Sigma P$ | Flexibility factor f $= b \frac{1}{u_{pr}}$ | Min. No. of rooms required R $= f. \frac{\Sigma P}{42}$ | Average periods per room $p = \frac{\Sigma P}{R}$ | Percent. of poss. room periods u $= \frac{\Sigma P.100}{R.42}$ | Pupil/ room ratio $\frac{\Sigma Ai}{R}$ |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| GEN. CLASSR. | 300 | 1.11 | 8 | 37.5 | 89.29 | 60.0 |
| GEOGRAPHY ROOM | 42 | 1.00 | 1 | 42.0 | 100 | 480.0 |
| ART ROOM | 42 | 1.00 | 1 | 42.0 | 100 | 480.0 |
| SCIENCE LABS | 72 | 1.17 | 2 | 36.0 | 85.72 | 240.0 |
| LIBRARY | 24 | 1.00 | 1 | 24.0 | 57.14 | 480.0 |
| TOTAL | 480 | - | 13 | 36.9 | 87.86 | 36.9 |

Table VII

No. of streams of school : Four  Enrolment acc. to design : Ai = 640

| ROOM REQUIREMENTS | | | | | | |
|---|---|---|---|---|---|---|
| Room | Periods per room-category $\Sigma P$ | Flexibility factor f $= b \frac{1}{u_{pr}}$ | Min. No. of rooms required R $= f. \frac{\Sigma P}{42}$ | Average periods per room $p = \frac{\Sigma P}{R}$ | Percent. of poss. room periods u $= \frac{\Sigma P.100}{R.42}$ | Pupil/ room ratio $\frac{\Sigma Ai}{R}$ |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| GEN CLASSR. | 400 | 1.11 | 11 | 36.4 | 86.67 | 58.1 |
| GEOGRAPHY ROOM | 56 | 1.00 | 2 | 28.0 | 66.67 | 320.0 |
| ART ROOM | 56 | 1.00 | 2 | 28.0 | 66.67 | 320.0 |
| SCIENCE LABS | 96 | 1.17 | 3 | 32.0 | 76.19 | 213.0 |
| LIBRARY | 32 | 1.00 | 1 | 32.0 | 76.19 | 640.0 |
| TOTAL | 640 | - | 19 | 33.7 | 80.24 | 33.7 |

## ROOM REQUIREMENTS OF BOYS' ACADEMIC SECONDARY SCHOOLS

Table VIII

No. of streams of school : Five  Enrolment acc. to design : Ai = 800

| ROOM REQUIREMENTS | | | | | | |
|---|---|---|---|---|---|---|
| Room | Periods per room category $\Sigma P$ | Flexibility factor $f = b\frac{1}{u_{pr}}$ | Min. No. of rooms required $R = f.\frac{\Sigma P}{42}$ | Average periods per room $p = \frac{\Sigma P}{R}$ | Percent. of poss. room periods $u = \frac{\Sigma P.100}{R.42}$ | Pupil/ room ratio $\frac{\Sigma Ai}{R}$ |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| GEN. CLASSR. | 500 | 1.11 | 14 | 35.7 | 85.00 | 57.1 |
| GEOGRAPHY ROOM | 70 | 1.00 | 2 | 35.0 | 83.33 | 400.0 |
| ART ROOM | 70 | 1.00 | 2 | 35.0 | 83.33 | 400.0 |
| SCIENCE LABS | 120 | 1.17 | 4 | 30.0 | 71.43 | 200.0 |
| LIBRARY | 40 | 1.00 | 1 | 40.0 | 95.24 | 800.0 |
| TOTAL | 800 | - | 23 | 34.8 | 82.85 | 34.8 |

Table IX

No. of streams of school : Four  Enrolment acc. to design : Ai = 960

| ROOM REQUIREMENTS | | | | | | |
|---|---|---|---|---|---|---|
| Room | Periods per room category $\Sigma P$ | Flexibility factor $f = b\frac{1}{u_{pr}}$ | Min. No. of rooms required $R = f.\frac{\Sigma P}{42}$ | Average periods per room $p = \frac{\Sigma P}{R}$ | Percent. of poss. room periods $u = \frac{\Sigma P.100}{R.42}$ | Pupil/ room ratio $\frac{\Sigma Ai}{R}$ |
| 0 | 1 | 2 | 3 | 4 | 5 | 6 |
| GEN. CLASSR. | 606* | 1.11 | 16 | 37.9 | 90.18 | 60.0 |
| GEOGRAPHY ROOM | 84 | 1.00 | 2 | 42.0 | 100.0 | 480.0 |
| ART ROOM | 84 | 1.00 | 2 | 42.0 | 100.0 | 480.0 |
| SCIENCE LABS | 144 | 1.17 | 4 | 36.0 | 85.72 | 240.0 |
| LIBRARY | 42* | 1.00 | 1 | 42.0 | 100 | 960.0 |
| TOTAL | 960 | - | 25 | 38.4 | 91.43 | 38.4 |

* It has been assumed in this case that the pupils of the first grade shall have one library period (Arabic or English) in their classrooms. This is feasible with regard to the classroom time-table. Therefore, the periods in the relevant room-categories are as follows:-

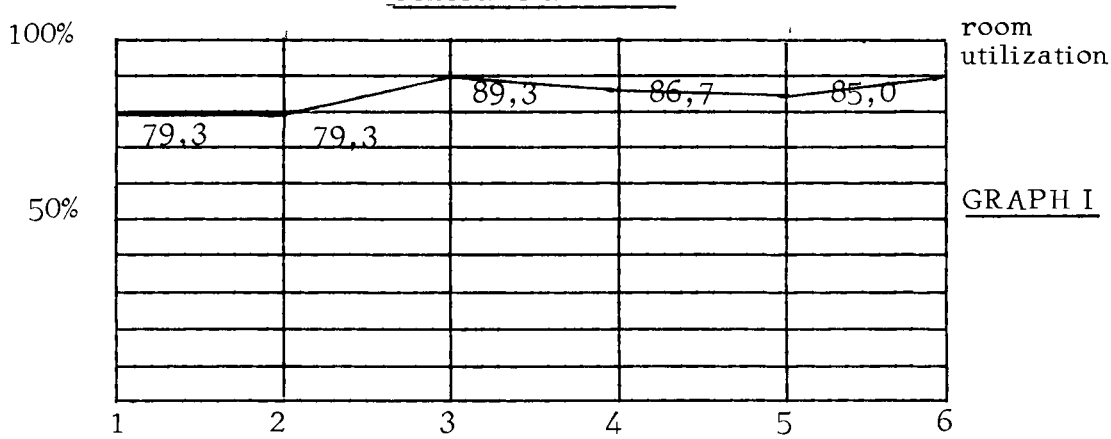
General classrooms 600 + 6 = 606
Library 48 - 6 = 42

BOYS' ACADEMIC SECONDARY SCHOOLS

ROOM UTILIZATION AS FUNCTION OF THE ENROLMENT OF A SCHOOL

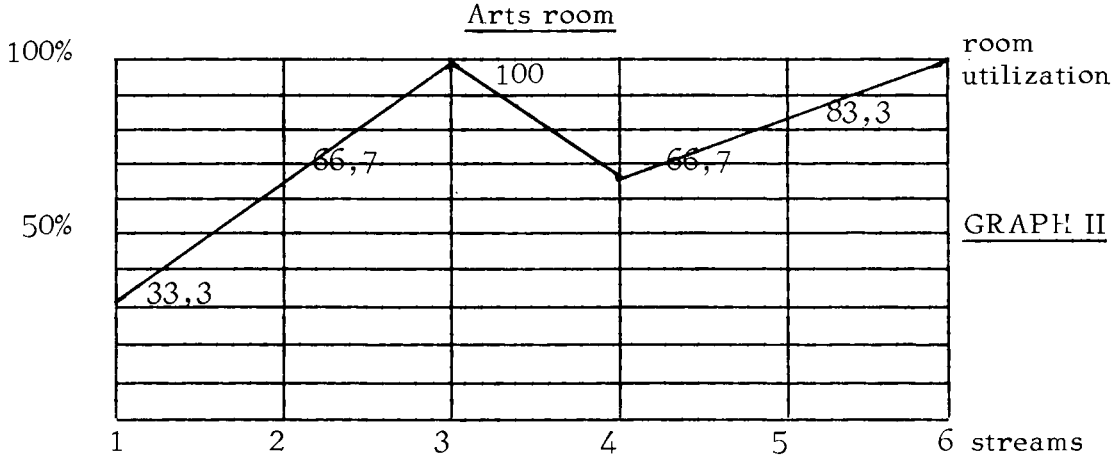
(100% = 42 room periods per week)

General classrooms



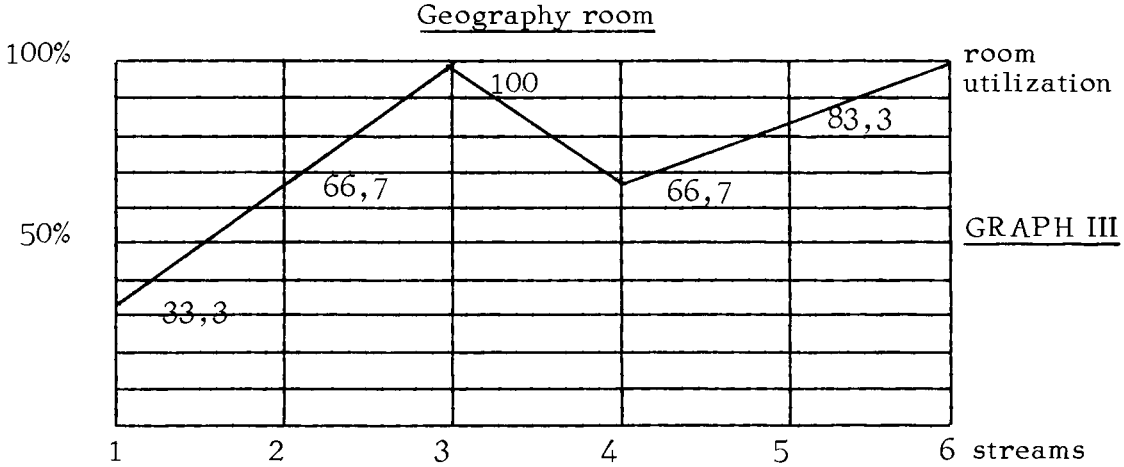

GRAPH I

Arts room




GRAPH II

Geography room



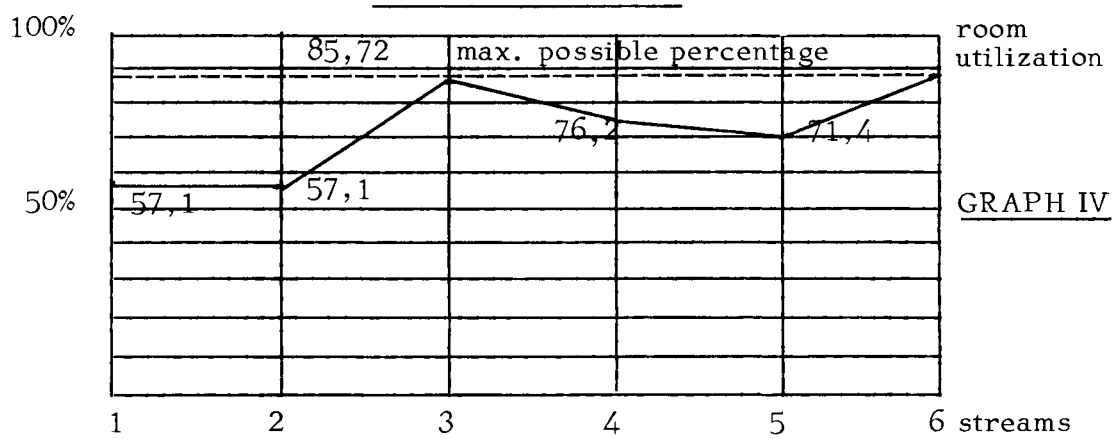

GRAPH III

BOYS' ACADEMIC SECONDARY SCHOOLS

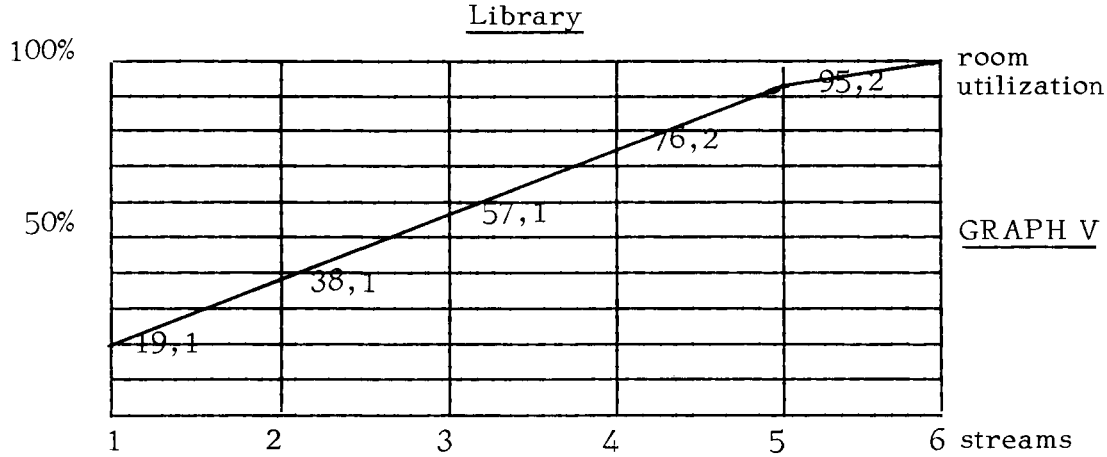
ROOM UTILIZATION AS FUNCTION OF THE ENROLMENT OF A SCHOOL

(100% = 42 room periods per week)

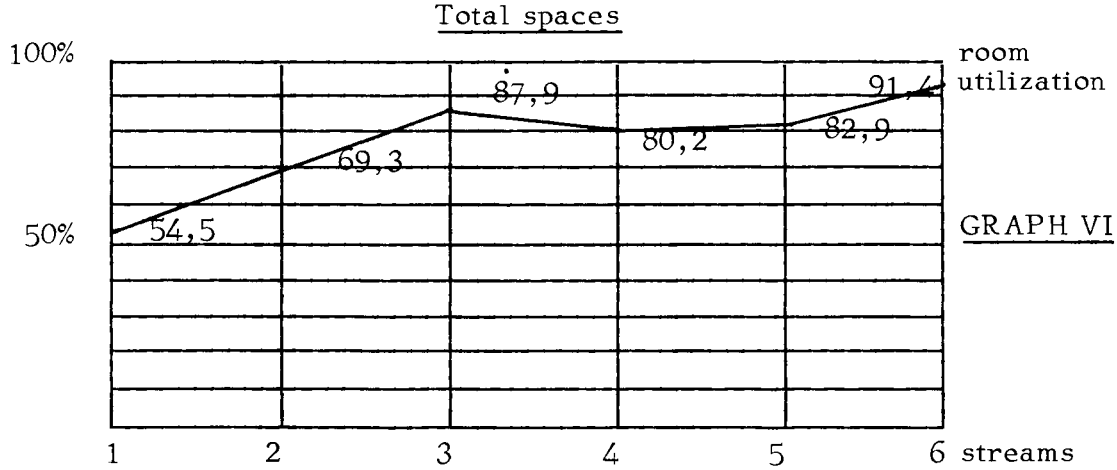
Science laboratories




Library




Total spaces



# BUILDING FOR DEVELOPMENT

Ruth Pearson

Member of the 'Building for Development' project team. The aim of the project, which is financed by the UK Overseas Development Administration, is to provide managerial and technological guidance for the construction industries in developing countries.

The traditional response to the "problem" of school building, or any other sort of building, in developing countries is to produce a low cost design. This response is understandable but, I think, inadequate.

