

June 2006

Draft

The Development of Education in Singapore since 1965

Background paper prepared for the Asia Education Study Tour for
African Policy Makers, June 18 – 30, 2006

By

Associate Professor Goh Chor Boon
and
Professor S. Gopinathan
National Institute of Education,
Nanyang Technological University, Singapore

The Asia Education Study Tour includes policy makers from
Cameroon, Ethiopia, Ghana, Lesotho, Madagascar and Mozambique.
It is organized by the World Bank in partnership with Singapore and Vietnam,
with financial support from Norway, Singapore and the Donor Partners of the Education
for All Fast Track Initiative.

This paper highlights key features of the development of education in Singapore over the last 40 years, focusing on how Singapore has been able over this period to develop its education system from a level in the early 1960s quite similar to that of many African countries, to reach a level comparable to the best OECD countries. The analysis is done in the context of the economic and social transformation of Singapore since 1965.

Introduction

The aftermath of the Pacific War in 1945 had created severe social and economic dislocations for the people of Singapore. Although the British rulers reclaimed control of the trading port, the halo of British invincibility was totally shattered. The people now clamoured for political freedom and economic opportunities. There were frequent industrial strikes and unrest which forced the closure of many British firms and, subsequently, an exodus of British capital out of Singapore. The population grew from about 960,000 in 1948 to about 1.6 million in 1954 but the colonial administration was slow in reviving the economy and in providing enough jobs. There was high unemployment and an acute shortage of public housing. Many squatter colonies sprouted out throughout the suburban and rural areas. In the 1950s, racial integration did not exist and within the plural society the main ethnic groups considered themselves as Chinese, Malays and Indians, rather than as Singaporeans. Religious differences, if

exploited, could lead to communal trouble, and this became a reality in the infamous Maria Hertogh riots.

Besides the economic and social woes, British colonial policies relating to education, language and citizenship were responsible for stifling the growth of racial integration and the sharing of a common destiny and identity by the people of Singapore. In education, for example, the government did not attempt to regulate and support the number of Chinese schools and, at the same time, encourage the growth of English-stream schools. The Chinese-educated became an under-privileged group; they had no opportunities for tertiary education nor could they hope to be employed in the civil service. In short, the government failed to recognise the more dynamic and vocal Chinese-educated group. These "gaps" were quickly exploited by the Malayan Communist Party in Singapore and contributed to a decade of political turbulence in the 1950s.¹

The years 1959 to 1968 represent some of the epochal years in Singapore's modern history. In 1959, the British colony became completely self-governing and in August 1965 Singapore became a sovereign state after separating from Malaysia. Her political leaders were faced with the unenviable

¹ In the 1950s, frequent clashes and demonstrations against the government were held by Communist-infiltrated trade unions and Chinese schools. The British soon decided that the best political weapon against the Communist insurgency would be to grant national independence to Singapore. This would deprive the Communists of their role as champions of anti-freedom movements and hence, the justification for insurrection against the government. Therefore, the stage was set for the first democratic election of a self-governing Singapore in May 1959. The People's Action Party (PAP), under the leadership of Lee Kuan Yew, won convincingly. Lee became the first Prime Minister and, at the same time, the state flag and national anthem "Majulah Singapura" were inaugurated. About four years later, in September 1963, Singapore became part of Malaysia. But political differences soon reached an intolerable level. On August 9, 1965, under the leadership of Lee Kuan Yew, the island of Singapore was formally separated from Malaysia and became a sovereign, democratic and independent city-state.

task of ensuring the political and economic survival of the small city-state. Colonialism had produced a lop-sided economy strongly dependent on entrepot trade. Increasingly, science and technology became the vital ingredients which dictate a country's level of competitiveness. The overriding priority of the Singapore government in 1965 was to find the quickest and most effective way to develop an industrialized economy and to develop its own military capability. To compete as a viable economic entity, the immediate task was to break away from the long dependency on entrepot trade and embark on an export-oriented industrialization strategy.

