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AUTHOR Seng, Law Song
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ABSTRACT

In this paper the system of coordination within the broader framework of education and technical manpower training is examined. The development of technical education in the schools and of programs offered by the public institutions is first described. A discussion follows regarding technical manpower training, the responsibility for which lies outside the school system and which is undertaken by different public institutions. Coordination of technical manpower development is considered. The closely linked system of progression between the schools and vocational training is then elaborated upon by focusing attention on the joint efforts of the Ministry of Education (MOE) and the Vocational and Industrial Training Board (VITB) in introducing a mechanism of automatic registration and a Pre-Vocational Training (PVT) program. Two tables and three figures are attached that depict areas of study in the technical education program, proposed PVT projects, the system of automatic registration, and features of the MOE-VITB system of progression. (YLB)

# CO-ORDINATION BETWEEN VOCATIONAL EDUCATION & VOCATIONAL TRAINING IN SINGAPORE

**Dr. Law Song Seng**
Director
Vocational & Industrial
Training Board
Singapore



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It is reprinted as a VITB Paper in view of its professional interests to others in the vocational and industrial training field.

Vocational & Industrial Training Board

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# ABSTRACT

This paper examines the coordination of public training institutions within the broader framework of education and technical manpower training including vocational training in Singapore. Although these institutions operate independently of each other without formal administrative linkages, the areas of responsibilities are clearly defined. In addition, the planning and projection of manpower needs is coordinated at the national level by a Council on Professional and Technical Education. In the area of vocational training, the tripartite representation of the Vocational & Industrial Training Board and its network of advisory committees also serve as a vehicle for coordination with special relationships being developed with the Ministry of Education.

# INTRODUCTION

In the previous paper by Law (1), the trend of vocational training in Singapore was presented. In particular, the paper traces the evolution and formalization of the system of training, its underlying features and recent development. The changes in the system of vocational training were viewed as a response to three impinging factors arising from Singapore's limited human resource, the policy of economic restructuring for the 1980s and 90s and implementation of a New Education System in 1980.

The lines of demarcation with respect to the roles and responsibilities of public training institutions to meet different levels and areas of manpower needs are well delineated. These institutions which are directly involved in the training of technical manpower (including vocational and industrial training) are highly integrated as components of the national manpower training infrastructure (1, 2).

However, in the broadest sense, public institutions only constitute a part, albeit major, of the greater pool of educational and training resources of a country. The partnership of private institutions and industries in training is viewed as an increasingly important feature of the total system. Schools represent the initial springboard towards further education and training and as such, governmental policies which transcend inter-ministry objectives must be well coordinated. It is equally important that interfaces between training institutions at operational levels are supported by mechanisms for coordination and consultation so as to ensure effective use of training resources.

In this paper, the system of coordination within the

broader framework of education and technical manpower training is examined. The development of 'technical education' in the schools and programmes offered by the public institutions are first described. This is followed by the coordination of technical manpower training. The closely-linked system of progression between the schools and vocational training is then elaborated upon by focussing attention on the joint efforts in introducing a mechanism of automatic registration and a Pre-Vocational Training programme.

# SCHOOL-TECHNICAL-VOCATIONAL TRAINING INFRASTRUCTURE

The major public training institutions in Singapore are represented by the National University of Singapore, Nanyang Technological Institute, Ngee Ann Polytechnic, Singapore Polytechnic, Economic Development Board (EDB) (with 3 training centres and 4 institutes), Vocational and Industrial Training Board (with 15 vocational institutes) and Ministry of Education (with some 470 schools) as shown in Fig. 1. Together they constitute the public education and technical manpower training infrastructure excluding private institutions and industry training centres.