It is understandable because the traditional view of building centres round the product - the school, the factory or the house. The provision of shelter for social and economic activities is a recognised and urgent necessity, particularly in developing countries whose stock of physical infrastructure is inadequate while the demand for more is growing fast.

However, the view of building activity which seems to us more pertinent to development is the view that sees building as a process: a process which involves the contractor and his employees, the materials suppliers, the client, the final users. It is in fact a management process which brings these individuals together to produce the building required.

Once one adopts this process approach to building activity, the school building problem appears in a new light. The necessity to design according to the requirements of the users and within cost and space limitations is still of paramount concern. But the designer must also consider the limitations and requirements of the construction resources available to carry out his work. He must consider the availability of materials, the ease or otherwise of transporting materials and components, and the level of technical and organisational skills available to assemble the building.

To some extent, designers and administrators of public building programmes in developing countries are inevitably aware of the limitations imposed on them by the technological and organisational capacity of the local building industry. There is, however, an inbuilt temptation to sidestep these limitations by importing materials and skills - in fact, in many cases, importing a complete organisational unit in the form of an international construction company to carry out the work. In some cases, building programmes financed by unilateral or multilateral aid agencies effectively stipulate the use of materials, design teams or construction firms originating in the aid-giving countries. What no one seems to be particularly concerned with is the net anti-development result of such practices.

It is a fact that an average of 50 per cent of all capital investment all over the world goes into construction. Furthermore, as a country develops - as its average annual per capita income rises - it will invest

an even greater proportion of its G.N.P. in construction, so that investment in construction rises in both absolute and relative terms as countries get richer.

Therefore, every developing country relies, and will continue to rely, on its construction industry to provide it with a large proportion of the investment and development projects it requires. The agricultural and industrial sectors, communications and transport, housing and education, all require to a greater or lesser extent the services of a construction industry, whether that "industry" operates as a private sector industry with contractors, or a public sector organisation with direct labour building teams.

## An urgent development priority

So the growth of a healthy, competent building industry, covering all aspects of the building process, is an urgent development priority. To ignore this priority deliberately or by default, and to allow the use of foreign skills, firms and materials to deprive a potential local industry of a real development opportunity can only be detrimental to the long term social and economic needs of the country.

Many people would argue that the priority is to get buildings built and that they must use whatever resources are to hand; and also that the local industry is more likely to develop in competition with more efficient and sophisticated expatriate firms.

Both arguments are valid up to a point. But buildings have been and are being built all over the world by indigenous builders, sufficiently competent to erect a standard single storey concrete block structure. Before engaging an expatriate contractor, the client must be quite convinced that his requirements genuinely necessitate a multi-storey block using precast concrete elements with a terrazzo finish. The priority is really to build a school, but the type of structure is not necessarily predetermined.

The second argument about competition from expatriates proving a stimulus is only valid if local personnel have the opportunity of obtaining the training and experience necessary to enable them to compete on equal terms with their expatriate counterparts. Most expatriate companies are run by experienced and highly-trained managers, backed by an international organisation and supported by large reserves of capital and credit facilities. Under these circumstances it is likely that most local firms will take a good many years to get to a competitive position.

During these years, the country which relies on imports in this way will be paying an inflated price for its buildings. Import duties, foreign exchange costs, repatriation of salaries, accommodation and other allowances for families of expatriate staff, added to the opportunity cost of not using at least its public building programmes as a development experience for the local construction industry, lead to the conclusion that the country will not get sufficient value for money from scarce resources invested in construction.

## Desirable government strategies

What can be done to change this? A basic requirement is that the

government must take on responsibility for the development of the construction industry. In most Commonwealth countries the old Public Works Department has been transformed into a Ministry of Works. The Ministry of Works usually has, as in its colonial days, a purely executive function. Its task is to construct what the other client ministries - Health, Education, etc., require. It has no formal responsibility for the progress of the local industry on which it virtually relies. Yet, to the other ministries, such as Education or Trade and Industry, which provide training and individual incentives for other sectors of the economy, construction is the prerogative of the Ministry of Works.

Once the government is prepared to take action to encourage the growth of construction activities, there are a number of strategies it can pursue on different levels.

At the administrative level, the planning process responsible for establishing and implementing development targets should be integrated with machinery responsible for information about the supply and distribution of construction resources. A "Construction Planning Unit", working in co-operation with the Ministry of Economic Planning and the Ministry of Works, could be set up to collate and analyse the information required.

At the industrial level, steps must be taken to provide an industrial climate conducive to the expansion of local entreprenurial activity in construction. Availability and terms of bank and other loans, credit facilities and company legislation could be reviewed with reference to the needs of indigenous contractors and manufacturers.

Education and training, a normal responsibility of government, is not generally directed to meeting the needs of a growing construction industry. While there has been a significant increase in the institutional training of professions and the provision of craft training, the contractor/manager is usually without any recourse to guidance in the art and science of construction management. Much of Building for Development's work during its three years of existence has been concentrated on producing and testing teaching material and techniques for local building contractors and construction managers in East and West Africa. This whole area of adult education is one that has been curiously neglected by educationalists in spite of their dependence on the services of the building industry for other purposes.

There are other factors which contribute to a development policy for the construction industry. Building for Development's concern is that the clients of the industry in developing countries should be aware of the development needs and potential of the industry on which they rely, as well as their own immediate demand for its specific products.

# BUILDING SCHOOLS: THE BRITISH DEVELOPMENT AID PROGRAMME IN THE EASTERN CARIBBEAN

S.C. Wood

Education Adviser, British Development Division in the Caribbean

The British Development Division in the Caribbean is an off-shoot of Britain's Overseas Development Administration. It provides the technical and professional know-how for managing the British development aid programme in the Caribbean. Its activities range between British Honduras (in Central America) down to Guyana (in South America); but its main work is in the Associated States (Antigua, Dominica, Grenada, St. Kitts/Nevis and Anguilla, St. Lucia, and St. Vincent), Montserrat, the British Virgin Islands, the Cayman Islands, the Turks and Caicos Islands, and Belize. It oversees the spending of about £10m. per year, and has a mandate for deciding upon projects of up to £250,000 on its own judgement without having to refer details to London. Well over £1m. a year from the annual aid budget is spent on education.

A good deal of this is spent on teachers, specialists, consultants, and experts of one sort and another, and upon curriculum development materials. But the bulk goes towards providing new institutions - technical colleges, teachers' colleges, secondary schools and primary schools, plus their furniture and equipment.

We confess from the start that after the five years of our existence as a Division we have no special wisdom to offer in the matter of school buildings. We keep ourselves informed of the latest design notions and building methods elsewhere, but have come to the conclusion that, so far as the Caribbean is concerned, there are as yet no novel panaceas and no new techniques which could enable cheap and satisfactory school buildings to be run up better and more quickly than they are. There are notable similarities in the origin, make-up and style of educational systems in the West Indies; but all have notable differences too - not only in education but in management, sites, soils, building capacity, and so on. Nothing is more insular than an island, and in an archipelago scattered over 2,000 miles of sea there can be no CLASP or consortia.

## Four basic precepts

But though we have made no new discoveries in solving more effectively the problems of overcrowding and a general lack of educational space and facility, we think we have learnt a thing or two about managing a development aid school building programme in the Caribbean. Whether these are likely to be of any use to others elsewhere is for them to decide. What we have learnt can be summed up in four precepts - you have to collaborate; you have to be flexible; you have to be realistic; and you must be economic.

Collaboration is the linchpin of the whole business. It is not a bit of use "selling" tidy aid package schools wrapped in exotic pre-cut metropolitan wrappings. Teachers, chief education officers, ministers

(of education and finance), directors of public works - and all the others concerned, in all senses of the word, with building a school or a college - have different ideas, goals, aspirations, standards, and ways of working. The essence of the matter is recognition, understanding, and even affection for all these points of view, and their rendering down into a cordial consensus between agency and government which leads as quickly as possible to something being done. This means working close to people and project; on-the-spot investigation; continuing discussion; and follow-up, to see that what has been agreed upon is, in the outcome, being done to the satisfaction of all partners.

The second rule of thumb - flexibility - goes hand in hand with collaboration. The type-plans and models, beloved by the theoretical and tidy-minded, usually do not work. Each problem has to have its own solution. Moreover, there are constraints to be overcome, e.g. in our case a project unfinished in one financial year carries over and cuts into the funds available in the following year. Given that it takes a long time - because of distance, barriers to decision-making, overloaded governmental machines and so on - for full agreement to be reached on a new educational building, speed is of overriding importance if funds are to be spent within the compass of a financial year. And this happens to chime in with the educationist's goal of getting children from overcrowded slummy schools into good, well-equipped, properly furnished, light and airy ones, just as quickly as can be.

Realism is vital too, to temper the cool winds of financial stringency to shorn lambs. In areas where children have only three or four square feet in which to sit and have their being - let alone learning - it is moon-talk to be prescriptive about standards of teaching and circulation space which only rich industrialised countries can afford to accept. Build a school with twenty square feet per child and it will fill up overnight with twice the number of children it was designed for. Better in the first instance to design for half this space - still a significant but not too invitingly luxurious advance upon existing conditions. Realism, too, means recognising that educational desiderata are not the only factors in the building of a new school or college. The engineers, architects and financiers all have their own touchstones to rub. The politicians also will be looking for eye-and-vote-catching features like constituency spread and prestige sites. All these recognisably human considerations have to be taken into account, and very often compromised with, without too much adulteration to the purity of the educational cream.

Economy goes without saying. Difficult though it may be for those who advise and hold the purse strings to subject educational projects to cost-benefit analysis, it is neither rational nor possible for the educationist to press his claim too jealously at the expense of others in the business of development. Coats must be cut. In this we have been especially lucky in that our most recent major tertiary-level project - the building of a large educational campus comprising technical college, teachers' college, sixth form college with central teaching and science facilities - in St. Lucia - was achieved by refurbishing a set of robust yet elegant Georgian-style barracks, at significantly less cost than a whole new complex of modern buildings would have led us into.

## Method of working

Now as to the modus operandi we have settled upon. When with

an island Government we have agreed upon the financing of a second-cycle secondary institution, we employ West Indies-based architects and builders. This is because, in our experience, foreign designed and pre-fabricated structures are neither cheaper nor better. In other words, the people on-the-spot know best. They have practical knowledge of the problems of siting, materials and construction, and how best to deal with local contractors and public works departments. They are closer to their clients; understand them the better; can consult more frequently; and are cheaper in terms of travelling time and other overheads. We find that this works towards speed, cost effectiveness, and harmony of design.

But at the primary and first-cycle secondary level we do tend to go for unit/modular constructions of the factory-designed-and-built type, something of an innovation in West Indian school building. As much as we would all like to emulate the most progressive and flexible designs (e.g. the Stapleford Infant School, in Nottinghamshire, or the Rolls Road School, Camberwell, London), these are not yet relevant or acceptable to the West Indies, where such a high proportion of the primary teaching staff is both transient and untrained. So we and the islands opt for conventional teaching areas/classrooms, plus adequate staff rooms, simple administrative accommodation, and the usual ancillaries. The junior secondary schools include provision for educational handicraft workshops, home economics rooms, general science laboratories and a central library. We often include a small kitchen so that children may have a simple midday meal.

The style of building, we have learnt, that can be put up quickly, is relatively cheap, and looks best, is one of steel-frame construction, with all the electrics and plumbing as part of the package. For the sake of speed again - both in terms of construction and financial clearance - we began by including the entire cladding of a school, usually of cement/wood fibre panelling. But recently we have tended to make use of local materials (e.g. random walling, or local timber), and islands prefer this both on the grounds of good looks and the greater employment opportunities offered to the local labour force.

We have tendered around widely for designs, steel framework and back-up facilities. Most of our contracts, it happens, have gone to a British firm (a recent winner of 'The Queen's Award to Industry') which offers the most effective on-the-spot project supervision. They have a regional representative close at hand, a site engineer, and a steel-erector - all available to move round the islands when need be to give advice both before and during construction.

Special design features

There are certain special features about these buildings which spring from local needs and circumstances. Roofs tend to have a substantial overhang to keep out tropical rain and sun. Buildings are braced to withstand high wind speeds of up to a hundred and twenty miles an hour. At least one block of classrooms in each school is divided by internal PVC sliding screens - as an economic substitute for a separate and expensive assembly area; ultimately for team teaching; and to provide a space for community activities in the parish, like evening classes, meetings, and the customary and joyous West Indian 'jump-up'.

To sum up, we have learned something about building schools (about

one hundred) in the Caribbean, over the last five years. Most of these are the creations of local designers and builders - an arrangement found best, in terms of time, money, and suitability. A considerable number of the simpler constructions (about twenty) have been 'prefabricated' or factory-built, and these are of special advantage when speed is paramount. But foreign frames look best and are most acceptable when locally clothed and clad. Local management and technical back-up is very necessary. And before schools are built their shape, size, and purpose must be the subject of mutual agreement - a sometimes delicate task, to be conducted at close quarters, in a spirit of both urgency and compromise.

# SIMPLE CLASSROOMS FOR PACIFIC ISLANDS

C.R. Honey

Building Research Station of the Department of the Environment, Britain

Satisfactory classrooms for small communities on remote islands are more difficult to build than is generally believed. The problems are more practical than technical or economic. One must find a way of getting something reasonable built when suitable skills are scarce, local materials limited and transport difficult. The sophisticated technique, long-term programming and continuous collaboration in design and development which have made possible dramatic advances in the quality of school building in Europe are a world away. The need for satisfactory buildings remains. This paper outlines the approach recommended for two territories in the Western Pacific, by an architect from the Building Research Station of the Department of the Environment, in the course of an assignment concerned with building standards, techniques and organisations.

## Background

Although circumstances differ widely between island territories, many are common to all and the principles underlying a solution for one place, although not the detail, may be valid for others. In this instance the New Hebrides presents an environment subject to earthquakes and hurricanes where, compared with other territories, labour is scarce and money plentiful. There is also no tradition of large buildings using local materials and techniques. The environment in the Gilbert Islands is much less demanding, labour is more plentiful and money is scarcer, and there is a tradition of very fine buildings using local materials and techniques. In both territories, few men skilled in western building techniques remain in the villages. Fewer still have the background, means or inclination to operate as contractors. Shipping services to outer islands are infrequent and sometimes unreliable; materials are brought ashore in small boats and often manhandled to the sites. Supervision in the conventional sense is at best intermittent. Projects require villagers to contribute a great deal of labour and sometimes money. In these circumstances classrooms range from unduly expensive (though not always well built) structures in western techniques to inadequate but low-cost accommodation of local materials as interim measures.

## Approach

The solutions proposed (and in the New Hebrides actually implemented) take account of the limitations in skills, transport and money, and allow decisions to be made locally on the facilities to be provided and the order in which improvements are effected. The basic precepts are:

(a) Design accommodation of the right size and correctly sited, as part of a planned ultimate development;

(b) Construct at least the foundation, frame and roof of the accommodation immediately needed and provide

display areas and good storage for teaching materials;

(c) Provide initially as much of the flooring, walling, windows and ceiling as can be afforded. If there is not enough money to build them to a good standard at first, omit them or for the time being improvise, e.g. with coral floors and bamboo walls;

(d) Spend money only on materials which will be satisfactory for the ultimate building. Avoid expenditure on low-grade materials with the intention of replacing them later.

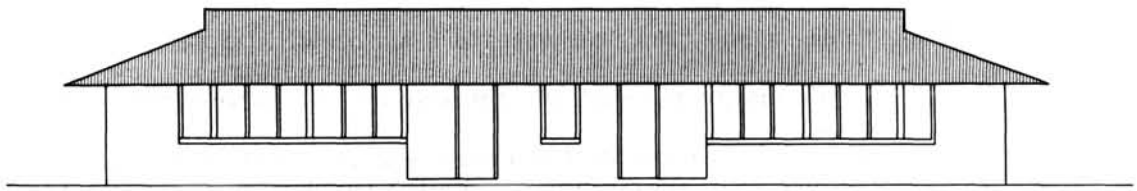
This approach is feasible because complete exclusion of weather from a classroom is not of over-riding importance in such an environment. Things, rather than people, require secure and weather-proof facilities. Further, a classroom needs continuous window openings and the walls need not be used to carry the roof: if they are, beams or lintels are essential to span the large openings. It is not necessary for the whole floor to be concreted before the superstructure is erected. This may delay the project until the large amounts of aggregate are brought to the site.