In the late 1960s and 1970s individual survival matched well with the state's ideology of survival. The ideology propagated the inseparability of economic and political survival. The successful fusion of economic and political survival required the internalization of an entirely new set of social attitudes and beliefs by the people of Singapore. The call was made for the sacrifice of self-interest for the "national interest". In the process of "catching-up, important policies, especially those in the field of education and manpower development, were speedily implemented.

Survival Economics, Survival-Driven Education, 1965-1978

Since the 1950s, industrialisation was widely acknowledged by the pro-capitalist, independent states of Southeast Asia as the key to survival and economic growth. But the task was not easy as long periods of colonialism had produced imbalanced economic structures which confined the rising indigenous capitalist

class to comprador trading activities and limited small-scale manufacturing and processing. The initial response was the adoption of the development strategy strongly recommended by the Argentinian economist Raul Prebisch, that is, Import Substitution Industrialisation (ISI) aimed at the reduction of dependence on imported goods.² Essentially, it involves the small-scale production of non-durable consumer goods whose production requirements are compatible with conditions, such as abundant unskilled labour and unsophisticated technology, existing in countries without previous industrial experience. High growth rates were indeed experienced by the countries in Southeast Asia but by the mid-1960s the limitations and inherent contradictions of the ISI strategy began to be felt. In the case of Singapore, apart from assembling of consumer goods, there were few signs of a transition to capital goods production. Manufactured imports were merely replaced by raw materials, capital goods and components. Pressure for accelerated growth through the development of export markets was emerging from local manufacturing capitalists. The situation was compounded by Singapore's expulsion from Malaysia in 1965. It seriously undermined the ISI strategy by dramatically reducing the size of the domestic market. When the country was part of Malaysia during the years 1963 to 1965, it was able to take advantage of the wide hinterland market to its north. Development strategy adopted by the Singapore leaders gradually shifted towards Export Oriented Industrialisation (EOI) which, by the early 1970s, became the "new orthodoxy"

² Chris Dixon, *South East Asia in the World Economy*, Cambridge: Cambridge University Press, 1991. p. 152.

strongly advocated by the Hungarian-born economist Bela Balassa of the World Bank for economic growth in the Third World countries.

In the case of Singapore, by the late 1950s, it remained primarily an entrepot, with 70 per cent of its Gross Domestic Product derived from entrepot activities.³ The country had a small and limited industrial base. The predominant industry was the shipbuilding and repairing industry which was largely in the hands of governmental and public bodies, such as the Singapore Harbour Board and the British Naval Base. The small manufacturing sector consisted mainly of light engineering, assembly of vehicles, marine engineering, printing and processing.⁴ Though employment in the manufacturing sector grew from 22,692 in 1955 to 44,295 in 1961, manufacturing development was slow and stagnated at about 12 per cent of gross domestic production in 1960. In the meantime, the post-war baby boom in the early 1950s and the free immigration policy had resulted in an average annual population growth rate of 4.4 per cent between 1947 and 1957, and unemployment rate stood at 5 per cent, rising to a high of 9.2 per cent in 1966. It was clear to the government that solving the rising unemployment problem was a matter of high priority.

The Government became more focused on the need to expand the industrial base though it still advocated that Singapore must continue to "jealously guard its position as an entrepot".⁵ But the task of expanding manufacturing activities for a trading port was not expected to be smooth

³ Ibid, p. 158.

⁴ Colony of Singapore (1955) Annual Report, Singapore

⁵ The Malaya Tribune, 13 March 1953.

because of the “dearth of skilled labour in Singapore”.⁶ The year 1968 was a watershed in terms of a shift in industrial strategy to more export-oriented manufacturing activities. To support the EOI strategy and given the lack of natural resources, the development of the country’s human resources was of paramount importance for the Government. To achieve this end, an education system that would support the development of a literate and technically trained workforce was introduced.

What is worthy of mention is that, while under British colonial rule, education was a tool to meet political and ethnic primordial interests, in 1965 and after, an intimate link between education and economic development of the small city-state was strongly emphasized. The Government took the conventional path in developing new skills and work attitudes to accommodate new economic strategies. While the economics of education was in focus, the role of education in socialization and nation-building process, especially in terms of developing a Singapore identity, was not forgotten. National integration through a national education system was seen as the key condition for economic survival. To attain these national objectives, the Government rightly recognized the necessity to provide every child with at least 6 years of education from the age of six - without discrimination of race, language, sex, wealth or status.