## Technical Education Within The School System

General education is administered by the Ministry of Education and is patterned on a basic 6-4-2 system until recently when provisions for 8-year primary and 5-year secondary streams were introduced with the implementation of the New Education System in 1980. Since the attainment of self-government in 1959, an emphasis of the educational policy has been the teaching of science and technical subjects directed at the manpower needs of industrialization and preparation for an emerging modern technological society. Following a Commission of Inquiry into Vocational & Technical Education in Singapore in 1961, a "technical stream" in secondary technical schools, leading to the General Certificate of Education, GCE 'O' and 'A' levels was introduced. 'Technical education' in Singapore schools refers to subjects such as Metalwork, Woodwork, Technical Drawing and Basic Electricity and Electronics. The objective is not aimed at providing vocational training but rather to acquaint pupils with the knowledge and use of basic hand tools and simple machines. Special secondary

vocational schools offering 2-year programmes for superannuated Primary six students were developed within the school system. So were secondary commercial schools offering 2-year programmes at Secondary 3 and 4 developed.

However, by 1968, there was still a heavy bias towards academic education with only 6% in the technical stream and 2% in vocational training. Major changes took place with the establishment of the Technical Education Department (TED) in 1968 which worked towards a National Industrial Training Council (NITC) through the Minister of State (Education). The policy was to further orientate the technical-vocational training towards the manpower needs of industrialization. In particular, the need to modify the attitude of the people towards and promote the image of blue-collar work was recognized. Within the school system, the following changes were introduced :-

- All Secondary 1 and 2 pupils were offered a common curriculum. Streaming was effectively postponed to Secondary 3.

- All Secondary 1 and 2 pupils were required to take technical drawing.

- All Secondary 1 and 2 boys and 50% of girls were required to undergo Workshop Practice. The remainder of the girls were to do Home Economics.

- Course assessment and aptitude tests were applied as a basis for channelling to Secondary 3.

- The target was to channel 1/3 of upper secondary pupils to the 'technical stream'. This was achieved in 1972.

- Secondary vocational schools were phased out in favour of vocational institutes offering craft courses leading to Trade Certificates. The Singapore Technical Institute (today, one of VITB's institutes) was established to offer higher-level Industrial Technician Certificate courses for GCE 'O' level trainees.

- The TEP took over the responsibility of administering Apprenticeship schemes from the Ministry of Labour.

- The Adult Education Board started to offer 2-year part-time pre-vocational classes to prepare primary school leavers for admission to the vocational institutes for skills training.

With the subsequent expansion of vocational institutes and infrastructural development the system of vocational training in Singapore was formalized through the formation of the Industrial Training Board (ITB) in 1973. Since then, industrial training was no longer a part of the secondary technical education programme. The ITB, as a statutory Board, operates independently outside the general educational system of the Ministry of Education. Following a review of the technical education programme in the secondary schools by the Shelley Committee in 1976, further adjustments were made to the secondary curriculum, in particular, the gradual phasing out of technical drawing and basic electricity and introducing the option of Workshop Practice or Home Economics for girls. At the lower secondary level, all boys, and girls who choose to, study Metalwork and Woodwork within the 40-period curriculum time for three periods per week. At the upper secondary level, the 'technical stream' students are expected to offer a combination of subjects including either Woodwork or Metalwork at the GCE 'O' level as an elective. The curriculum time is five periods per week. The rationale is that for the abler students, compulsory exposure at the lower secondary level is sufficient and, at the upper secondary level, would benefit more from taking a humanities elective instead. Furthermore, a technical elective at GCE 'O' level is not a pre-requisite for admission to further technical or engineering courses at the Polytechnics or University. The curriculum for the technical education programme remains essentially the same today as shown in Table 1.

## Public Training Institutions

The National University of Singapore (NUS) was established in 1980 through the merger of the then University of Singapore and Nanyang University. It provides

under-graduate and post-graduate training in eight faculties including Engineering. An Institute of Systems Science was recently established to provide advanced computer training and applications research within Singapore's overall plan for the computer software industry. Admission to the University is based on the GCE 'A' level examination jointly administered by the University of Cambridge and Ministry of Education at the national level. The second University-level institution is the new Nanyang Technological Institute (NTI) set up in 1981 specially to train practice-oriented engineers as against the academically-oriented engineering programme of the NUS. By a special arrangement, all engineering students undergo a common first year course at the Faculty of Engineering at NUS before continuing the remaining three years at the NUS or NTI.