The New Hebrides

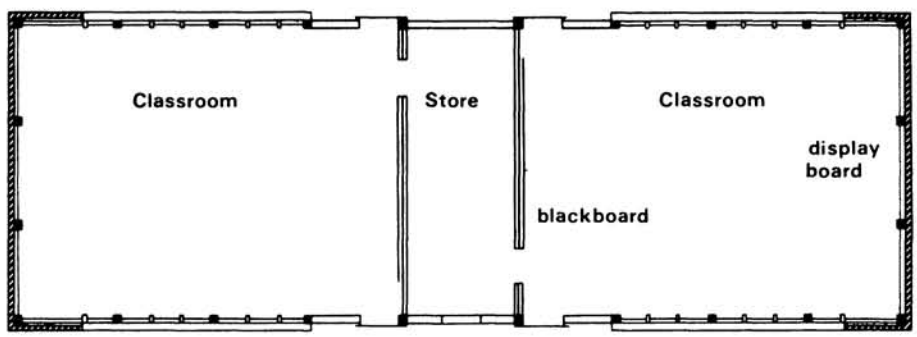
In the New Hebrides, this approach involved the use of a timber frame and a roof sheeted with galvanised corrugated iron. For the first two projects, built without supervision by a New Hebridean builder and two VSOs respectively, the posts, roof trusses and shutters were prefabricated in the Works Department and taken apart for shipment. The detailing of the bases of the posts did not require very accurate work in setting out and that of the window cills and wall plate (also prefabricated) ensured that the posts were brought to their proper position. A skilled man could equally well have cut the framing on site. If full overheads are charged, pre-fabrication in a workshop usually costs more. Local preference was strongly in favour of a "proper" building, which implies a concrete block structure. As a cladding material, concrete blocks are very suitable for schools and maintenance is limited to redecoration. As a load-carrying material in local circumstances they have disadvantages. Reinforced concrete beams and columns are needed under earthquake conditions and the uncertain quality of local workmanship and aggregates (usually uncrushed coral) make this an unreliable technique. Concrete blocks may be expensive if they have to be shipped to the site and variable in quality if made on it. Construction could be delayed while the blocks are curing.

If the blockwork is used only as cladding below the windows and as high as the wall plate at the ends of the building, and the roof load is carried on separate posts, no structural concrete is needed and the block-making and laying can proceed independently. All that is necessary is a footing sufficiently wide to carry the blockwork as well as the posts, and careful bracing of the posts until the blockwork is completed. Where blockwork is not feasible at all, flat asbestos-cement sheeting can be applied as cladding to the frame.

The windows in the first two schools were horizontally pivoted shutters with hooks to hold them open in one of two alternative positions. In one school they were faced with tongued and grooved boarding and in the other with flat asbestos-cement which lapped over the face of the openings so that accurate fitting was not important. If necessary, shutter frames could be faced initially with woven split bamboo.



Elevation




Plan

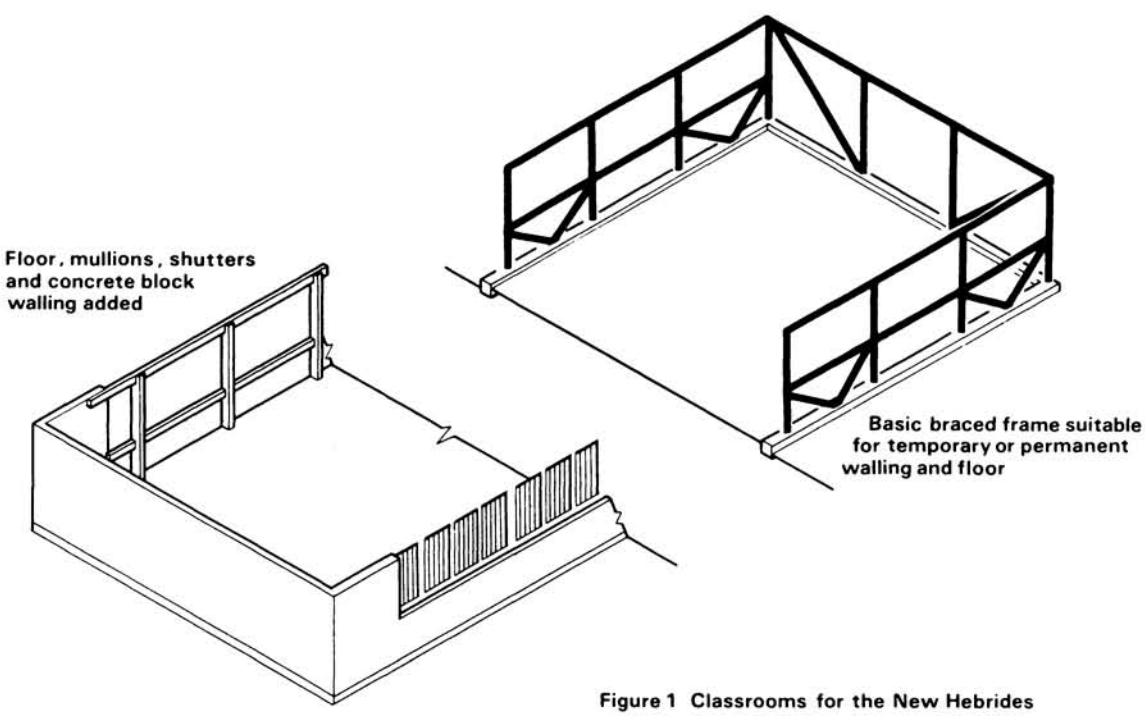



Figure 1 Classrooms for the New Hebrides

## Gilbert Islands

For the Gilbert Islands a similar design is also suitable, particularly on Tarawa where adequate supplies of traditional local materials are difficult to obtain. On outer islands the situation is different. Local materials, mainly pandanus poles and thatch, are available and their use is well understood. There are economic reasons in favour of using them even when the relatively short life of thatch is considered. (There is, however, an understandable desire for a "proper" building, but in relation to local incomes this would bring a heavier financial burden than in the New Hebrides.)

The traditional Gilbertese maneaba structure provides a very satisfactory way of covering a large meeting space. The simplicity of the structure depends on a relatively square plan form and a very low eaves height and there are no walls. For teaching, however, a higher standard of daylighting, storage facilities and display space are needed, and for several classrooms in a block a more elongated structure is essential.

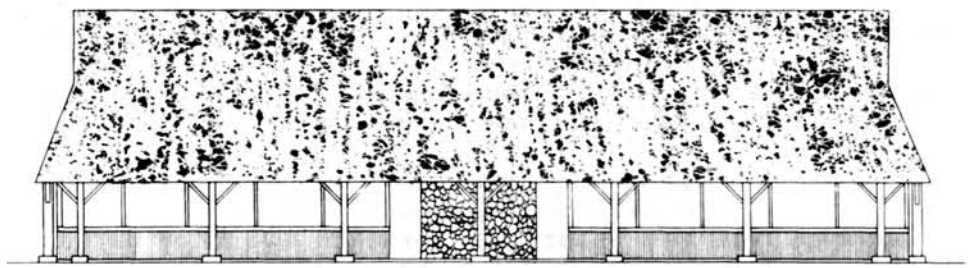
The modifications proposed to the traditional structure to meet these needs are increasing the eaves height by setting the roof on braced posts, providing a ceiling to reflect down on to the working plane daylight reflected up from the surrounding sand, and constructing a masonry store-room between pairs of classrooms to stabilise the building. These modifications radically change the original concept of the framing of the maneaba and require some understanding of structural principles. The provision of a floor, walls and windows is desirable, but not essential initially, and they can be made of whatever suitable materials are available.

## Prefabrication

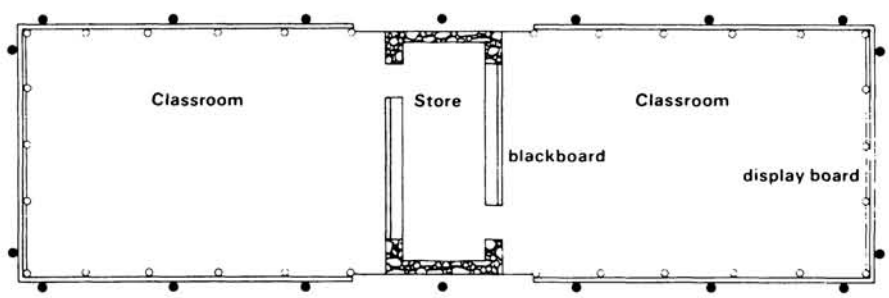
This approach to school building, whether it uses a timber frame on posts or a traditional structure of pandanus poles, is basically the same as using a prefabricated steel frame and it stems from the simple shape of classroom buildings in the tropics where continuous window openings for ventilation and light are needed on both sides. Steel frames have been used successfully for schools in the Pacific and in some places may cost no more than timber frames. Ordering and despatch need special care as does handling on arrival because damage or deficiency is difficult to remedy. It may be thought that, with the scarcity of resources on some outer islands, the simplest solution would be to provide a completely prefabricated building. In practice these solutions are seldom completely prefabricated and still require considerable work in site preparation, foundations and finishing. They may in fact complicate the work because of their need for greater accuracy and more care in shipment. Ideally, simple community buildings should provide an example of techniques which villagers can adapt for other buildings and which provide work for local skilled or semi-skilled men. In practice, the circumstances of each project will indicate what should be done.

## Conclusion

Because circumstances can differ widely from project to project, it is useful to have ways of building which can be suitably varied. Not every educational authority would agree to the priorities between, say, storage, flooring and walling as suggested above, and there may be scepticism about techniques which provide only the carcase of a building and leave unresolved the question of timing and financing its completion. But in some cases they



Elevation




Plan

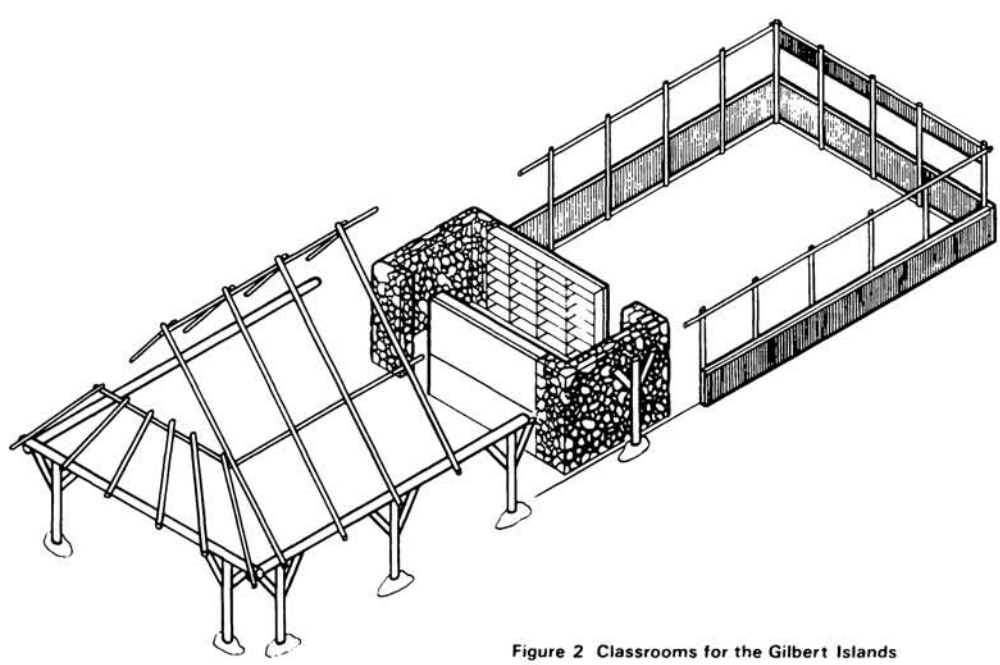


Figure 2 Classrooms for the Gilbert Islands

may enable a school to start this year instead of next year or to have three classrooms instead of two and this may sometimes be advisable even though walls and flooring have to be improvised. Where there is a system of subsidies for capital works, it can be used to influence local choice. For example, the full cost of all the essential features (foundation, frame and fittings) could be met centrally and the remaining items subsidised according to local preference and contributions. There may also be prohibitions on features known to cause trouble, to be executed poorly, or to require expenditure on short-lived materials such as untempered hardboard used externally, unpainted softwood exposed to weather or timber structural members buried in earth or concrete. Where there is not enough money for a well-made durable piece of work, it is better to have a "no-cost" short-term solution of local materials than a low-cost solution of imported materials that may last only a little longer. A floor of tamped coral is better than a very thin floor of weak concrete which will soon break up, and walls of woven bamboo or coconut mid-rib are better than unpainted hardboard which will soon deteriorate. Another doubtful form of economy is to build classrooms too small for their purpose. There is usually very little saving in reducing the width of a classroom but this can result in restriction of teaching methods.

The approach described requires little special technical skill either in design or construction, although some is needed. Outer islands contain too many derelict buildings which through ignorance or expediency were erected by amateurs. With the techniques outlined and sympathy for and understanding of local circumstances, a higher standard of school building could be achieved.

# HARAMBEE SCHOOL BUILDING IN KENYA

A.H. Muraya

Deputy Director of Education, Ministry of Education, Kenya

Before 1960 the former African schools offered a four year primary education course at the end of which pupils sat the Competitive Entrance Examination. The successful candidates, predetermined by the available classroom space, were admitted to the intermediate schools where they took a four year course leading to the Kenya Preliminary Examination. The best of the pupils were then admitted to a four year secondary education course. The above structure of education simplified tremendously the work of the education planner. By the turn of a screw at any stage of the school system he could control the enrolments to match the available resources for education and the employment opportunities of the school leavers.

Two developments took place in the early sixties which introduced a radical change in the structure of education: the standard four Common Entrance Competitive Examination was abolished and the primary education course reduced to seven years. It was now possible for an African child to have seven years' continuous education. The Government and the Local Authorities, though ready and willing to meet the additional recurrent expenditure and to employ extra teachers, were not in a strong financial position to provide funds for capital development except in the City of Nairobi and a few Municipalities.

The parents, the local communities and the political leaders rallied to His Excellency, the President, Mzee Jomo Kenyatta's call of "Harambee" and organised self-help groups to construct the much needed classrooms and teachers' houses in the whole length and breadth of the Republic.

The buildings put up varied from locality to locality depending mainly on the prosperity of the people, their willingness to contribute material, money and labour for the projects and the availability of suitable local material for building. Plans for the classrooms and teachers' houses were provided free of charge. Education Officers and schools' supervisors gave freely their advisory services and made sure that the classrooms were of the standard size and well-lighted and lockable. The last requirement was an essential component of the building programme because, under the New Primary Approach (a method of teaching), equipment and apparatus had to be left in the classrooms.

The majority of the buildings were of mud and wattle with cemented floors and corrugated iron sheet roofs. A good number of them were of a more permanent nature - brick or dressed stone or cement block walls with corrugated iron sheet roofs.

The total cost to the community of this capital development in monetary terms is unknown but its impact on education may be evaluated, in terms of enrolments, by examining the following figures:

Primary School Enrolments 1960 and 1971

| | 1960 | 1971 |
|---|---|---|
| Total enrolments | 781,000 | 1,557,000 |
| C.P.E. Candidates | 23,200 | 176,100 |

Note: C.P.E. Certificate of Primary Education is taken at the end of the Primary course.