Bilingualism became a key component in Singapore’s education system. In 1960 the learning of a second language was made compulsory in all primary

⁶ Colony of Singapore, Report of the Industrial Resources Study Groups, September 1954, para 86, p. 13 in Andrew Gilmour, Official Letters, 1931-1956, Mss. Ind. Ocn. s. 154. Andrew Gilmour was the Chief Planning Officer in Singapore during the 1950s.

schools, and the policy was extended to all secondary schools in 1966. The decision on bilingualism was not just for the achievement of social cohesion in a largely plural society (at least, during the early 1960s). English language was seen as a primary utilitarian tool in Singapore's effort to make the world its marketplace. However, with the increasing demand for English the danger that the young could become deculturised and forget their mother-tongues. The bilingual policy would assure parents that their children would not grow up ignorant of their cultures. At this juncture, perhaps it is useful to state that Singapore's bilingual policy is perhaps the most unique of its kind in the world. It is an East-West model which allows Singaporeans to attain the competency in the use of the English Language, the language of the so-called "West" and in the use of the Chinese Language (or other indigenous languages, such as Tamil and Malay), the language of the so-called "East". This approach is particularly useful for Singapore's business internalization strategy. The Western concept of bilingualism in schools is based more on a "Latin" model in which pupils will usually learn, say, German and English or Italian and English.

The years 1959 to 1965 were significant or even epochal in the history of Singapore's educational transformation. In May 1959, Singapore was given self-government status and a Five-Year Plan (1961-1965) to boost the educational standards of the people was implemented. The priority at this point of time was to provide universal free primary education. It consisted of three main features:

- Equal treatment for the four streams of education – Malay, Chinese, Tamil and English.
- The establishment of Malay as the national language of the new State.
- Emphasis on the study of Mathematics, Science and technical subjects.

The philosophy behind these aims was stated as: “Conserved equal opportunity for all citizens, established the means of maintaining unity in diversity and instituted a programme for training a new generation for the needs of a forward-looking, modern, industrial and technological society”.⁷ It must be noted that till today this philosophy, broadly speaking, stays intact. Although the Government continued to provide for vernacular education, a major consequence of the transformation of the Singapore economy from 1959 onwards was the consistent strong tendency for parents to enroll their children in the English language schools. In 1959 only 47 per cent of children entering primary one were in the English stream while 46 per cent were in Chinese schools. Twenty years later (in 1979), the English stream enrolled 91 per cent of all primary one children with only 9 per cent in the Chinese stream and a negligible number in the Tamil and Malay language streams. This dramatic drift was brought about by the free choice of pragmatic parents in response to the nation’s drive towards high value-added industrialization and to an economy where the language of business is English.

⁷ Ministry of Education. November 1966. “Progress in Education in Singapore, 1959 to 1965”. The Malays were (and are) considered as the indigenous people living in Singapore at the time when the British founded Singapore in 1819. Hence, the Malay language becomes Singapore’s national language. Singapore’s National Anthem is sung in the Malay language.

Primary education was freely made available to all. In 1962, out of a population of 1.7 million, the student population stood at nearly 400,000. This led to a period of rapid construction of schools. Under the British rule, government English schools and missionary English schools had good buildings. However, in mainly the rural areas, vernacular schools, built and supported by private organizations or individuals, were wooden-type of schools. Beginning in 1959, the responsibility of building all new functional schools was passed on to the Ministry of Education.