At the next lower level of technical manpower training are the two Polytechnics, viz, Ngee Ann Polytechnic (NP) and Singapore Polytechnic established in 1963 and 1954 respectively. The basic role of these Polytechnics is to produce engineering technicians through diploma-level programmes. The Ngee Ann Polytechnic in addition, conducts diploma courses in Business and Computer studies. Full-time courses of two-year and three-year durations are available for GCE 'A' and 'O' level holders respectively.

The Vocational & Industrial Training Board (VITB) was established as a national authority in 1979 with the responsibility for promoting, developing and providing vocational and industrial training. Today, it has developed a systematic and integrated system of skills training which complements the overall manpower training infrastructure in Singapore. It offers a wide spectrum and levels of courses ranging from the Certificate of Competency in Construction Trades to the National Trade Certificate and Higher-level Industrial Technician Certificate, Certificate in Business Studies and Diploma in Applied Arts courses. Entry qualifications for VITB courses vary from primary education to the GCE 'O' level.

Apart from VITB institutions, another avenue for skills training is through the three training centres and four institutes of the Economic Development Board (EDB). These institutions are established (the first in 1972) as

joint ventures with foreign governments or international corporations to meet the specific skilled manpower needs for the newer industries. Admission to these centres and institutes are based on the GCE 'O', GCE 'A' and VITB National Trade Certificates depending on the courses which are available at the Diploma, Industrial Technician Certificate and Craft Certificate levels.

## Coordination Of Technical Manpower Development

As is apparent, the responsibility for technical and skilled manpower training lies outside the school system and is undertaken at various levels by different public institutions. There are no formal administrative linkages amongst the institutions. At the national level, however, is a Council on Professional and Technical Education (CPTE) chaired by the Minister for Trade and Industry which oversees the overall planning and projection of manpower needs and its development for the country. Also represented in this Council are the Minister of State (Education) who is also the Minister-in-charge of VITB and the Polytechnics, National Trades Union Congress, Ministry of Labour, Public Service Commission, Economic Development Board, National University of Singapore, Nanyang Technological Institute and National Computer Board. Projected manpower demands approved by the CPTE provide the basis for the development and implementation of training programmes by the various institutions.

The VITB, as a national body responsible for skills training, also has a direct interest in and actively supports the upgrading of skills in the existing workforce through its apprenticeship, approved training centre and continuing education and training programmes. The mechanism of tripartite representation at the Board level and its advisory committees serves to reinforce the coordination of training efforts.

The Board of the VITB, for example, is constituted on a tripartite basis with representation from the Government, NTUC and employer groups. In particular, the Director of Schools is presently a Board member representing the Ministry of Education. The EDB is represented on the Board by its Divisional Director (Manpower). Likewise, the VITB

is represented on the Management Committees of EDB training centres. The two universities are placed under the charge of the Minister for Trade and Industry. The Minister of State (Education) who is the Chairman of VITB is also the Minister-in-charge of the two Polytechnics. Besides these official linkages, the VITB has its own network of thirteen trade advisory committees to assist its role in the establishment of occupational classifications, skills standards, certification and curriculum development.

# SPECIAL MOE-VITB LINKAGES

There are obvious and logical reasons for close linkages between general education within the school system and VITB's system of vocational training. The national objective of developing each individual to his maximum potential can be achieved only if students are sufficiently motivated to do their best in schools and are attracted and equally motivated to undergo vocational training with the VITB. In a tight labour market situation with no unemployment, it is very tempting for a school leaver especially from the lower economic-social group to seek direct employment and thus forgo an opportunity to build a good foundation through proper training. There is no compulsory education in Singapore. The system of vocational training under these circumstances must be sufficiently flexible and attractive in matching the abilities and educational attainment of the school leaver.