Some increases in enrolments may be due to the holding of larger classes but this gain is offset by the heavy losses of classrooms incurred when some intermediate schools were converted into secondary schools. It is not, therefore, unreasonable to assume, since no figures are available, that the national stock of primary school physical facilities was doubled, through Harambee efforts, in a short period of ten years. What is certain is that the social and political demands for primary education were to a large extent met. The efforts, moreover, were a pointer to the extent to which parents are prepared to go to provide education for their children.

Expansion at secondary level

Although secondary and higher education expansion had received some impetus at the eve of independence, the real secondary education 'explosion' came after independence. Critical shortages of trained manpower in the Government service and in the private sector of the economy had to be met. It became the deliberate policy of the Government to expand opportunities for secondary education, first to meet the immediate manpower needs and secondly to obtain recruits for training programmes and higher education.

In 1960, the Form I places available for primary school leavers were 6,500. By 1971 the available places in government aided and assisted schools had rocketed to 23,600. Despite this remarkable programme of expansion the hunger for secondary education places could not be satisfied. The parents and the pupils alike were impervious to the arguments advanced by the educationists, manpower planners and economists about the quality of education, employment opportunities and alternative investment openings. To parents and their children, secondary education was the golden road to salaried employment, higher education, prestige and success in life. It had to be acquired at any cost.

The situation was moreover made worse by a large output of primary school leavers, for the changes in the structure of primary education, made in the 1960's, were now beginning to bear fruit. It has already been noted that in 1960 there were 23,200 candidates for the Certificate of Primary Education Examination and that nearly 176,000 candidates are expected to write this examination in 1971. As the following table indicates, the index of opportunity for primary school leavers getting a place in a government secondary school was falling.

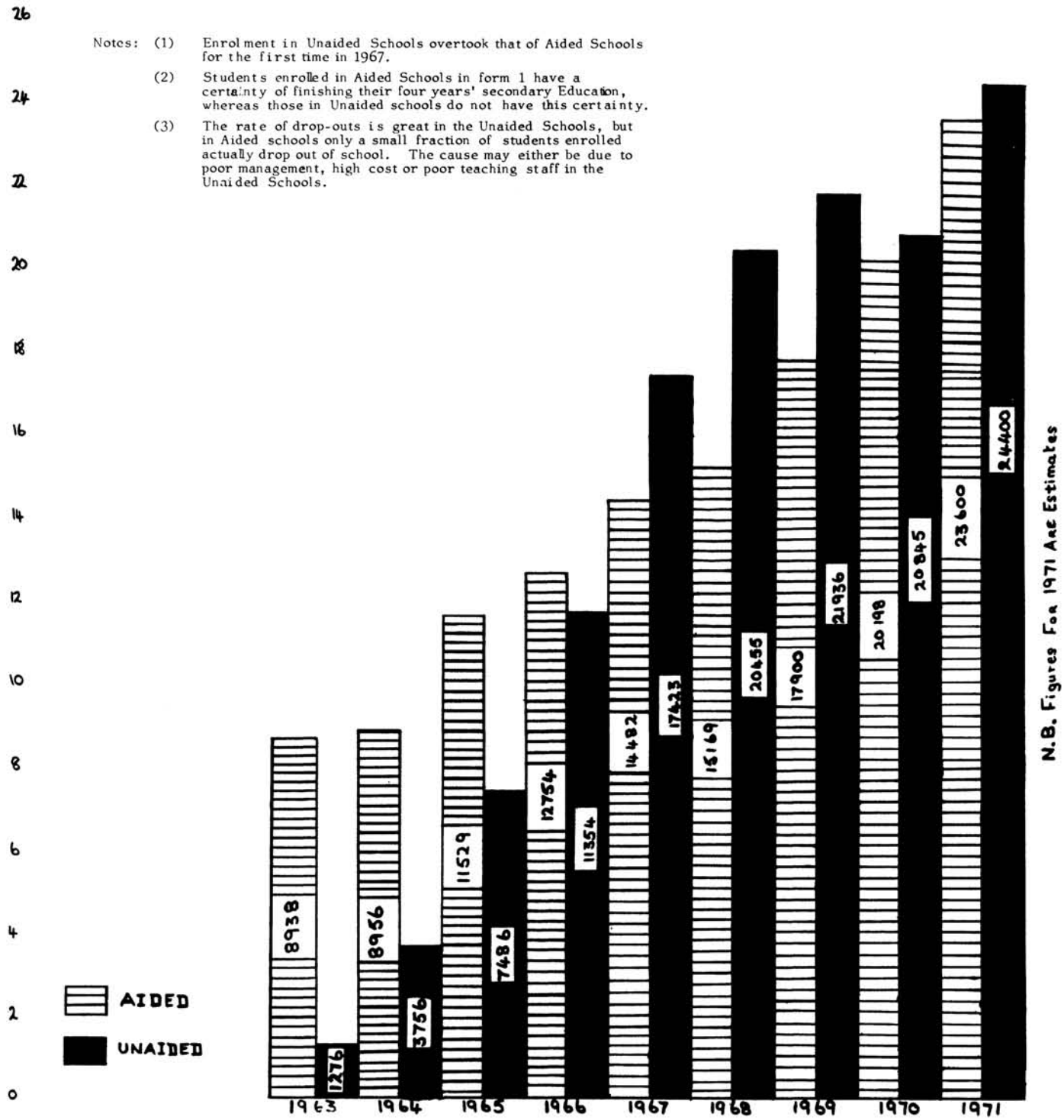
# KENYA

## ENROLMENT IN FORM 1 IN AIDED AND UNAIDED SCHOOLS 1963 - 1971

Notes: (1) Enrolment in Unaided Schools overtook that of Aided Schools for the first time in 1967.

(2) Students enrolled in Aided Schools in form 1 have a certainty of finishing their four years' secondary Education, whereas those in Unaided schools do not have this certainty.

(3) The rate of drop-outs is great in the Unaided Schools, but in Aided schools only a small fraction of students enrolled actually drop out of school. The cause may either be due to poor management, high cost or poor teaching staff in the Unaided Schools.



Index of opportunity for a Form I place in government aided and assisted schools, 1964 and 1966

| | 1964 | 1966 |
|---|---|---|
| C.P.E. Candidates the previous year | 62,125 | 150,000 |
| Form 1 places | 8,956 | 12,754 |
| Index of opportunity | 14.4 | 8.4 |

As the Certificate of Primary Education candidates increased, the relative opportunity of a Std. 7 leaver getting a Form I place in a government secondary school declined. This decline was a threat to the parents' and pupils' education expectations. It had social and political implications which are outside the scope of this paper.

As an emergency measure the local communities began to build Harambee secondary schools in anticipation of government assistance. The Harambee effort was now being directed towards an area of development where heavy expenditure for capital and recurrent expenses was imperative. Co-operative Societies enthusiastically offered to meet some of the expenses for the schools that served their children. Parents paid fees and made building fund contributions. Occasional fund-raising rallies were organised and donations collected from all the well-wishers. Initially it was only the agriculturally rich and the densely populated areas that built these schools, but as the movement gathered momentum all districts joined, and today even the remotest district in the Republic has a Harambee Secondary School of its own.

Generally speaking, the buildings are of an acceptable standard in size and design, and some of the sites are very good from the point of view of future development of the schools. A few of these schools have managed to build standard laboratories for the teaching of science. The quality of the instruction given varies, depending on the availability of qualified staff, teaching material, text-books and equipment. Public examination results are generally reasonable, considering the conditions prevailing in these schools.

On the brighter side, the Harambee schools and the private schools combined (referred to in the Ministry of Education as the unaided schools) are providing a service of inestimable value to the people. In 1963, the unaided schools offered 1,300 Form I places to the primary school leavers. Three years later, in 1966, the unaided schools had created 11,350 Form I places. In January 1971, approximately 24,400 primary school leavers were admitted in unaided schools, that is, 800 more pupils than were admitted in the government aided and assisted schools.

In conclusion it might be pointed out that a development of this magnitude cannot fail to attract the attention of the Government and the public at large. Already it is beginning to influence the education thinking in planning, staffing, classroom construction costs, size of classes, intensified utilization of the available space and the use of the mass media. The Government is giving moral and material support to these schools. Some are assisted with teachers and others are taken over completely

each year as part of the secondary education development programme. The buildings form an important part of the accumulated assets of the nation in education; they are also monuments to the faith the common man has in education as a potential cure for all the ills of the developing world.

(The views expressed in this paper are those of the writer and do not necessarily represent the official view.)

# MULTI-STORIED SCHOOLS IN HONG KONG

Due to the shortage of building land, especially in the urban areas, and the need to provide an adequate number of school places, it has been necessary to build multi-storied schools in Hong Kong. Sites for schools are calculated on the basis of approximately 1,000 square feet per classroom for a primary school and 2,000 square feet per classroom for a secondary school. As schedules of accommodation are laid down for both primary and secondary schools, the actual design of the school depends upon the shape and contour of the site. It is not possible to give, in a short article of this nature, details of the various designs of all schools which have been built in the Colony. However, a description of the Government standard plan co-educational primary school and the Government standard plan co-educational secondary school may give readers a general idea of multi-storied school design in Hong Kong. These schools were designed by the Government Architectural Office.

## Standard primary school

The architect for the project produced a design for a standard primary school which could be accommodated on sites of about 22,000 square feet in area (measuring at a minimum 160 feet by 140 feet clear of any adjacent slope or cutting). The requirement was for a 30-classroom school for 1,350 children and the resultant design is for a six-storey building which, because of the restricted sites, incorporates a playground on its flat roof and an open-sided covered playground and assembly area under the building at ground level. No lifts are provided but climbing to the upper floors is reduced by the roof-level play-areas which enable the upper-floor pupils to enjoy their play-periods without the need to go down to ground level.

The detailed accommodation provided in the 30-classroom standard primary schools is as follows:-

| | Item | Area |
|---|---|---|
| 1. | 30 classrooms | 560 sq. ft. each |
| 2. | 3 special teaching rooms as follows:- | |
| | a) woodwork room | 730 sq. ft. |
| | b) housecraft room | 730 sq. ft. |
| | c) general purpose room | 730 sq. ft. |
| 3. | Administrative accommodation as follows:- (for operation of the school in 2 sessions) | |
| | a) two headmaster's offices | 140 sq. ft. each |
| | b) a general office | 215 sq. ft. |
| | c) a stationery store | 30 sq. ft. |
| | d) two staff rooms | 730 sq. ft. |

e) staff toilet accommodation -
f) a medical inspection room 270 sq. ft.
g) a cleaner's store on each floor 30 sq. ft.
h) quarters for two caretakers -

4. Playground accommodation

a) Covered playground 2500 sq. ft.
It was considered that this area would be used by two thirds of the 1,350 pupils, i.e. 900 pupils, and that the following facilities should be provided:-

i) lavatory accommodation and changing rooms for boys and girls
ii) a games store 200 sq. ft.
iii) a simple platform/stage at one end of the space in order to make the fullest educational use of the covered playground as a temporary hall for speech days, amateur dramatics etc.

b) Roof playground 4500 sq. ft.
It was considered that this area would be used by one third of the 1,350 pupils, i.e. 450 pupils, and that the following facilities should be provided:-

i) lavatory accommodation for boys and girls
ii) approximately one third of the area i.e. 1,500 sq. ft. to be covered to provide protection against sun and rain for physical education and art lessons.

c) Open playground
An open playground laid out as a basketball court with floodlighting installation.

5. A car park for 6 cars.

A similar need for economy in the use of land was also an important factor in evolving a design for the standard secondary grammar school. In this case, however, because of the increased facilities called for, the minimum site area necessary to accommodate the school was found to be approximately 50,000 square feet (measuring at a minimum 160 feet by 315 feet). The requirement was for a 24-classroom school for 920 pupils with an additional 10 practical rooms and with adequate assembly and recreational facilities.

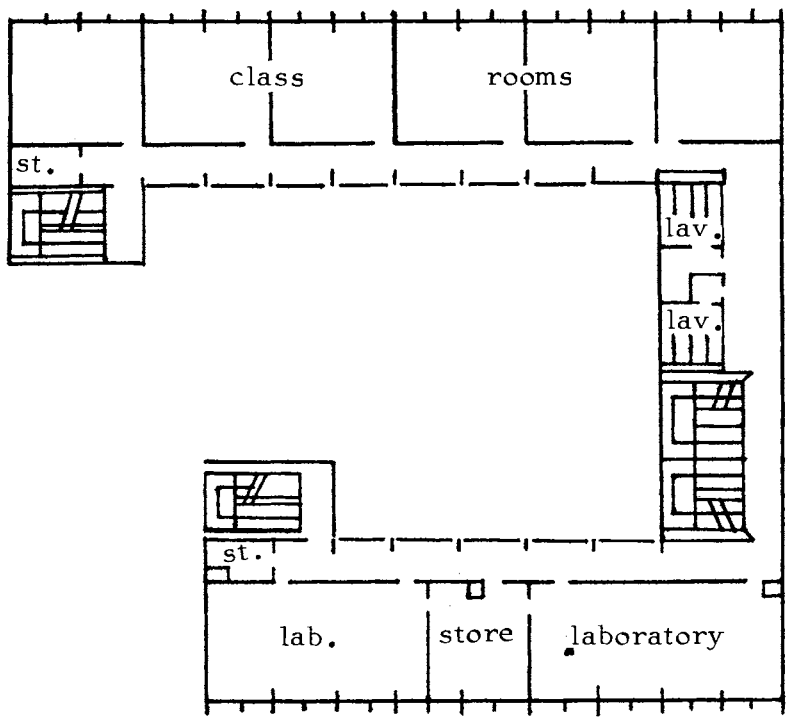
The resultant design comprises a five-storey and six storey classroom block forming three sides of an open courtyard. One wing of this block houses the 24 classrooms on four of the five floors above ground floor level, the other wing the 10 practical rooms on the four floors above ground floor level. Connecting these two wings and enclosing the third side of the courtyard is a corridor wing housing the main staircase and toilets on each floor. An assembly hall to seat 1,000 pupils is raised on columns and forms a separate block linked to the classroom block at first floor and second floor levels, access to the main floor of the hall being from the former level and to the balcony from the latter level. An open-sided covered playground occupies the ground floor area beneath the hall.

The hall is designed for multi-purpose usage with facilities for general school assemblies, meetings, examinations, lectures (with or without visual aids), concerts, stage performances and film shows as well as for gymnastics and games. The maximum amount of cross-ventilation has been provided. Artificial ventilation - necessary during film shows and when natural ventilation is inadequate - has been provided in the form of three large exhaust fans housed within the false ceiling over the balcony at the rear of the hall.