Primary and secondary education enrolment rose from 315,000 in 1959 to a peak of 522,611 in 1968. Table 1 shows the enrolment since 1959. The early 1970s saw a decline in primary enrolment because of successful family planning strategies implemented by the Government. By 1965, a total of 83 new school buildings were completed since 1959 – at about the rate of one school a month for eight years. The accelerated building programme became equal to the demand of the primary school-going population in 1964. Even with this programme, however, it became necessary for school buildings to be used by two sets of children, that is, double sessions, in order to accommodate the rapid increase in enrolment. In the words of Ong Pang Boon, then the Minister for Education: “The people of Singapore are becoming so education conscious that we have achieved universal primary education without making it compulsory...and once admitted, they [the children] are assured of a 10-year

primary and secondary education finishing at the minimum age of 16".⁸ Due to the rapid construction of schools, universal lower secondary education was achieved as early as 1970. There were places in secondary schools for all those leaving the primary school system and qualifying for another four years of secondary education. The overall growth in secondary education, from 48,723 in 1959, 114,736 in 1965 and 161,371 in 1972 is impressive evidence of the importance attached to education (beyond primary education) as perceived by parents. From a societal point of view, secondary education was the most profitable investment.⁹ The rate of return to society is 18.2 per cent for a completed secondary education for males and 17.0 per cent for females. In terms of types of education, an English-stream education had greater monetary pay-offs to society than other vernacular-stream education.

⁸ Straits Times, 26 September 1965 and 25 November 1965.

⁹ Pang Eng Fong. 1982. Education, manpower and Development in Singapore. Singapore: Singapore University Press, pp. 94-95.

Table 1 Pupil Enrolment in Primary and Secondary Schools

| Year | Primary | Secondary |
|-------------|----------------|------------------|
| 1959 | 272,254 | 48,723 |
| 1960 | 290,576 | 59,314 |
| 1961 | 307,981 | 67,857 |
| 1962 | 324,697 | 72,308 |
| 1963 | 341,620 | 84,425 |
| 1964 | 353,622 | 99,592 |
| 1965 | 362,672 | 114,736 |
| 1966 | 370,899 | 132,088 |
| 1967 | 373,437 | 144,448 |
| 1968 | 379,828 | 150,251 |
| 1972 | 354,936 | 161,371 |

Source: Department of Statistics, Yearbook of Statistics, various years

Although statistics indicated successful outcomes, it was increasingly difficult for the Ministry of Education to meet the intense desire of the people to educate their children. Some obstacles were logistic in nature. There was uneven distribution of population in most urban areas and in certain rural areas. Suitable school sites in the densely populated areas were unavailable. The problem was compounded by the parents' selection and preference for certain schools, such

as those with personal affiliation and language stream. Nevertheless, with careful planning, budgeting and ensuring that there were sufficient teachers, universal primary education was attained by mid-1960s.

In the first year of its independence, the Singapore Government allotted 59 per cent of the annual budget on primary education, 27 per cent on secondary education and 14 per cent on higher education (as compared with 65 per cent, 20 per cent and 15 per cent respectively in Japan).¹⁰ Table 2 shows the annual expenditure on education during the years 1959 to 1967:

Table 2 Annual Expenditure on Education, 1959-1967

| Year | Expenditure on Education S\$ | % of Total National Expenditure S\$ |
|------|---------------------------------|--|
| 1959 | 60,008,000 | 23.6 |
| 1960 | 57,100,000 | 23.5 |
| 1961 | 65,841,000 | 17.1 |
| 1962 | 82,307,000 | 23.4 |
| 1963 | 94,644,000 | 15.8 |
| 1964 | 103,358,000 | 31.7 |
| 1965 | 112,806,000 | 28.8 |
| 1966 | 124,076,000 | 23.4 |
| 1967 | 135,051,000 | 22.8 |

Source: Department of Statistics, Yearbook of Statistics, various years

¹⁰ Straits Times, 25 November 1965.

It must be pointed out that education in Singapore was financed almost entirely from State revenue. The Ministry of Education made its own estimates of expenditure annually which were presented to the Ministry of Finance for submission to Parliament for approval. Hence, except for a handful of private schools run by private organizations such as clan associations, schools in Singapore were (and are) public or state-supported schools. This is quite different in the case of African countries where private funding played a significant role in the development of schools, especially secondary schools and, indeed, outstripping the number of state-owned schools in many cases.¹¹ Besides the generous funding from the Government, two other strategies were adopted to cater to the rapid expansion of the schooling population. These were teacher recruitment and the availability of textbooks.