The main criterion for admission to the VITB is the level of educational attainment although credit points are awarded for relevant technical subjects taken in schools for the purpose of selection. In this sense, the 'technical education' received by students at the secondary level is not specifically aimed at preparing a student for further technical or vocational training but rather in providing a broad introduction to the knowledge and handling of basic tools and machines. There is presently no direct 'technical education' - vocational training linkage with respect to the curriculum in school and vocational training.

The feasibility of a system of compulsory education and vocational training was examined in a study jointly carried out by the VITB and the MOE in 1981/82. After much

analysis and discussions, it was decided that a system of automatic progression was the more appropriate and should be adopted. It was thought that a compulsory system was no guarantee of successful education or skills acquisition. It is more important that students see the value of and are encouraged by their parents and teachers to undertake vocational training on a voluntary basis. Besides, a compulsory system could mean unnecessarily excessive commitments of training and administrative resources for implementation.

The study, however, highlighted the need for a very close linkage between the schools and VITB. An effective mechanism to facilitate the process of progression was seen as essential if the projected intakes into vocational training are to be achieved. This recognition resulted in the development of the Automatic Registration System (ARS) which provides the physical channel through which primary school leavers (after eight years of general education) will be automatically posted to one of VITB's vocational institutes. The necessary steps and departments involved in the ARS are depicted in the flow chart in Fig. 2. The system of automatic progression is further supported by adopting a total strategy based on self-contained audio visual packages, career exhibitions and open houses. Each audio-visual package will aim to interest different targetted groups of students, explain the opportunities for training and its importance to their future. The ARS was successfully tested for the first group of primary school leavers in Dec 82 with a progression rate of 71%.

Another significant outcome of the joint study was the identification of the need for a new one-year Pre-vocational Training (PVT) programme for Primary 8 Monolingual (P8M) school leavers under the New Education System. This programme has been conceived and is being developed as an integral part of VITB's system of vocational training. The underlying concept of PVT is to create a stimulating and challenging environment during this transitional but critical one-year learning experience between the schools and world of work. Those who have the necessary aptitudes will be able to proceed further to National Trade Certificate courses. For those who decide to seek employment or apprenticeship training, they would have acquired the additional maturity, work discipline and

understanding of vocational choices which will make them that much more enlightened and trainable as workers. Thus, the training of those who do not proceed to secondary education will not be left to chance but systematically planned and provided for.

The implementation of this PVT concept calls for a fundamentally new approach in training which is trainee-centred, activity-based and work-oriented. The training environment should encourage self-motivation, allow for independence of progression and develop confidence through a diversity of meaningful project activities (Table 2).

Specifically, the objectives of the PVT programme have been established as :-

- To provide the necessary discipline, work attitudes and habits to bridge the gap between the school environment and world of work;

- To provide a broad-based vocational training of an exploratory but meaningful nature which will lead to further training in a specific occupation or choice of appropriate employment in the Manufacturing, Commerce or Household and Personal Services sectors of the economy;

- To provide further general education to strengthen functional competencies in basic literacy and numeracy.

The PVT will have a 30-hour per week curriculum covering English Language, Mathematics, Work Orientation, Project Works and Physical Education and Extra Curricular Activities. The Project Work which constitutes 18 hours per week or 60% of the curriculum is the core of the one-year programme. The P8M student in school would have been introduced to the basic psychomotor skill in Woodwork and Metalwork through 5 hours of workshop activities per week. The PVT curriculum is being developed in close consultation with the Ministry of Education and will be pilot-tested in Jan 84. When fully implemented in Jan 85, the programme will be offered in six vocational institutes with a planned capacity of 3,100 places.

With these additional developments, a closely-linked system of progression from school to vocational training has recently been established. The ability of the VITB to offer a wide spectrum of courses designed at various levels to match the abilities and aptitudes of school leavers has made the progression as attractive as possible. There is both the incentive to do well in schools and motivation to excel in skills training so as to progress towards the next higher-level of training (Fig. 3).