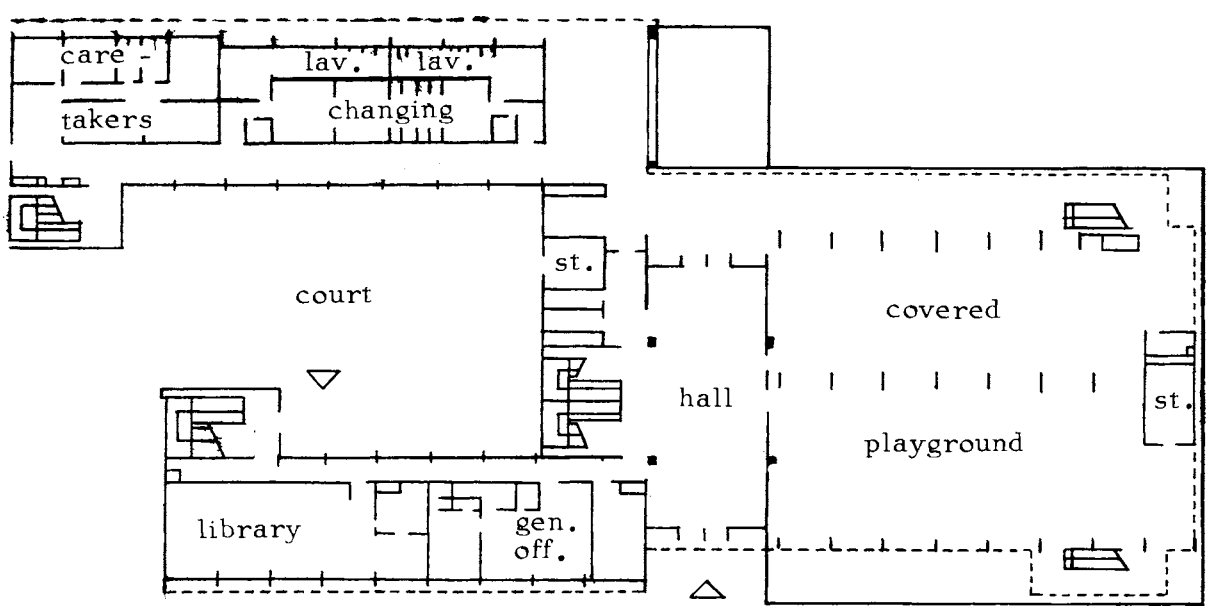
Standard secondary school

The detailed accommodation provided in the 24-classroom standard secondary grammar schools is as follows:-

| | Item | Area |
|---|---|---|
| 1. | 24 classrooms | 545 sq. ft. each |
| 2. | 10 special teaching rooms as follows:- | |
| a) | 4 laboratories (for chemistry, physics, biology and general science respectively) | 1100 sq. ft. (chemistry & physics)<br>950 sq. ft. (biology & general science) |
| b) | 2 preparation rooms to serve the laboratories | 400 sq. ft. each |
| c) | domestic science room with model living area and store | 1500 sq. ft. |
| d) | needlework room with store | 800 sq. ft.<br>120 sq. ft. |
| e) | woodwork/metalwork room with store | 1200 sq. ft.<br>120 sq. ft. |
| f) | art room with store | 1200 sq. ft.<br>200 sq. ft. |
| g) | geography room with store | 800 sq. ft.<br>200 sq. ft. |
| h) | music room | 680 sq. ft. |
| 3. | Library with store | 1200 sq. ft.<br>120 sq. ft. |
| 4. | Administrative accommodation as follows:- | |
| a) | headmaster's office | 200 sq. ft. |
| b) | a general office | 470 sq. ft. |
| c) | two staff rooms | 520 sq. ft. each |
| d) | a medical inspection room | 250 sq. ft. |
| e) | quarters for two caretakers | - |
| 5. | Assembly and physical education accommodation as follows:- | |
| a) | an assembly hall to seat 800 pupils with balcony accommodation for an additional 200 pupils, together with a stage equipped with a stage-lighting installation adequate for moderately-sized productions. | |




4th FLOOR PLAN




GROUND FLOOR PLAN

24 - CLASSROOM STANDARD SECONDARY

GRAMMAR SCHOOL HONG KONG

b) an open-sided covered playground at ground floor level under the assembly hall, together with a games store.
c) a basketball court with floodlighting installation.
d) changing rooms for boys and girls.

6. A car park for 24 cars.

The structural systems used in both types of standard school are similar, as are the types of materials and finishings used and the elevational treatments. The structural system generally is of simple reinforced concrete column, beam and slab construction. In external elevational treatment, the structural frame is painted in white cement paint, while the recessed wall panels between the concrete framework are in coloured cement paint. Internally, the colour scheme is generally a controlled selection of pastel shades as background treatment, punctuated by some stronger solid colours applied in paintwork to the classroom doors. Materials and finishings used were primarily chosen with fitness for purpose and durability in mind but at the same time with due regard for maintaining the overall cost of the standard schools within a reasonable budgetary figure.

# EDUCATION FOR THE DEAF IN MALAWI

Brother Hortensius Meeuws

Montfort Teacher Training College, Malawi

When I arrived in the country, in 1963, there was no special provision for the education of deaf children. Being the only person with a rather long experience in this particular field and with the necessary qualifications, I thought it my duty to undertake something for the deaf children in this country. However, no funds were available at that time, so I had to confine myself to incidental and private lessons.

In February 1967 I happened to have a meeting with Mr. John Chadwick, the Director of the Commonwealth Foundation, on a visit to Malawi. With him and other interested parties I discussed the possibilities of financial aid from the Commonwealth Foundation for this particular project. Initially the Commonwealth Foundation was prepared to help, but a simple start had to be made first to prove the feasibility of the project.

In March 1968 one unit with five children was opened in a borrowed classroom in Montfort Teacher Training College. In 1969 we had to open a second classroom in the College, and we had fourteen pupils in the two classrooms together. It proved that the number of applications for a place in the first school for deaf children in Malawi was rapidly increasing, and we had to make plans for our own school buildings. Particularly, the room for temporary boarding facilities was up to its maximum, and therefore hostels had to be planned together with the school, and also houses for the teachers.

From the first start we began training some local teachers for the education of the deaf. This had now grown out to a full teacher training course for teachers of the deaf at Montfort College, which course is also open for teachers of other countries. A prospectus of this course has recently been issued and sent to different countries. The course is run by four expatriate tutors.

In June 1969 the Commonwealth Foundation offered an overall award in the sum of £37,150. This award was made up of the following elements:

| | | |
|---|---|---|
| (a) | Visits twice-yearly over a five year period to Malawi by British E.N.T. consultants | £10,650 |
| (b) | Construction of deaf teacher training school-cum-clinic | £20,000 |
| (c) | Purchase of equipment for school and clinic | £ 5,000 |
| (d) | Transport for visiting surgical teams over a five year period | £ 1,500 |

The building plans for the school, hostels, audiology testing centre and teachers' houses were made by an appointed architect in Blantyre. We realised from the beginning that the building grant of the Commonwealth Foundation would not cover the cost of the total plan, and therefore we had

to find additional funds to be able to finish the buildings.

The buildings of the school consist of: one classroom block with three classrooms and one handicraft room, a second classroom block with three classrooms, a service block with two individual speech training rooms, a staffroom and toilets for the staff, boys and girls. In addition to this a special block was built as the audiology testing centre, which contains a director's office, a big testing room which also serves as an auditory training room and assembly hall for the children, a small observation room and a laboratory.

Each classroom was designed for approximately 8 children. They are light and pleasant and well ventilated. Four classrooms are equipped with a Philips group hearing aid, and two classrooms are equipped with the inductive loop system. They are as far apart from one another as possible to prevent overlapping of the signal. The group hearing aid is installed in specially designed horseshoe tables with the amplifier built-in in the teacher's desk. In addition, each classroom is equipped with a loop-system for special purposes.

The testing centre is equipped with a Peters AP5 Audiometer, which is installed in the observation room with a record player and a tape recorder. From the observation room signals can be given to the testing room via several loudspeakers and an intercom system for free-field testing. Apart from that a portable audiometer is available for fieldwork. In the laboratory equipment is installed for making earmoulds and repairing hearing aids.

The hostels are divided into four units, each self-containing, and each hostel unit offers place for approximately 16 children. The hostels are run by local African Religious Sisters, who receive a special training. They also attend classes two days per week in the school, and they are even allowed to give an occasional lesson. The four hostel units have one central kitchen.

For the African teachers four houses have been built so far on the same premises. We hope to get four more houses from the Malawi Government. The buildings are all supplied with electricity from town (we are about 15 miles from Blantyre) and have their own water supply from a borehole and a handpump. The borehole is operated with an automatic electric pump and a storage tank, so that there is a continuous water supply.

Part of the Project for The Education For the Deaf in Malawi is the twice-yearly visit of an E.N.T. consultant from Britain. Malawi does not have its own E.N.T. specialist. The visiting specialist is usually based at the Queen Elisabeth Central Hospital in Blantyre, but during his stay he also visits bigger centres elsewhere in the country, like Zomba and Lilongwe. In order to give him full opportunity for operations a special operation microscope has been purchased from a Commonwealth equipment grant. Several ear operations have been already successfully completed.

The testing centre not only serves the school for deaf children, but also anybody with hearing complaints. In addition aircraft pilots are tested here twice per year. Two members of the expatriate staff are qualified audiologists. Where necessary and possible, individual patients are helped with a hearing aid. About 40 hearing aids have been handed out so far. African patients who are not able to pay get them free of charge. They have to pay only for replacements of batteries, cords and receivers.

The education of the children is free. The Government gives a grant for boarding and tuition. The Government is also responsible for the running costsof the existing school. During the last four years we have collected a good deal of information about the incidence of deafness in Malawi, and,although exact numbers are not yet available, we think it justified to establish three schools for the deaf in the country: one in the south, as the central training base for teachers, one in the north and one in the centre. But first we have to build the existing school properly, and we are planning already a third classroom block, to bring the total number of classrooms up to ten. The next step will certainly be vocational training, but all this will take time, since we have only just started.

# FROM QUANTITY TO QUALITY - AN ASPECT OF EDUCATIONAL DEVELOPMENT IN CEYLON

Dr. Premadasa Udagama

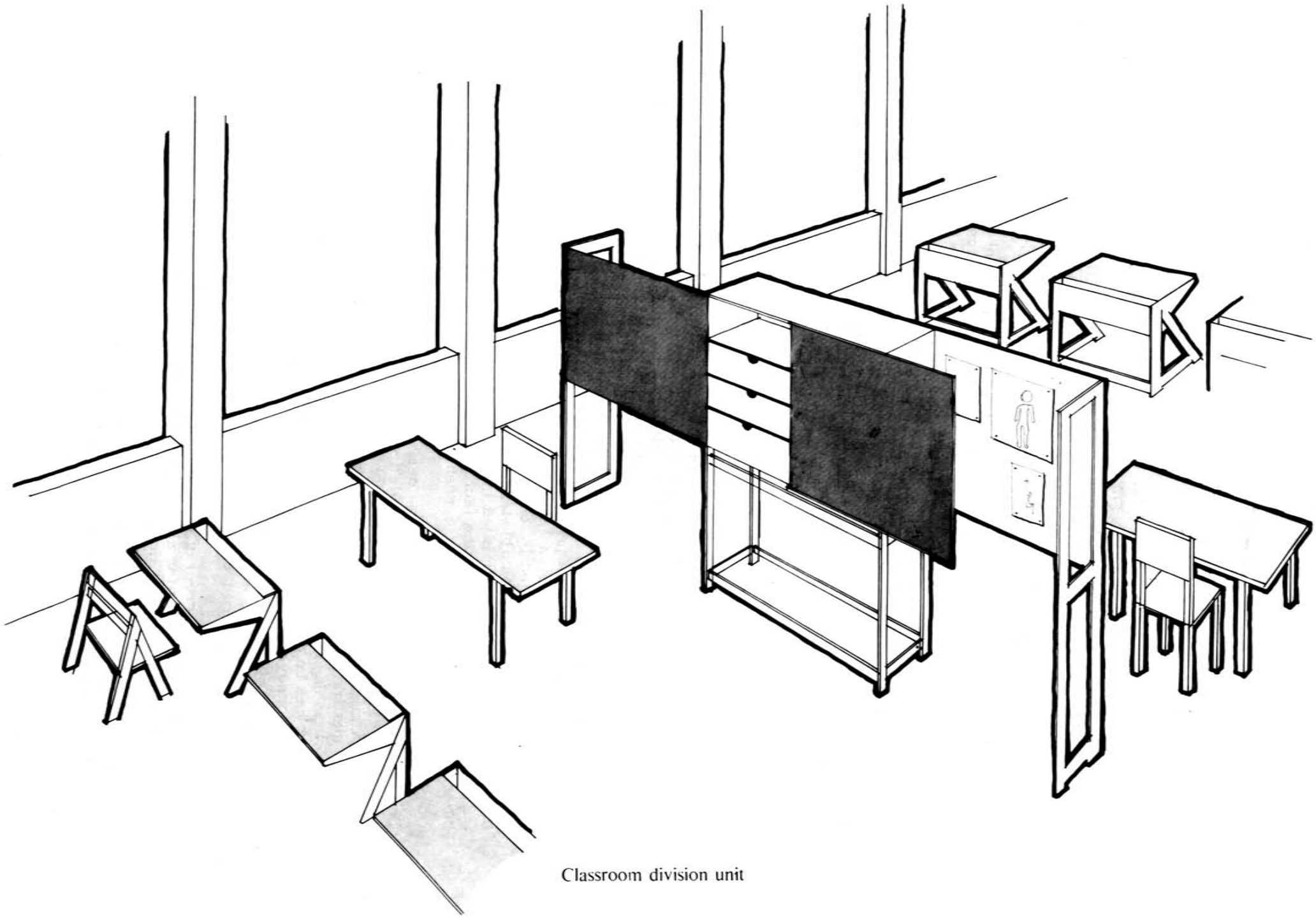
Permanent Secretary, Ministry of Education, Ceylon

Since the achievement of independence in 1948, school enrolments in Ceylon have doubled and currently stand at over 2.64 million children. This increase has been matched by the construction of some twenty-eight thousand new classrooms as well as by the remodelling and enlargement of the older buildings inherited from the colonial period. Now, in 1971, with universal free primary education and a very substantial proportion of the children of secondary school age receiving education, the Government is able to turn its attention from the problems of quantity to those of quality. This, of course, is not to suggest that the quantitative problems have entirely disappeared - they have not. It is, however, true to say that they have eased sufficiently for greater attention to be paid to matters such as the adjustment of the structure of education, improvement of the curriculum, teacher training and re-training and, last but by no means least, to the improvement of the physical environment for teaching and learning.

The climate of much of Ceylon is both hot and humid. It is, however, a comfortable climate due to the cool sea breezes that blow throughout the year. The standard school building has been designed to take advantage of those breezes and comprises an open hall with wide overhanging roof and big openings in the external walls in place of the customary windows. There are usually no brick divisions between one class and the next. This arrangement has many advantages: as numbers have grown, classes have been able to adjust along the length of the hall, unobstructed by dividing partitions; when a teacher is sick, two classes can very easily be joined and managed by one teacher; team-teaching, although not generally practised, is possible; changes in the structure of education and in the curriculum are not inhibited by rooms of the wrong size. Most important of all, perhaps, is the fact that these buildings are very cheap indeed to construct, costing, at current prices, about US$ 30 per place.

Although the use of the low-cost, open hall type school has enabled Ceylon to house the bulk of its population of school-going age and thus helped to resolve the quantitative problem that still besets many other Asian countries, the open character of the buildings has, in some ways, retarded qualitative development. Because there are no division walls between classes, there are no large chalkboards or pin-up boards, and the teacher has to make do with a small wooden blackboard and easel. There is, moreover, no storage space either for the teacher's materials or for student work. Whilst there appears to be little distraction due to noise between one class and the next, there is certainly some visual distraction as all classes can watch each other.

Thus, in its current efforts to improve the quality of education, the Government decided inter alia to see what could be done to improve the physical environment of the classroom, without, of course, losing the advantages of flexibility inherent in its standard school designs. The first solutions to the problem were developed in the Ministry of Education's Regional School Building Research Institute[1] and comprised a free-standing double-sided division unit which included storage spaces for both teachers



Classroom division unit

using it, as well as over 2 metres of chalkboard and a metre of soft-board for pinning (Figure 1). These units, costing about $83, together with more functional desks and chairs, specially designed by the Institute in relation to the body sizes of Ceylon's children, have now been installed in one hundred schools.