Corresponding to the increase in pupil enrolment, the number of teachers of the teaching service also increased rapidly, from 10,590 teachers in 1959 to 16,986 in 1965 and 19,216 in 1968. These were trained or qualified teachers and the strategy to achieve the numbers was to resort to large-scale recruitment of teachers-in-training at the then Teachers' Training College. During this period, part-time teaching programmes were introduced – training in the morning and teaching in the afternoon and vice versa (depending on the type of programme). This was a realistic approach during the years of rapid expansion.

¹¹ To some extent these privately-supported secondary schools played a crucial shock-absorbing function especially when the population of primary school leavers was bulging and the state's ability to fund the construction of secondary schools was progressively declining.

In tune with the Government policy of equal treatment for all four language streams of education, the Government Scheme for Loan of Free Textbooks offered assistance to all four language streams pupils. This was done in accordance with the “Textbook for All” policy that no needy children from lower-income families should be denied an education merely because of inability to purchase textbooks. The free textbooks scheme was administered by schools and the books were obtained directly from the Education Publication Bureau (EPB) which was set up by the Government in 1967 to produce common and affordable textbooks for all. The rising cost to the Government of this form of aid to needy children can be seen from the annual expenditure on free textbooks – rising from S\$79,606 in 1959 to S\$259,200 in 1965. The ownership of textbook-to-student ratio was close to 1:1 due to the low cost of production achieved through a competitive tender system administered by EPB with private printers. The cost recovery associated with textbook development was not a primary concern as “Singapore has so far been able to finance its own educational expansion programmes largely because of the resourcefulness of its people”.¹²

The period of survival-driven education also saw the review and upgrading of technical and vocational education. In 1964, the Government established secondary vocational schools for the first time, with an enrolment of 4,910 pupils. These were pupils who did not pass the primary leaving examinations to enter into academic secondary schools. The curriculum, aimed to equip pupils for employment in establishments where basic vocational skills are required,

¹² Straits Times, 25 November 1965.

consisted largely of vocational subjects such as woodwork, domestic science, art and crafts and technical drawings. By 1968, it was becoming increasingly apparent in the Ministry of Finance that the prospective output of technically trained workers produced by the school system would not be sufficient to meet the requirements of new industries. It did not require any elaborate process of manpower planning to reach this conclusion. In 1968, out of the 144,000 students in secondary schools only some 18,000 were in technical and vocational streams. Accordingly, the Government accelerated the plans for the expansion of technical education. A Technical Education Department was set up in the Ministry of Education in June 1968, and from 1969 all male lower secondary pupils were required to have two years of exposure to technical subjects while girls were given a choice between technical subjects and home economics.

The Technical Education Department made use of all available training facilities (located in four newly-built vocational institutes) to turn out skilled workers, such as welders and machinists, to service the shipbuilding, oil refinery, electro-chemical, electro-mechanical, precision engineering, metalworking and woodworking industries.¹³ From 1970 to 1973, for example, 1,789 trainee welders received formal technical training. It must be noted that, while Singapore succeeded in attracting a wide range of foreign-owned new industries, the industrialization effort benefited immensely from technical and financial assistance from a number of foreign governments and from the United Nations

¹³ David Clark, "Manpower Planning in Singapore" in *Malayan Economic Review*, Vol. XVI, No. 2, October 1971.

Development Programme aimed at producing industrial skills. Foreign governments who donated machinery and expertise included Japan, Britain and France. Several vocational training centres were set up as a result of this external support.

In order to keep pace with the rapid developments in technical and vocational education, extensive teacher training and re-training programmes were developed and the Finance Ministry made funds freely available for such purposes. The number of technical teachers increased from 425 in 1968 to 1,950 in 1972. This was by no mean achievement as the labour market was getting increasingly tight. Besides teachers specifically trained in technical subjects, academic subject teachers were also encouraged to be re-trained as technical subject teachers. In 1968, some 4,000 teachers received training in metalwork, including fitting and sheet metal, woodworking, printing, motor mechanics, radio and television servicing and electrical fitting and installation.