Lastly, it should also be noted that the Minister of State (Education) is also the Minister-in-charge and Chairman of VITB. This personal link at the top is perhaps the most important in ensuring the compatibility of the general educational process and vocational training. It is the objective of the Board to ensure that progression to vocational training is accepted by students and parents as an automatic and integral part of their education and training.

# CONCLUDING REMARKS

The roles and responsibilities of training institutions in meeting the different levels of manpower needs are well delineated. Although operating independently without formal administrative links, they represent highly integrated components of the national manpower training infrastructure.

At the national level, coordination of manpower, developmental efforts is supported by the Council on Professional and Technical Education chaired by the Minister for Trade and Industry. At the institutional level, external tripartite representations at the Board level and other advisory committees provide further means for coordination and consultations.

Special linkages have been developed between the education system and the system of vocational training. A closely-linked system of progression between the schools and the VITB is viewed as a specially important feature to produce a better educated and trained workforce for the high-technology industries of Singapore.

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# TABLES & FIGURES

# Table 1 - Areas Of Study In Technical Education Programme

| LOWER SECONDARY | | |
|---|---|---|
| Woodwork | Metalwork | Workshop Drawing |
| Safety precautions | Safety precautions | Visualisation exercises |
| Workbench - parts uses | Tools | Pictorial drawing |
| Tools | Drill and drill bits | Orthographic projection |
| Materials: local timber, nails and screws, wood finishes, glue | Drilling machine | Interpretation of working drawings |
| Woodwork joints such as housing, halving, dovetail, mortise and tenon, mitre and box pinned joints | Riveting | Sketching |
| | Screw and thread cutting | Practical geometry |
| | Soldering | |
| | Materials: sheet and bar metal | |

| UPPER SECONDARY | | | |
|---|---|---|---|
| Woodwork | | Metalwork | |
| Workshop Practice and Theory | Design and Drawing | Workshop Practice and Theory | Design and Drawing |
| Common woodwork tools | The ability to make and read properly dimensioned working drawings to scale. | Materials | Solving of construc-tional problems and the drawing of omitted parts. |
| Materials | Knowledge of construction in wood and methods of showing this by means of pictorial drawings | Heat treatment | Ability to make and read properly dimensioned drawings. |
| Construction and processes | Layout of drawings, dimensioning and hand lettering. | Hand processes | |
| Drawing in relation to woodwork construction | Understanding of design in rela-tion to woodwork. | | |
| Common safety precautions | | | |

# Table 2 - Proposed PVT Projects

| TRADE CLUSTERS | WORK STATIONS | PROJECTS * |
|---|---|---|
| Fabrication | Woodwork | Construct a Telephone Table |
| | Metalwork | Construct a Tool Box |
| | Plastic Work | Make a Plastic Container with Cover |
| | Wood Carving | Carve a Wooden Clip Tray |
| Electronics | Electronic Projects Construction I | Construct a Digital Display Unit System |
| | Electronic Projects Construction II | Construct a Multivibrator |
| | Electronic Projects Construction III | Construct a Musical Door Bell |
| | Communication Cable Forming & Terminating | Form and Terminate Communication Cables |
| Assembly & Maintenance | Furniture Assembly | Assemble Cabinet, Settee and Fix Display and Wall Shelves |
| | Small Engine Service | Service a Motor Cycle |
| | Plumbing & Pipe Fitting | Connect and Maintain a Domestic Water Piping System |
| | Light Vehicle Engine Service | Service a Car |
| Building | Interior Furnishing | Make Pillow, Pillow Cover, Curtain and Rug |
| | Model Making | Make a Wooden Tricycle Model |
| | Painting | Paint Wall and Panel |
| | Building Construction | Construct, Plaster and a Return Corner Wall |

* These represent the minimum number of projects required. More projects will be developed.