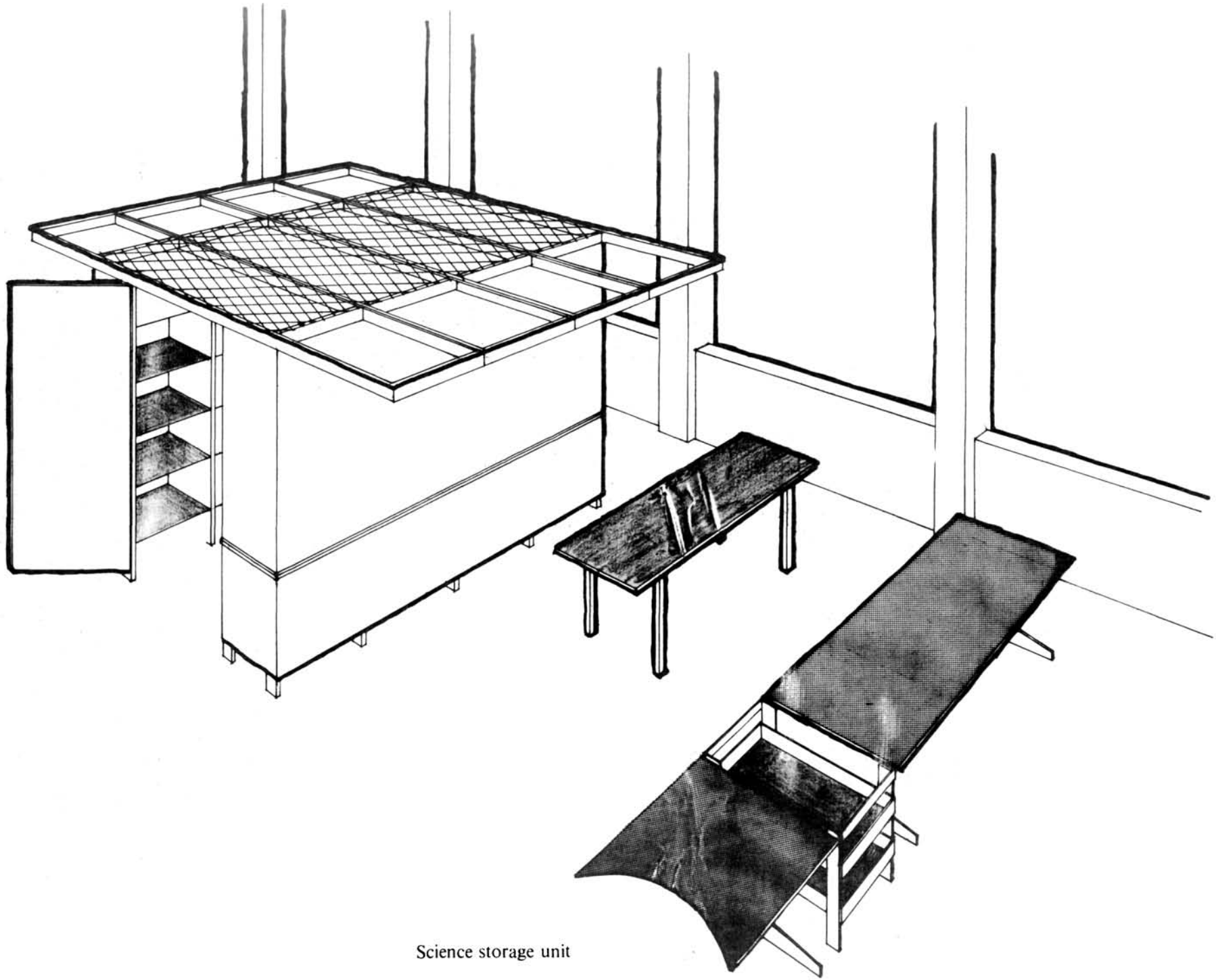
## Movable trolleys

Improvement of the physical facilities in classrooms is, however, only one aspect of a much wider problem. Facilities for handicrafts teaching and learning and science teaching and learning in the secondary schools need to be improved. Only some 600 schools have laboratories for lower secondary level science and only 160 for science at the upper secondary level. The cost of traditional laboratories has been very high in the past and this is one of the reasons why so few of them have been built. The Institute developed a cheap, prefabricated, demountable science storage unit which could be located in a hall type building and with it, science tables and stools. The storage unit houses movable science trolleys. When a science lesson is to be given, these are wheeled out, complete with water and sink (in local plastic). When the lesson is completed, the trolleys are put away and the teacher gets on with the next lesson which may be geography or history. The same trolleys can be used for handicrafts materials also. Thus, through the introduction of this simple, inexpensive unit (costing about US$330) into 100 standard hall type schools, the Ministry of Education has made science teaching and learning possible in situations where before, because of the high cost of the traditionally designed laboratory, it had been impossible (Figure 2).

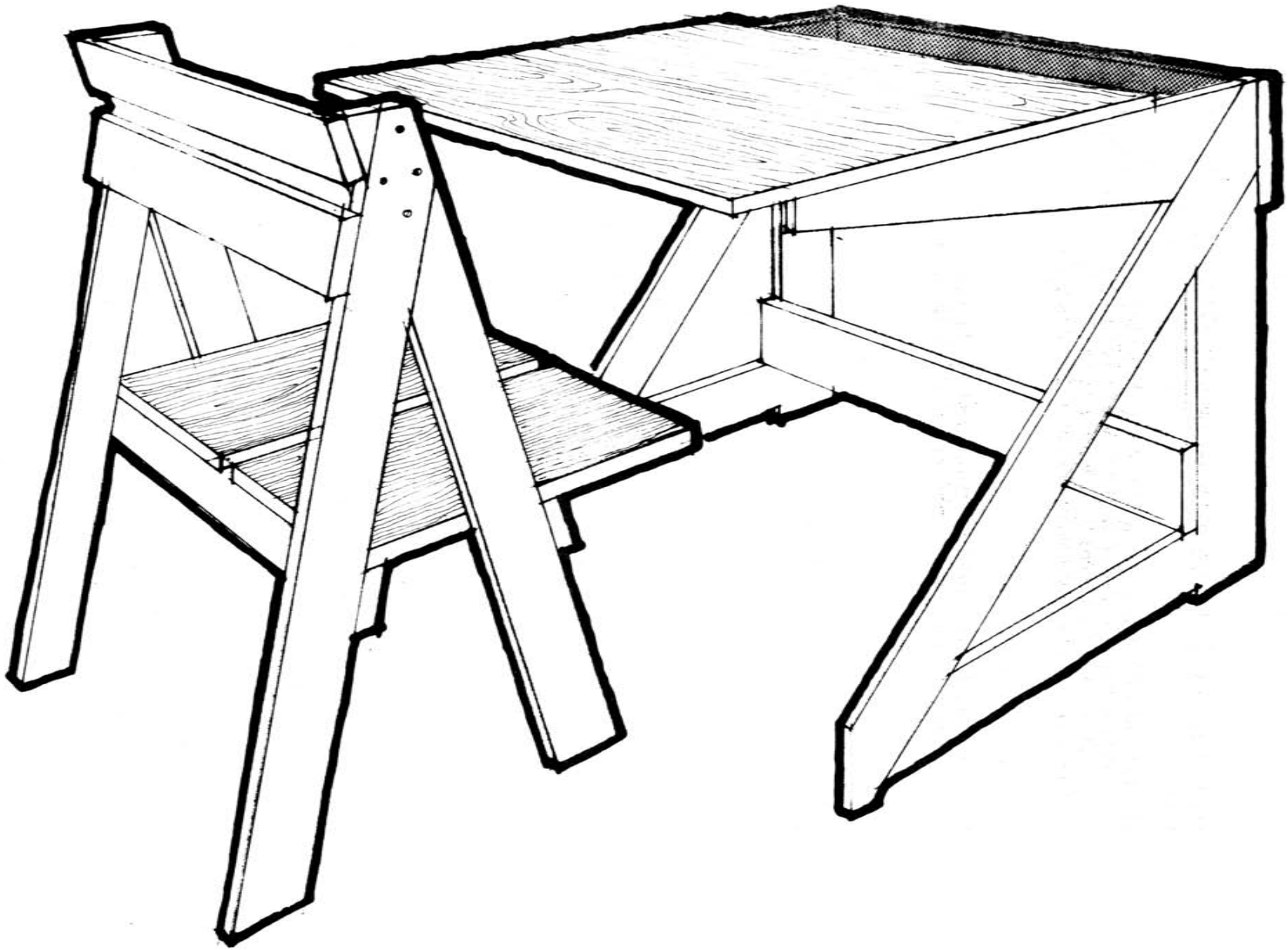
The most ingenious aspect of this story has, however, been left to its end. In June 1971, the Government of Ceylon started to examine both the structure and content of its educational system. At the time of writing, the discussion on the policies to be adopted are continuing and it will obviously be a long while before the changes proposed are fully implemented. It is clear at this stage, however, that far greater attention will be paid in future to job-oriented education at the upper primary and lower secondary levels. At present, not only are the facilities for subjects such as woodwork in the schools very limited, but the nature of the teaching is highly academic in character. Handicrafts, the Ministry of Education decided, should not be confined to the learning of skills but should also lead to the development of desirable attitudes towards the world of work and industry. This, it was reasoned, was more likely to take place if, instead of the small and often useless models made in handicrafts classes, the children worked at exercises which they themselves could plan, construct, utilize and evaluate.

## Desks and chairs made in the schools

It was at this stage of the thinking that the Ministry of Education decided to link the improvements they desired in the quality of the schemes of work for carpentry with the improvements planned in the classrooms, through the introduction of better desks and chairs. A seminar was arranged for all the country's Inspectors of woodwork at which the construction of the very simple desk and chair (Figure 3), designed in the Ministry's Research Institute, was explained. Sufficient working drawings to distribute to over 500 schools were printed and the Inspectors returned to their regions to conduct in-service courses for woodwork teachers to



Science storage unit



Desk and chair
designed by ARISBR

introduce the new desk and chair as learning units in the lower secondary school system.

During the next year, some thousands of desks and chairs will be made in Ceylon's schools and this activity will have an impact not only on the quality of teaching and learning in handicrafts, but also on the general quality of the classroom environment in which it takes place.

1. ARISBR - a unit of the Ministry - sponsored by Unesco and having regional functions in respect of educational buildings.

# NEW IDEAS ON SCHOOL FURNITURE

D.L. Medd

Architects and Buildings Branch,
Department of Education and Science, London

A hundred years ago John F. Moss in E.R. Robson's book "School Architecture" opened his chapter on School Furniture and Apparatus with these words:

> "Suitable appliances are to the teacher very much what proper tools are to the handicraftsman. The furniture and apparatus should be carefully adapted to the kind of instruction to be given and the most approved methods of imparting it. All ulterior considerations must be held subservient."

We uphold these admirable sentiments today, but the furniture that stems from them is different because children and teachers work differently. A hundred years ago, in Great Britain, on the continent of Europe and in the United States the obsessions were with the seated posture, the need for the pupil to see the teacher and for the teacher to command the attention of pupils and gain access to them. Discussions centred on the merits or otherwise of single, dual, or desks for four and more, and on whether seats should be separate or combined with them. If separate, they would be fixed to the floor, for loose seating was still a thing of the future. Furniture for other than reading and writing purposes reflected the low priority other work held in the timetable, and was designed as relatively complicated apparatus on which the teacher could demonstrate rather than as simple equipment on which the pupils themselves could work.

However, there was one feature of the classroom furniture of a hundred years ago which over the years has been ignored, and to which designers of the present generation have restored attention. This feature is the size of the furniture in relation to the size of the pupils. Recommendations and practice in 1870 were closer to those in 1970 than those during the first half of this century. At the end of the last century the priority was to read and write, and above all to keep still. Storage requirements amounted to little more than a slate. In these circumstances tailor-made furniture was relatively easy to achieve. During the course of this century the formality of the classroom persisted, but the content of education multiplied so that armfuls of books replaced the slate and created a severe storage problem at the workplace. School furniture makers naturally responded by providing deeper shelves or lockers which meant higher tops, and thus we soon had the grotesque postures that have come to be associated with the locker desk. Similar influences were at work in office furniture. Surveys in the early 1950's resulted in the confident claim that a very large majority of pupils were sitting at furniture which was too high for them. The surveys also resulted in British Standard specifications which in 1955 reminded the public that classroom furniture was primarily for children to work at (and not solely for reading and writing) rather than a repository for paper. They also showed how designers could reconcile the conflicts.

This outline shows how influential the academic tradition has been, in which the type of education thought most appropriate for the leading classes a long time ago resulted until quite recently in classrooms for pupils of all ages and kinds that could in essence be described by the words, desks, rows, blackboards; words that have become so familiar that they instantly conjure for the man in the street the image of a school.

There have been more fundamental influences at work for just as long, but it is only in this present generation that partnerships of educators and designers have been established which have been able to realise the implications of these influences in design. During the last century, educators have been making discoveries of how children learn, the importance of learning from the concrete, from experience. Concern for the whole child has become a cliché, but it is too important to put to one side, for through this kind of concern, we now realise that physical surroundings and our physical well-being affect our development and our power to think. Designers and educators now increasingly realise therefore that the provision of furniture in a school is not the closing phase of a building contract, but regard it as part of the ethos of the school, and as a starting point in school design.

Influences on furniture

It is not possible here to pursue closely these connections between how children now learn and their physical surroundings, but at the risk of oversimplifying for the sake of clarity it is important to state briefly the influences on furniture. For working purposes, teachers are concerned with individual pupils, rather than classes. Pupils learn in different ways and speeds, which together with the emphasis on learning from real experiences means that they are working in varying sizes of groups, and at many different kinds of work. Throughout the day the patterns of group size and work will change. Not often will everybody be doing the same thing at the same time. This means, among many other things, a less rigid division between reading and writing work, and work with the hands. The conventional design of both buildings and furniture has implied a rigid division in the past. These are principles which apply in varying degrees throughout the whole educational process, and ones which pioneering teachers have been applying before the physical attributes of a school and the furniture in particular had responded to them.

The dichotomy of education into primary and secondary stages is giving way to a more continuous process that is being encouraged by the special consideration of the needs of pupils in the middle years, whether at the upper end of primary, in middle, or in the first stages of secondary schools. In most buildings, therefore, the pattern of the self-contained classroom for the younger pupils, to which is added self-contained special subject rooms, is again giving way to buildings containing a much more complicated pattern of variety in which versatile and movable furniture is the chief means whereby changing patterns of groupings and activities are achieved. It has been the tradition that the room for the class group serves both for pastoral and for working purposes, the simple needs of the former restricting the complex needs of the latter. This is no longer acceptable because for varying group sizes and activities more variety of spaces and furniture is required, and these are no longer neatly divisible into general and special subject categories. However, the need for security and pastoral care is of supreme importance, particularly for the younger

children, but at no stage need this necessarily imply classrooms as we have known them.

How does this change the popular image of a school and its furniture which history has made so sharp?

Now it is unlikely that all the children for whom a teacher is responsible will be provided with the same kind of furniture. No longer are we concerned with 30 or 40 desks or tables for 30 or 40 pupils. The implications of working in small groups doing different things are that a variety of seating and work surfaces are required. Bench seating, soft cubes, stools, rostra, steps, a patch of carpet, for example, will have their place as seats as well as chairs. Pupils will move from one working surface to another, from sitting height to standing height, from small private tables to larger communal ones, from surfaces for clean work to surfaces for messy work. Furniture for practical work is closely associated with furniture for book work, both of which need to be serviced with trolleys, providing instant categorised storage, display and screening facilities. Furnishing of the vertical surfaces is equally important as the furniture that is placed on the floor. The image of the notice board, the blackboard and the occasional shelf has disappeared with the locker desk with its rows and gangways. The vertical surfaces are now fully equipped as working surfaces, with furniture for storage and display in two and three dimensions, both to inspire and to inform.

The movement of pupils in their work now makes it impossible for a pupil to establish permanently any one chair or work place as his own. This movement and regrouping means that work surfaces need to have mobility and possess what is most easily described by the ugly phrase "all round sittability". Therefore storage at the work place is giving way to separate storage in trays or lockers, which leaves the work surfaces unencumbered.