The survival-driven system of education continued into the 1970s with the continual propagation of an industrial-oriented education to produce the manpower for industrial development. The Vocational and Industrial Training Board (VITB and the predecessor of the current Institute of Technical Education) was created in 1979 to take in secondary school-leavers who were less academically-inclined. Vocational training institutes under the VITB offered a wide range of courses, the most popular of which were electrical, electronics, maintenance and repair of motor vehicles, refrigeration, air-conditioning,

carpentry, masonry and plumbing.¹⁴ Enrolment at the secondary level continued to grow, rising from about 148,000 in 1969 to 176,000 in 1979. Enrolment in VITB institutes also rose from 2,800 to 14,000 during the same period. By 1976, close to 20 per cent of the secondary school population was receiving technical education. At the tertiary level, the total intake at Singapore's two main polytechnics at this time – Singapore Polytechnic and Ngee Ann Polytechnic – rose from about 3,500 in 1966 to about 11,000 in 1980.

The year 1978 was another watershed in Singapore's educational development. While the British's *laissez faire* policy did not produce systemic changes to the educational landscape in colonial Singapore, the Singapore leaders introduced a flurry of "haphazard changes".¹⁵ Singapore's planners in education failed to see early enough that the bilingual requirements of the system were not differentiated in terms of pupil ability. As mentioned earlier, although universal lower secondary education was achieved by 1970, the places available were never fully taken up because of attrition rates of pupils leaving the primary school system. Those who failed to make the grade at the Primary School Leaving Examination (PSLE), which was a selection to secondary school, left the system and only some went on to vocational institutions. As a result the growth in secondary education was slow, with an average of about 70 per cent of the

¹⁴ Vocational training and employer-based training constituted the twin strategies of skill-level manpower development. In this respect, the Skills Development Fund (SDF), administered by the Economic Development Board, was an invaluable source of funding for companies to promote employer-based training. This refers to customized training to meet production, re-structuring and specific development needs, undertaken directly by employers as a part of their investment in manpower resources. The SDF worked closely with VITB in promoting vocational skill level training and awarded grants to employers to sponsor (up to 90 Per cent) employees for VITB's skill courses and apprentices.

¹⁵ Straits Times, 24 March 1976

leaving primary cohort entering into secondary schools. As it happened, there were as many as seven different ministers who were at the helm of educational changes and, at one stage, Singapore had a high turnover rate of three Education Ministers within a span of less than 15 months. There was no attempt to hear the views of teachers or parents before new policies were implemented. As pointed out by one Member of Parliament: “The point is we were so concerned with objects and objectives that we lost sight of the fact that we were dealing with children and people”. It was recognized that there was a serious communication gap between the Education Ministry and the schools. This lack of dialogue led to all kinds of interpretation of policy decisions which, at one point, totaled 78 notifications issued to schools in a short period of nine months.

The low status and morale of teachers was also high up on the list of complaints. As voiced out by the Singapore Teachers’ Union, resignation of teachers and principals was consistently high since the early 1970s. In 1973 there were 379 resignations or 2.1 per cent of the teaching force, in 1974, there were 350 resignations or 1.9 per cent and in 1975, the figures were 306 and 1.7 per cent respectively. To top it all, teachers and principals were often the “whipping boys and this could only engender a feeling of malaise and dejection among them”. The stage was set for an overhaul of Singapore’s education system.

To support its broad “catching-up” economic strategy, and working on the premise that senior servants and talented bureaucrats should assumed major

roles in decision-making, spearheading changes and in managing large government enterprises, the Government introduced a technocratic ethos in its education framework. A high-level reviewing committee, led by Dr Goh Keng Swee (the then Deputy Prime Minister) and his team of systems engineers, reviewed the education system and totally overhauled it. Its report (popularly known as the “Goh Report”) brought to light the education doldrums embedded in the system - as reflected in two sets of statistics, those relating to education wastage and to the literacy level of the students respectively. It was singled out that the education wastage, in the form of failure to achieve the expected standards and pre-mature school leaving, for the years 1971 to 1974 was high. Out of 1,000 pupils entering Primary One, on an average 206 dropped out of schools nine years later, without acquiring any useful qualification or skill. It was recommended that those pupils who did not have the ability to proceed satisfactorily in the academic stream would be screened out and prepared for vocational careers.