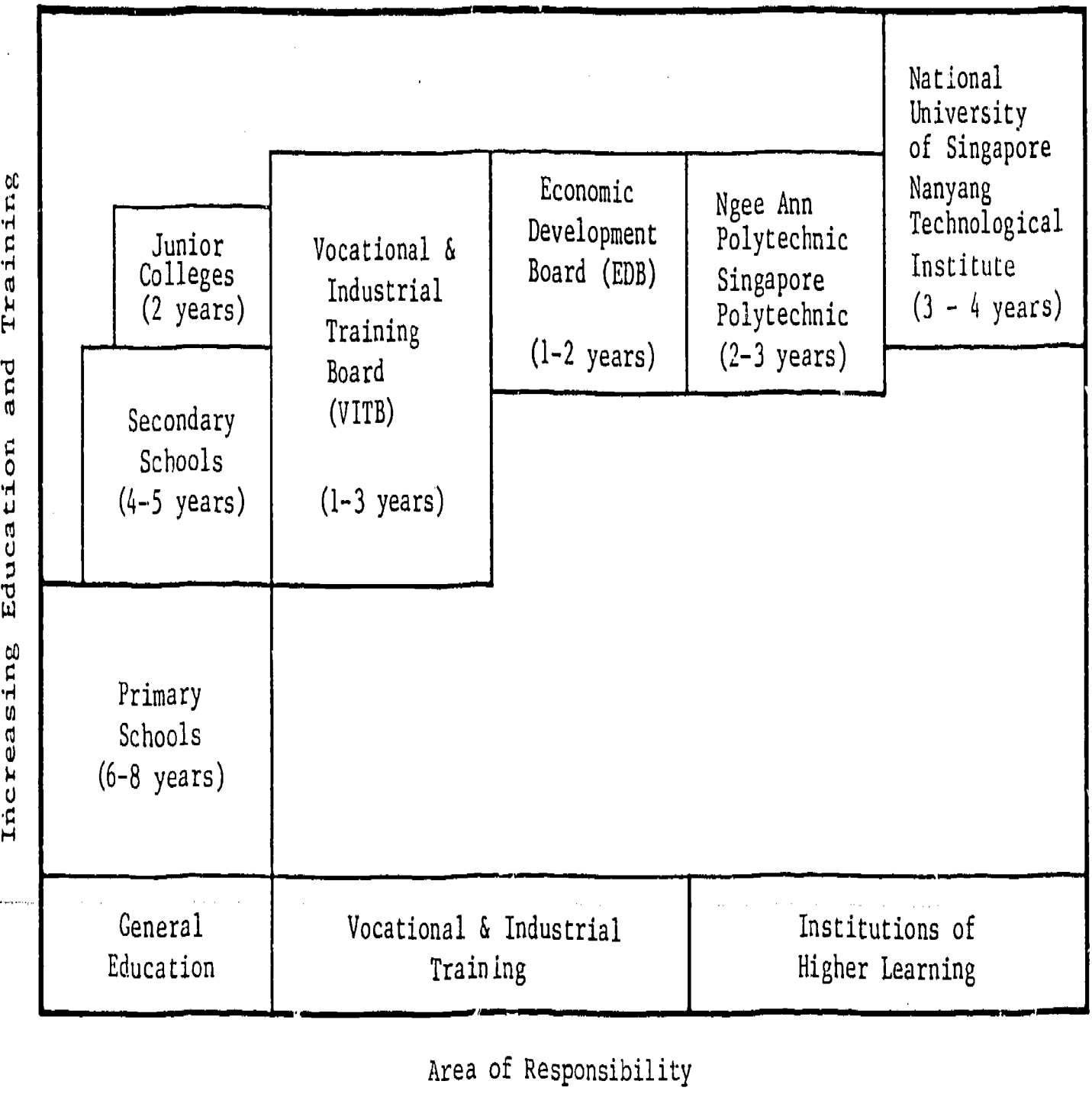



Figure 1- Public Institutions Of Education & Technical Manpower Training

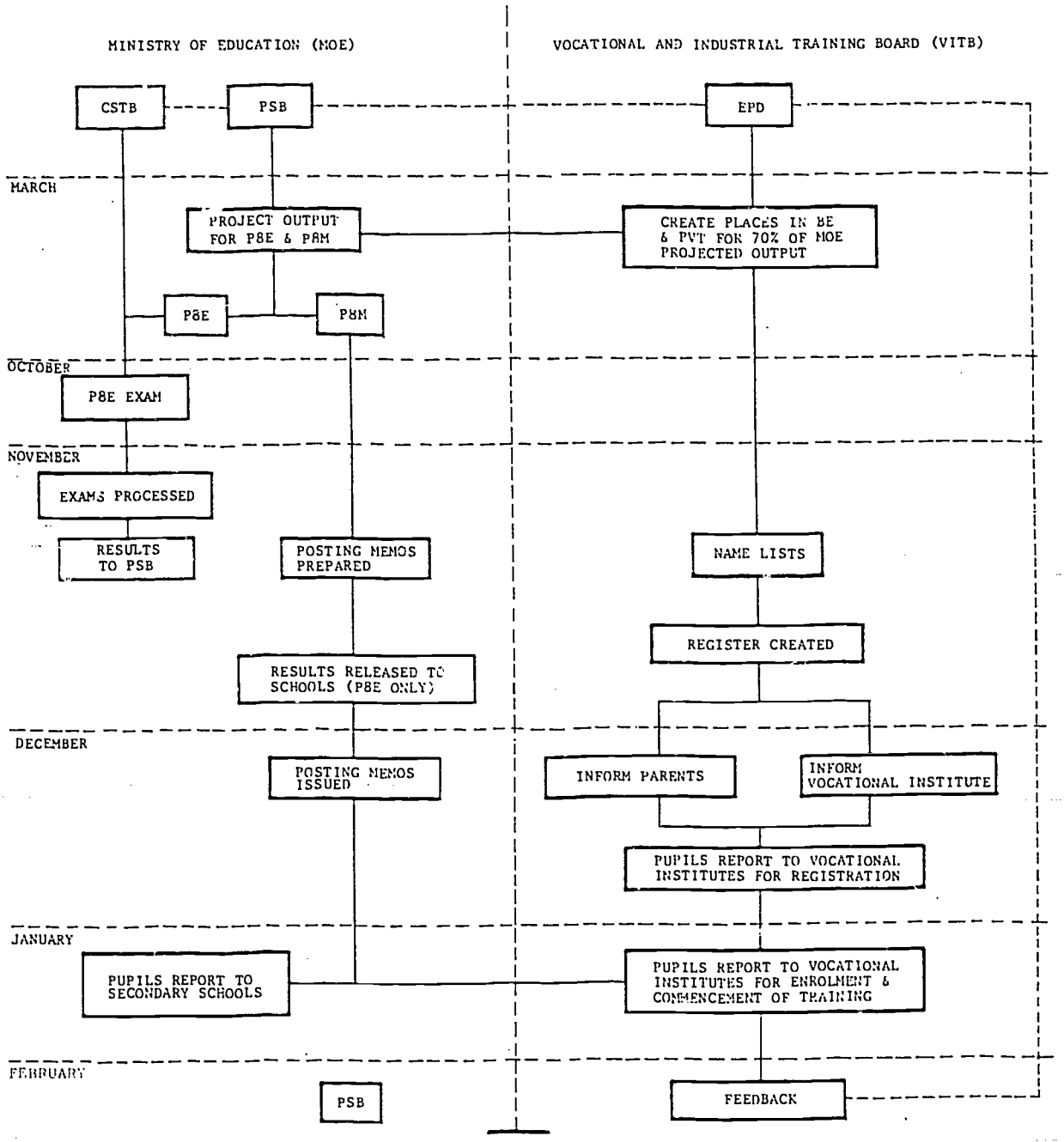
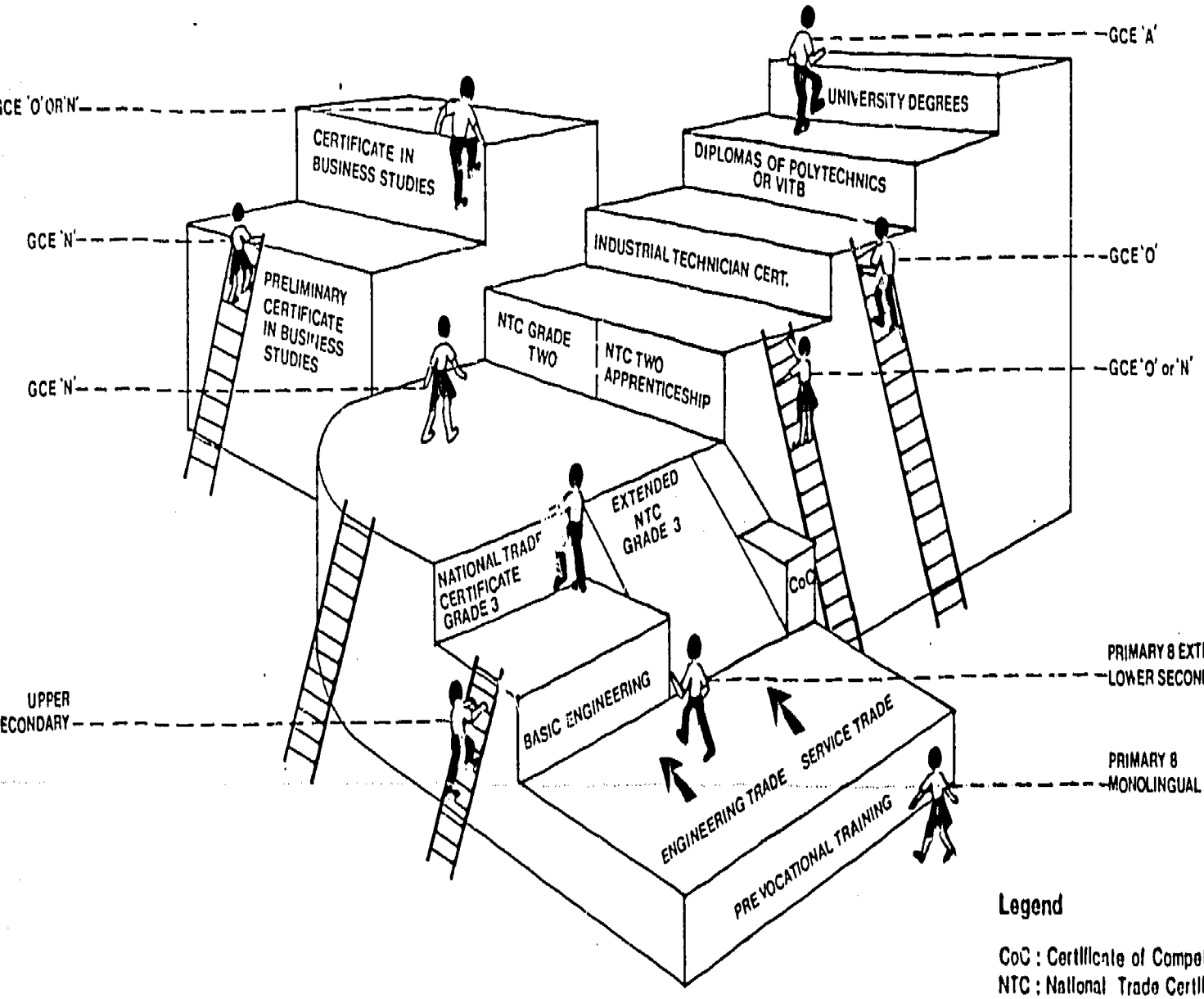



Figure 2 - System Of Automatic Registration From Schools To Vocational Training

# Figure 3 - Features Of MOE-VITB System Of Progression




**Legend**

CoC : Certificate of Competency
NTC : National Trade Certificate
GCE 'A' : GCE Advanced level
GCE 'O' : GCE Ordinary level
GCE 'N' GCE Normal level
VITB : Vocational & Industrial Training Board