This mobility affects the principle of "tailor making" the furniture to fit the child, a principle that seemed admirable in the past, and that is only recently being challenged. Unless academic anthropometricians are to stand in the way of changing education, it is necessary to modify the aim of fitting each pupil accurately to one by which furniture allows people of widely differing statures to sit reasonably comfortably at a given size. Not only are children of different sizes working together but teachers are working with children, rather than merely having to "command their attention" from the blackboard. In Great Britain the educational pressure for this change is very clear, and a nationwide measurement survey of the school age population has recently been completed to enable existing recommendations to be re-examined in the light of both new educational methods, and changes in the growth of the population.

> "Now it is accepted that young children need frequent opportunities to move and change their position quite apart from times which are specifically set aside for physical education".[1]

On the continent of Europe on the other hand, where education tends to involve sitting still for longer periods, and with exercise often not part of school education, the medical profession has a stronger case for advocating so strongly the accurate design and distribution of furniture for perfect postures. Thus adjustable furniture, and a multiplicity of

sizes with consequent educational inflexibility are characteristics of European schools. However, educational trends, and the growing awareness in Europe of British furniture and its educational starting points, are giving rise to an interesting international dialogue.

## Consortia of local authorities

The realisation of these changes has gathered speed in Britain over the last 20 years, but was slow to start when furniture designed for pioneering individual projects was not taken up by industry for wider marketing. It is understandable that the manufacturers' catalogues should contain only what they can sell, reflecting an accumulation of the past experience of the majority, rather than future trends representing only the minority. Manufacturers on their own could not themselves bridge the gap between industry and education, a gap that had to be bridged before school furniture could serve and encourage modern educational objectives. Individual designers and authorities had shown the way, but their order books were not large enough nor their programmes long enough to give industry the confidence to change.

The initiative taken by local education authorities (designers and users) in forming consortia to employ industrialised building techniques more effectively was first applied to furniture production by the Counties Furniture Group in 1962. In this way strong teams of designers and educators can establish requirements and present to industry a co-ordinated demand with continuity over long periods. In this way, too, new materials and new technologies whose use demands large scale production can be employed to produce furniture whose quality is high, but whose cost can be afforded by public authorities who are continuously hard pressed to balance quality with quantity. More recently other consortia of local authorities for furniture have been formed, notably one for some Welsh authorities (CLAW) and another for authorities in the south west of England (FLAG). The Department of Education and Science maintains an active collaboration with local authorities in the design both of buildings and furniture. This resulted in a partnership between the then Ministry of Public Buildings and Works (Supplies Division) - now Department of the Environment - and the CLASP Consortium of local authorities, and enabled furniture design associated with individual projects, such as the Eveline Lowe primary school, for which there was close collaboration with the Greater London Council, to be developed and made more widely available. The range of furniture stemming from this partnership of central and local authorities is now manufactured by Pel Ltd. and is known as the Forme Range. This is one example of the application of principles which are now shared and accepted by many and are being developed in different ways. The Forme Range is at the present time perhaps the most comprehensive and clearest demonstration of the ideas which are the subject of this account. These changed relationships between customers and industry reflect the fact that the combination of value for money with high quality and large quantity depends on larger buying organisations and manufacturers who have at their command large resources to employ sophisticated engineering techniques in metal, plastics and timber.

## The modern range of furniture

Until recently the furnishing of schools has been the provision of set piece interiors, whether classroom, library, laboratory, or workshop. Now a furniture range must consist of a multitude of items for floors and vertical surfaces, for working, storage and display in great variety. In fact many of the attributes of building elements are now being assumed by

furniture, which increasingly is becoming the means whereby a school becomes an educational instrument. Moreover in the interests of flexibility, cost, and speed of construction, much furniture that used to be built into the building structure is now provided in the form of loose furniture. Educators and architects will select different combinations of many items, and teachers will rearrange them constantly in their schools. This variety is kaleidoscopic in its complexity, and poses special problems for design and manufacture, which are beyond the scope of this paper. Suffice it to say that a harmony in use, whatever the arrangement, can be maintained by the versatile application of a discipline of material specification, colour and dimension that is common to the hundreds of items there may be in a range. Thus the items are given a family relationship.

For industry the aim is to pursue the manufacture of standard components by whose assembly in different ways variety in use is combined with standardisation in manufacture. The aim is to apply skill and ingenuity in these directions, not in the design of elaborate or highly specialised furniture, for which the field in education is narrowing. Teachers do not want furniture that stifles them with sophistication, but would prefer the money to be spent on good engineering and good finish. It is furniture that is versatile, that stimulates unforeseen applications, that doesn't imply a very particular use, which can truly be called a tool in the hands of teachers and pupils - to paraphrase the words of John Moss with which this paper began.

1. The Child and his Growth. Stella Duncan. Trends, February 1970, published by the Department of Education and Science.

# WIDE OPEN SPACES

E.L. Ryan

Assistant Director of Primary Education (Buildings)
Education Department, Victoria, Australia

The future school may be as unlike the school of the past as today's contemporary open air offices are unlike the musty, dusty dens in which clerks perched on stools in Charles Dickens' time. Just as the best housing products of modern imaginative architects can be called places for living so the new schools may be called places for learning - with the emphasis on learning.

The emphasis used to be, and in many places still is, on teaching with the teacher standing on the platform in front of the static class of "desk-chained" children, attentively silent, absorbing facts to be regurgitated later.

Few innovations in schools during the last decade have caused more excitement, more interest, more questioning than the open area teaching concept. Overseas there is an increasing number of open area schools in England, Scotland, United States, Canada and New Zealand. In Australia, South Australia has perhaps developed the idea most quickly, though other States have erected some open units or are about to do so. In Victoria some modest, modified attempts at open planning have been erected - the concept is being more widely accepted and more advanced buildings are being planned for several areas.

The major aim of open-space schools in encouraging greater interaction between both teachers and children reinforces the current idea of removing divisions of teachers, pupils and subjects into tight standardised compartments.

To provide space and facilities for co-operative teaching and learning is to provide accommodation that promotes teacher-facilitated learning rather than teacher-directed learning. Open planning is a challenge to the box-like structure of existing schools and is intended to make it more possible to carry out modern methods.

Open planning is designed to encourage co-operative teaching, team teaching, differentiated teaching which makes use of the individual interests and skills of the teachers; it provides more stimulating education and a higher degree of pupil activity and participation.

Open planning is an attempt to provide the physical environment in which the emphasis may be on learning rather than teaching. Flexible areas quickly adaptable to different kinds of learning situations characterise open planning.

Open planning is conceived as a means by which the needs of individual children may be better catered for. In this setting it will not always be necessary for every child to be receiving the same educational menu at the same time from the same teacher. Numerous learning situations will be contrived and the teacher's role will change from directing to facilitating.

Based on the principle of flexibility in instruction the structure plans of open area school buildings provide for the accommodation of large numbers of children in large work spaces, allowing for various groupings and regroupings of pupils under the direction of teacher teams. In some buildings there are movable interior walls that may partly or entirely screen off sections of the large open space. Another method is by means of mobile room dividers with a variety of useful vertical surfaces made up of chalkboard, pin up, peg board, white screen and magnetic board with horizontal working surfaces on one or both sides.

The work areas differ in sizes according to need, some being equal to double classrooms whereas others may be comparable to six, eight or ten classrooms. The fascinating variations in shape are both functional and pleasing to the eye; triangular, circular, octagonal, L-shaped or rectangular according to the design of the building. The spaces may be linked by corridors or walk-throughs and are referred to as pods, decks or learning areas rather than rooms, divisions or classes.

Acoustics play a significant role in the success of open area teaching. Without acoustical floor coverings the noise level appropriate to teacher-facilitated learning situations would become intolerable and there would be a reversion to teacher-directed instruction which may just as well proceed in the single classroom. In single classrooms, so that modern primary school procedures may be most fruitful, acoustical floor coverings are desirable also. These coverings in soft greens, strong blues, warm golds and vivid rusts make for an attractive and inviting setting for learning and lend themselves to easy natural informality. Such advantages are not characteristic of the cold, hard surfaces of traditional classrooms.

Furnishings are an important consideration of the concept of flexibility. The old fixed desks idea is gone. Instead, ingenious arrangements of tables of trapezoidal, rectangular and square shapes can be organised according to the needs of the children and to fit classroom programmes. The use of tables and chairs, while contributing to the classroom flexibility, has created the problem of storage of pupils' materials. Locker units with individual shelves may be used. In some cases baskets are fitted to the chairs in various places - between the legs or on the back; but any arrangement that hinders the flexibility and profitable use of all space is unsatisfactory. Probably the best arrangement is to have a series of table-height cupboards on castors, each cupboard to contain slide-in space for each child's plastic tray and possessions. Such cupboards can be placed strategically to serve the children as required and, for storage, may be placed against a wall perhaps under extra working space benches - this would necessitate rooms larger than 24 ft x 24 ft (7.3m x 7.3 m).

Adequate and suitable storage is a major consideration for resource media and the increasing quantitites and types of equipment and aids required for the creation of learning situations.

The furnishing for staff and children in open plan units must contribute to an environment which encourages greater interaction between pupil and teacher and between teacher and teacher, allow for the adaptation of space as required and make it possible for the teachers to plan jointly and to pool their talents.

Assuming that acoustics and physical arrangements of the area are satisfactory, what can be expected from teachers and pupils functioning there?

What improvements in the general learning pattern may be found? From observations and discussions with teachers who have worked in these multi-class learning centres some of the significant advantages are:

(a) the facility for re-grouping to meet needs and nourish interest;
(b) social behaviour can be readily observed by more than one person;
(c) growth in mature bearing, as freedom of movement, combined with responsibility is put into practice;
(d) improvement in attitude, progress and participation of pupils;
(e) the possibility to give unobtrusive individual assistance as required;
(f) improvement in pupils' abilities to work independently;
(g) all children can become involved in a learning situation;
(h) teachers have the opportunity to do more in an area of competence while being released from an area in which they feel less competent;
(i) teachers have the opportunity of talking over and sharing problems;
(j) teachers enjoy the team co-operation in the sharing of the space, the pupils, the activities and the resources;
(k) teachers have an opportunity to evaluate their own efforts and share in the evaluation of the children. Some teachers say that they find themselves changing in outlook and in personality as they interact with other members of their team.
(l) the open area makes it possible to bring the child's world into the classroom.

Most teams function best with a team leader. Status is not necessarily a requisite where a sharing of this role on a rotation basis is preferred.

What types of teachers find success and satisfaction in a setting where group-oriented guidance for children is the pattern of instruction? Those with a pioneering spirit perhaps, who like new adventures. Age and experience seem relatively unimportant considerations when weighed against compatability. Open area teachers recognise this as the most essential team member trait. Where teams exist, team planning must also exist. Ingenuity must be used to find time for the inter-change of ideas, for arranging the schedules, for deciding who is to introduce a topic, who is to help and in what manner with follow-up activities. Is the subject matter to be shared or are the children to be shared? When, who and how become vital questions in every aspect of team planning. Finding the necessary moments for team planning and evaluating progress presents one of the greatest challenges in open area planning. Some planning may be done after school hours, but short, extra team meetings are often possible. In well established centres the children are able to carry on independently for the first half hour of the school day, while team members brief each other on their specific responsibilities for the remainder of the day.

In the initial stages of open area development it is wise to have short term objectives with flexible scheduling and easily changed arrangements.

Open area teachers who are sensitive to noise distraction use

various quiet strategies such as flashing ceiling lights on and off as a signal to all to moderate their voices. Other teachers prefer to forestall noise volume that exceeds tolerance levels by arranging for quiet activities with some pupils while the others are engaged in lively learning situations. Pupils who are easily distracted by sound have opportunity to use the study carrels or small withdrawal areas.

A child in difficulty can more readily be helped over a learning hurdle in the open area than in the enclosed classroom. He need not be made conspicuous before his peers. Similarly the show-off does not easily find an audience for his antics. The climate for learning is more natural and a more comfortable one for the child.

How are the pupils evaluated? A filing system is common, with a file for each pupil containing brief comments plus a memorandum of specific troubles he is encountering. Books and materials are listed as well as statements on progress. Often pupils are able to keep a plan book of their own, writing down their assignments under the appropriate date. With the interchange of groupings throughout the day such information is helpful and essential for both pupils and teachers.

In some learning centres the use of aides helps to free the teachers from routine tasks. The aides help the teachers to gain added team planning time and enables them to give undivided attention to small groups and individuals in much more measure than when acting alone.

As with all school innovations there are problems, but as time passes teachers and pupils will appreciate the advantages of the "wide open space". The narrow restrictive influences of the conventional classrooms are overcome and the potential of pupils and teachers is unleashed.

In such places there will be more significance in the old saying:

"What I hear, I forget,
What I see, I remember,
What I do, I understand."

The responsibility of leadership in developing schools for this and future generations of boys and girls must be accepted by educators who must make certain that buildings become an integral part of the changing educational programme.

Much has been accomplished over the years in learning about child growth and development, the psychology of learning and teaching methods and aids. Much more will continue to be learned through research and experimentation in the years ahead. Those who plan school buildings of the future must take this knowledge into consideration. They must accept the fact that what is built will have a long life, that the elementary school programme will change, and that the ideal school has not yet been built.

The creative minds of all who have a part in building a school - children, teachers, administrators, parents, citizens, architects, engineers and designers of equipment and materials - must be utilised to full advantage.

# THE TEACHER'S VIEWPOINT

G.E. Nottle

Senior Master, Brighton Boys Technical
High School, South Australia

Any conscientious teacher surely wants a combination of circumstances in a school building that will encourage, permit and,indeed, inspire him to do his best work - to employ the methods of teaching that are his particular strengths and to provide the learning situations that will be of the greatest benefit to his students. The design, construction and fittings of the building cannot guarantee that these desired circumstances will exist, but at least they can make them possible, if enough thought goes into the project at the planning stage.

Whatever his wishes concerning the physical make-up of the school, first and foremost the teacher wants recognition and consideration before a school building is erected or even planned. Recognition of his existence and that of his students - recognition of the fact that he and his students must spend their working hours in close contact under the same roof - consideration of the fact that they are human beings,who come from architecturally planned homes where "comfortable living" and "labour-saving devices" have largely replaced the Spartan conditions of the pioneering days - recognition of the fact that environment and the experiences it provides are a big factor in shaping people's lives, particularly those of impressionable young people - in short, recognition of the inescapable fact that those who occupy school buildings are qualified to say, to some extent at least, how they should be designed and what they should contain.

When the administrator, whose responsibility is to spend public money to the best advantage,and the architect, whose task is to plan school buildings, seek out and incorporate opinions of teachers and students in their preliminary thinking, so will more functional and more congenial surroundings for the school population result. Many costly alterations, which so often have been found to be necessary immediately upon completion of the building,may thus be avoided. Generally better education should be the outcome of this research.

## Convenience and comfort

Next, the teacher wants convenience. To carry out his duties to the best of his ability, to use his valuable teaching time to the maximum, to create the conditions for learning which modern educational theory demands, he must have "everything" he needs within easy reach.

Audio-visual equipment must be readily available, administration and ancillary services close at hand, office and storage space ample and accessible and students' amenities immediately adjacent to their working areas.

Finally, the teacher wants and expects to find comfort - not

luxury or extravagance, but a reasonable measure of comfort in keeping with standards existing in professional premises elsewhere. The industrialist, the medical man, the banker and the public servant generally spend their working days in hygienic, thoughtfully-planned, air-conditioned, insulated, well-lit, carpeted, cushioned, acoustically favourable and aesthetically attractive worlds. So should the teacher and so should his students.

Now, if these needs are to be met, what kind of building will fill the bill?

## Choice of materials

Availability governs the structural materials to be used, but brick and mortar walls have a substantial, permanent and weather-proof appeal that timber, metal or pre-fabricated units cannot match. The same can be said for the stair-cases and covered walk-ways. In the event of fire, their value is obvious. Plaster acoustic ceilings and rough cast internal walls reduce the sound reflection in classrooms and transmission through corridors. Polished wood panels may look attractive, but their worth ends there. Large expanses of glass are also acoustically and climatically undesirable.