The low education standard in the 1970s was also reflected in the poor literacy level, in terms of proficiency in the English Language (an average of 40 per cent pass rate in the Ordinary Level Cambridge Schools Examinations in the 1970s), of pupils who passed their PSLE and young national servicemen with educational levels ranging from secondary three to no formal education. This was despite the fact that the nation’s literacy rate increased from 72.7 per cent in 1970 to 77.6 per cent in 1978.¹⁶The low English proficiency resulted in the overall

¹⁶ Straits Times, 11 August 1978.

low education standard.¹⁷ Out of 1,000 pupils entering Primary 1, only 440 reached Secondary 4 after 10 years and, of this number, only 106 obtained 3 or more “Ordinary” level passes at the Cambridge Schools Examinations.

On the economic front, the continual success of Singapore's EOI strategy in the 1970s involved the development of science and technology. By the mid-1970s Singapore had achieved full employment. But the task of closing the technological gap was easier said than done. British rule had not produced the desirable development in technical and vocational education. Indeed, the long time lag made it difficult for its political leaders to work out an effective and systematic plan for the development of technical and engineering education in schools and the two universities, namely, University of Singapore and Nanyang University. Furthermore, there was a severe shortage of local expertise in the field of science and technology who could impart knowledge and skill in formal and informal education. The problem was compounded by the drain of the limited pool of engineers into the fast-developing industrial sector during the 1970s.¹⁸ The Winsemius Report had highlighted on the deficiency in terms of the shortage of skilled workers.¹⁹ On the request of the government, Dr Albert Winsemius continued to make regular visits to Singapore. In February 1970, he estimated

¹⁷ Since the 1950s, more and more parents sent their children to English stream schools. In 1960, 49 per cent of all students were registered for the English stream and by 1970, it reached 66 per cent. In 1982 the figure went up to 90 per cent. The reason behind this trend was an economic one. Singapore's economy was inextricably tied to the outside world, especially developed nations where the international language for business and trade is English. Moreover, all multinational corporations (where employment was highly sought) in Singapore used the English Language.

¹⁸ Goh Keng Swee, 1972. *The Economics of Modernization*. Singapore: Asia Pacific Press, p. 275.

¹⁹ In 1961, a United Nations Industry Survey Mission, under the leadership of the Dutch economist Dr Albert Winsemius, was commissioned by the Singapore Government to advise on the measures for economic development. The Winsemius Report, as it became known, convinced the Singapore leaders that the traditional dependence on entrepot trade would not ensure the future economic survival of the small nation.

that Singapore would remain short of engineers over the period 1970 to 1975 by between 450 to 500 each year - despite the government's effort to increase the annual output of engineers from the then University of Singapore from 80 to 210 by 1974.²⁰ The shortage for management personnel and technicians was equally worrisome, the former by about 200 a year over the next three years and the latter by as many as 1,500 to 2,000 each year over the next two years.²¹

Hence, from the outset, the Singapore government followed an open-door policy in an attempt to close the technological gap. Multinational corporations (MNCs) and foreign expertise were attracted into the small city-state to provide the impetus for an industrial take-off. As explained by Goh Keng Swee, then the Deputy Minister in his 1970 Budget Speech, "When foreign corporations bring their expertise, what we experience as a developing nation is a brain-drain in reverse....in the long term the scientific know-how and technological processes which we now borrow from abroad must in course of time develop on an indigenous base at our institutions of higher learning".²²

²⁰ Goh, *Economics of Modernization*, p. 273.

²¹ *Ibid.*, p. 274.