A non-slip, non-stain, vinyl-type floor covering laid on an underfelt stands hard wear and is easier on the feet (and ears) than concrete or bare boards. Staff accommodation should be carpeted throughout.

Studies into the amount of natural lighting needed for optimum working conditions are an important adjunct to the planning of the school building. What is best for one situation may be excessive in another, resulting in eye-strain and early fatigue. With evening classes for adults becoming more common, the problems of artificial lighting warrant close attention too. In fact, every room in the school needs to be well-lit for both day and night use. Invariably, store and locker rooms are just like the "black hole of Calcutta" and the incentive to keep them clean and tidy is consequently reduced.

Colour consultants are called in to advise on the interior decoration in the home. Why not in the school? The psychologist could probably offer some advice too about the shades likely to be conducive to the best working conditions.

Land costs, especially in urban areas, probably dictate that the structure is two or three storeys. Traditionally the shape has been that of "I", "L" or "LI". I suggest that for the same money a "wheel" design with a central hub and radiating spokes is more compact and functional.

The "home" room, where general academic subjects are studied, and the "specialist" rooms form the main working areas within the building. If they are isolated from each other too much by being at opposite ends, there is a tendency towards fragmentation rather than integration of the whole school programme. Sufficient "home" rooms to be real homes for their respective classes and not just "transit camps" are most desirable.

## In the classroom

What does the teacher want or expect to find in the class-room? First of all sufficient space to accommodate his students and himself, for

storage, display and equipment with adequate space in between. Single unit "portable" desks and chairs are the rule these days and so too are wood and steel. Modern picnic furniture is lightweight, sturdy and silent aluminium and plastic. Perhaps there is a place for these materials in the school room too.

Whatever the seating plan, the room should be large enough to ensure that every student has some privacy from his "neighbour" and none should be so close to the front as to suffer a droplet shower when the teacher is speaking.

Adequate storage space is essential, consisting of cupboards (preferably dust-proof), some of which have laminated plastic tops and can double as work benches where a larger area than a desk-top is needed. Space underneath at intervals for the students' legs, while seated, is desirable. Sets of drawers for teaching aids and students' projects; show-cases and open shelves for collections of books, displays of models, etc. are other conveniences which are not luxuries but necessities for more effective teaching and learning. The same can be said for "pin-up" boards of felt (not caneite) and sundry fittings to permit the expeditious use of audio-visual equipment. It would be unrealistic to have a full range of such apparatus from tape recorder to television set to slide projector permanently installed, but power points (not in awkward places), projection screen and maps (roller-blind style or wall mounted), projector stand, radio and public address speaker, chalkboards (front and back at least), "blackout" blinds or curtains, movable room dividers and intra-school communications 'phone are all basic requirements. A sink with hot and cold water is very handy too.

While on the point of the chalkboard, if it must slide, then two or three leaves moving sideways, not up and down, are easier for the teacher to handle and less strain on the necks of the students at the front of the room. If some enterprising scientist could invent a better "board", which takes an absolutely dust-free "chalk", all teachers would welcome it and his fortune would be made. The overhead projector is a useful alternative, but not a satisfactory replacement.

To open and close windows a hydraulic system, which controls all units with one movement of a handle, is the most efficient and desirable.

Two doors, one leading to the playground and the other into the building, provide for more rapid movement at the change of lessons and in case of emergency.

An indoor signalling system based on flashing lights rather than buzzers or bells is kinder to everyone's ears and nerves.

Facilities for students

Students' storage lockers are best placed adjacent to their "home" rooms, above floor level and of reasonable height, large enough to take books, bags and clothes, and having folding doors. Combination locks deter the would-be thief and students seem more proficient at remembering a number code than a key.

The locker room is inclined to be crowded at "rush hours", so that the doorways are better arranged in pairs to allow for "in" and "out" traffic. Access from both the playground and the building is essential.

If changing rooms and toilet blocks adjoin, the lockers are available for safe-keeping of property at all times. Hot water, showers, basins, soap, disposable towels, mirrors and shoe-cleaning equipment are basic necessities in these areas. A refrigerated water fountain here, and in other convenient spots about the school, is certainly preferable to having students drinking from open taps.

Soft drink dispensers have their place alongside other food and refreshment facilities in the dining room. This most important area must be well appointed with sufficient seating and services to promote a high standard of eating habits. The kinds of foodstuffs to be offered for sale is a controversial topic these days and beyond the scope of this article. However, it must be mentioned that the idea that a dining room is not needed in a school, if the climate favours eating outside most of the year, is a fallacy. Playground lunches are too often eaten "on the run" and in quite unhygienic circumstances with a resultant accumulation of litter. A teacher's time is too valuable for some of it to be spent in supervising yard cleaning and rubbish disposal. With a platform or stage included in its design, the dining room can easily double as a formal assembly hall or for social functions, such as dances or parents' meetings.

Other desirable features

A gymnasium, properly equipped and adequately sound-proofed, with direct access to the locker and changing rooms, is essential if physical education is to be taught comprehensively. A stage for drama instruction and play presentation at one end and a projection room at the other would ensure that full use could be made of this area throughout the weekly timetable.

"Sick" rooms for ailing students are best placed in the quietest section of the building, as are the library and staff common room. Private study carrels for senior students are a worthwhile addition to the usual library facilities. In the future, self-teaching equipment using records, tapes and film is likely to be equally desirable as books on the shelves for students' use.

Offices, at least on a share basis, for staff to find privacy to get on with their many associated duties, make for greater efficiency and work volume. The common room should be reserved for relaxation and refreshment and not be cluttered up with piles of books or bundles of paper. Why public servants, who ultimately control the design of school buildings, believe that teachers can work well in difficult conditions, when they themselves take pains to guarantee their own comfort and convenience, is one of the mysteries of the age.

The need for "specialist" teaching rooms for certain subjects is apparent. What must be acknowledged is that the planning and equipping of these working spaces calls for special consideration. The co-operation and consultation referred to earlier between the administrator, the architect, the builder and the teacher is nowhere more important than in these areas. The great fund of experience built up over the years by many teachers working in unsatisfactory initial conditions, which they have modified, by their own efforts, into more pleasant, convenient and stimulating surroundings, cannot continue to be ignored if schools are going to keep up with advances elsewhere in this technological age.

What then does a teacher want in a school building? In short, a place in which he is proud to serve, in which his energies are freed from the bonds of inconvenience and frustration, in which learning and teaching are a pleasure and not just a business, in which the money spent thereon is regarded as an asset for the future, rather than a liability of the present. To fulfil its educational function a school must be a leader in the community; a centre of progress and development, even ahead of its times; an example to be imitated; an object of admiration and respect. The right kind of building can make this possible.

# EDUCATIONAL FACILITIES RESEARCH IN ONTARIO

S. T. Orlowski

Chief Research Architect, Ontario Department of Education, Canada

## Formation

Increasing costs, rapid growth and changing educational philosophies resulted in a need for more detailed information on the planning and development of educational facilities. As the Minister of Education in Ontario, Honourable Robert Welch, pointed out in the introductory remarks at the presentation of the Department of Education's 1971-72 Estimates to the Legislature's Committee on Human Resources on July 16, 1971:

> ".... we are now turning more of our attention from the quantitative to the qualitative aspects of education in Ontario.
>
> Today we are standing on the threshold of a new era in society as we approach the life of our province - and the lives of each individual in this province - with a renewed emphasis on the priority of truly human values. And although this shift toward greater human responsiveness is reflected in virtually all aspects of society, nowhere is it more evident than in the Department of Education. In fact, this emphasis is an integral part of virtually every one of our programs.
>
> In a democratic society that values the individual, education is not satisfactory unless it recognises the unique personality, the unique abilities, needs, and interests, and the unique aspirations of each individual student."

To help fulfil this need the office of School Planning and Building Research was formed in June 1964. Since that time the office has continued to develop and at present has a multi-disciplined staff representing different educational backgrounds and cultures from around the world.

## Activities

a. Members of the staff are involved in a continuing program of research into facilities for elementary and secondary schools with the assistance of educators and other experts invited to participate. The studies range through all areas of the curriculum.

b. With the formation of Colleges of Applied Arts and Technology in 1968, a new dimension was added. Research is carried out on prospective construction projects from conceptual stage to completion. It covers all aspects of the proposed structure from educational purposes through site, facilities, materials, planning and execution, a comprehensive process in which the question of cost-economics is given high priority. At present there are 20 of these community colleges in operation.

c. The cost analysis group of school planning involves itself in the investigation of the nature and trend of school and college construction costs,

undertakes reviews of expenditures and continually studies the provincial capital grant plan.

d. The office provides guidance and assistance in anticipating the future needs of educational facilities and investigates the current requirements for space utilization to meet educational programs. It also researches new construction techniques and materials to define the most appropriate building forms through economic design and construction.

e. The office also conducts research in the area of special education, including schools for the deaf, blind and emotionally disturbed.

f. The office provides a consultation service for those involved in school building. It co-operates with the Ontario Teachers' Federation, County Boards of Education and others. Contacts are maintained with other provinces of Canada, UNESCO agencies and school research groups throughout the world.

Workshops

School Planning and Building Research holds two School Design Workshops a year and a College Design Workshop every other year. The general theme of this continuing series of meetings is education and architecture in the 20th century.

The purpose of the workshops is to bring together persons with diverse backgrounds and occupations who are interested in some way in the construction of educational facilities. All too frequently, seminars, conferences and conventions are restricted to the narrow confines of the interests of a single profession. This only leads to a ghettoization of the approach to problem solving. The aim of the School Planning workshops is the cross-fertilization of ideas and concepts from a multi-disciplinary grouping. Architects, planners, engineers, professional educators - both those on the classroom front and behind the scenes in administration - together with elected school board officials, who represent the community, concerned parents and members of boards of governors of the 20 community colleges in Ontario are invited to spend an intense two days discussing the problems of planning and building educational facilities.

Workshop locations are carefully slotted through various locales in the province. Each meeting is planned to provide a regional interpretation of the problems discussed and to accentuate local participation. This does not mean that the workshops are inbred affairs. Far from it, all the seminars have had delegates and participants not only from all parts of Ontario, but from the other provinces of Canada and from abroad.

Care is always taken to locate the meetings in the same building where the majority of those attending are staying. This is done to encourage the informal exchange of ideas between meetings and at after-hours "bull sessions". For this reason the registration fee includes meals. Lunch or dinner can provide a better opportunity to pursue a topic of interest in depth than the necessarily time-restricted question periods in the more structured discussions. School Planning believes that the informal exchange of ideas and the non-structured meetings with cohorts can be as significant a benefit from the workshop as the actual program.

The program is carefully worked out to offer a wide range of topics to interest and involve the multi-disciplinary participants. Usually an overall theme is established for the workshops:

School as a Community Resource
Alternative Spaces for Education
New Techniques in Construction Contracts
Control of Environment
The Systems Approach to Construction

The technique of panel discussions is frequently employed both in general sessions and discussion groups to present the multi-disciplinary picture. Panels frequently include an educator, administrator, trustee and an architect. Specialists such as engineers, cost analysts or TV consultants are invited according to the topic.

Panelists are urged to give their frank opinions and lively discussions are sought. The larger sessions always allow a question period at the end while in the small groups less formalized participation is encouraged.

Many memorable sessions have been held including the time Dr. Gores, head of Educational Facilities Laboratories, observed:

> "If we could only get from teaching over to learning and get on trust, trust the student to regulate his own intake. Just as we try to get the building out of the way, get the teacher out of the way. In many instances the teacher is an intrusion between the kid and the access he wants to what he wants to know, which means then, as this library is growing, this library-like space is growing, because more and more kids are regulating their intake, with instinct, with their natural thirst that Einstein said all young children have until it is beaten out of them by education."

The proceedings of the workshop are quickly printed for distribution to those who could not attend but who are interested in the proceedings. School Planning believes that one of the fundamental attributes of the workshop is its timeliness. To avoid the long delay in preparing the papers for publication, the meetings are recorded on magnetic tape and then transcribed. Each participant is asked for a copy of his speech notes in a literary form at the time of the meetings.

## Research publications

After thorough study, information gathered by the office of School Planning and Building Research is reflected in the specialized publications it produces.

Since the inception of School Planning, 27 publications have been produced including:

Library Resource Centres for Elementary Schools (1966)
Colleges of Applied Arts and Technology - Movement and Growth Patterns (1969)
Relocatable Learning Facilities (1970)

All of these publications and the expertise of the staff are available to any interested parties, not only in Ontario but throughout the world.

## COMMONWEALTH SECRETARIAT
## EDUCATION DIVISION PUBLICATIONS

(packing and overseas postage included)

*out of print

### Commonwealth Education Conferences

1. Report of the First Commonwealth Education Conference, Oxford, 1959.

2. Report of the Second Commonwealth Education Conference, New Delhi, 1962.

3. Report of the Third Commonwealth Education Conference, Ottawa, 1964.

4. Report of the Fourth Commonwealth Education Conference, Lagos, 1968.

5. Report of the Fifth Commonwealth Education Conference, Canberra, 1971.

### Specialist Conferences

1. *Report of the Commonwealth Conference on the Teaching of English as a Second Language, Makerere, Uganda, 1961.

2. Report of the Commonwealth Conference on the Teaching of Science in Schools, Peradeniya, Ceylon, 1963.

3. Report of the Commonwealth Conference on the Education and Training of Technicians, Huddersfield, England, 1966. (£1.37p.)

4. 'Mathematics in Commonwealth Schools'. Report of an Expert Conference, Trinidad, 1968. (£1.15p.)

5. 'Education in Rural Areas'. Report of the Commonwealth Conference on Education in Rural Areas, Ghana, March, 1970. (75p.)

### Seminars

1. 'Youth and Development in Africa'. Report of the Commonwealth African Regional Youth Seminar, Nairobi, November, 1969. (£1.25p.)

2. 'Youth and Development in the Caribbean'. Report of the Commonwealth Caribbean Regional Youth Seminar, Trinidad, August 1970. (£1.25p.)

3. 'Youth and Development in Asia and the Pacific'. Report of the Commonwealth Asian-Pacific Regional Youth Seminar, Kuala Lumpur, August 1971. (£1.25p.)

Education in the Commonwealth (series)

1. Examinations at Secondary Level, 1970. A Symposium. (40p.)

2. *Directory of Educational Provision for Handicapped Children in Developing Commonwealth Countries, 1970. (40p.)

3. Education in the Developing Countries of the Commonwealth: Research Register 1970-71. (50p.) 45p

4. School Building and Design in the Commonwealth. A Symposium. (50p.)

Commissioned papers

1. Language and Communication in the Commonwealth, 1965. (20p.)

2. Correspondence Courses in the Training of Teachers, 1966.

3. Vocational and Social Training of Primary School Leavers in the African Countries of the Commonwealth, 1969.

4. 'Visual Perception' by Helen Coppen, University of London Institute of Education, 1970. (20p.)

5. 'Teacher Education in the Developing Countries of the Commonwealth: A Survey of Present Trends' by W.A. Dodd, University of London Institute of Education, 1970. (35p.)

Current Research

1. *Current Research in Education in Some Developing Countries of the Commonwealth, 1968.

2. *Education in the Developing Countries of the Commonwealth: Abstracts of Current Research 1969.

Registers of research projects will in future appear biennially in the series 'Education in the Commonwealth' (see above).

C.E.L.C. Newsletter

1. Vol. 1, Nos. 1-8 (May 1966 to February 1968)

2. Vo. II, Nos. 1-12 (May 1968 to February 1971)

3. Vol. III, Nos. 1- (May 1971 -

Commonwealth Scholarship and Fellowship Plan

Commonwealth Scholarship and Fellowship Plan - 10 Annual Reports (1960-61 to 1969-70) (35p. each)

Published by the
COMMONWEALTH SECRETARIAT

To be purchased from the
Commonwealth Secretariat
Printing Section
Marlborough House
London SW1Y 5HX

I.S.B.N. 0 85092 044 2

ISBN 978-1-84859-189-9