²² Parliamentary Debates Singapore, Annual Budget Statement, 9 March 1970. These statements reflected the optimism of a young but fast-developing nation. In fact, Goh's comments made in 1970 raised several significant, closely-related issues concerning Singapore's quest for technological excellence in the 1980s and 1990s - the transfer and diffusion of technology and skill from the MNCs, the lack of a critical mass, brain-drain of local expertise, the weak university-industry linkage, the lack of a well-planned science and technology policy, and the painfully slow development of research and development in Singapore's indigenous firms. Compared to the newly-industrialising countries in East Asia and in Japan, Singapore in the 1970s suffered from low labour productivity. Between 1973 and 1978 "real productivity growth in Singapore averaged about 3 per cent per annum, compared to an average of 7 per cent for Hong Kong, Taiwan and South Korea."²² These labour-intensive industries do not require professional scientists or engineers; they only need to have experienced foremen or plant supervisors and imported managers. Hence, even within the larger MNCs, transfer and diffusion of technology and skill was very rare. See also Speech by the Minister of Trade and Industry quoted in Lim Joo-Jock, "Bold Internal Decisions, Emphatic External Outlook" in *Southeast Asian Affairs 1980*, Institute of Southeast Asian Studies, Singapore, 1980. p. 279.

What measures were carried out by the Government in the 1960s and 1970s to enhance the role of science and technology in the economic development of the nation? A new ministry, the Ministry of Science and technology was established in April 1968 to formulate science policies and to coordinate the deployment of the nation's scientific and technological manpower. There was also an urgent need for the re-structuring of the educational system to provide the requisite technical manpower. Radical changes were introduced in the field of technical education, especially in the face of the British military withdrawal from 1971 which created the pressing need for the supply of skilled labour resources to fill the positions formerly occupied by skilled British workers. The yawning gap between the enrolment in academic and technical streams was stressed in a ministerial report in 1968 - while in Japan, the ratio of academic to vocational students was 3:2, in Singapore the ratio was 7:1 and the ratio of technicians to engineers and scientists was 1:23.²³ As mentioned above, to redress the imbalance, the Ministry of Education announced that, from 1969, all secondary school pupils would receive two years of compulsory technical education, after which they would be streamed into technical, commercial or academic education. Several industrial training centres and vocational institutes were built in the 1970s and later came under the supervision of the VITB. At the tertiary level, greater emphasis was placed on engineering and technology. However, young Singaporeans' indifferent attitudes towards "blue-collar" jobs persisted. The magnitude of the problem was seen in some shocking statistics in 1976 – of the 150,000 clerical and related workers, only two per cent were work

²³ Ministry of Culture, *The Mirror*, 22 April 1968, pp.6-7.

permit holders; but of the 1,600 metal process workers, 46 per cent were work permit holders, and the figure was 56 per cent of the 4,700 woodworkers and a staggering 60 per cent for the 55,000 building construction workers.²⁴

Although new governmental institutions were set up to deal with science and technology policy problems, quite often the measures recommended did not endure for long. Instead, there was a bewildering succession of ad hoc committees, councils and agencies, each of which sometime sent out different signals and directions. The confusing situation was further reinforced by the existence of a rather inept Ministry of Science and Technology, suffering from a shortage of high level administrators and having to oversee a wide range of activities, ranging from coordination of technical education to the promotion of research work.²⁵ Eventually, on 1 April 1981, after 12 years since it was formed, the Ministry was dissolved. As explained by Goh Chok Tong (the former Prime Minister and now Singapore's Senior Minister), "the defunct Ministry of Science and Technology had only a budget of \$100,000 to disburse as research grants....We did not have a research and development policy until now [1991], because research and development was not critical to our economic growth strategy in the last decade".²⁶ However, recognizing the backwardness in the development of science and technology in the country, the Singapore Government, in the 1980s, adopted developmental strategies designed to push

²⁴ Straits Times, 9 August 1976. In Singapore's context, a Work Permit is a work pass issued to a skilled or unskilled foreigner earning a certain maximum monthly salary to work in Singapore. Currently, the monthly basic salary stands at not more than S\$1,800.

²⁵ Straits Times, 18 February 1981.

²⁶ Straits Times, 8 June 1981.

the economy and society higher up the technological ladder. With this vision, more educational changes were introduced to prepare the people for the "Second Industrial Revolution" in the 1980s.

Sustainable Development through an Efficiency-Driven Education, 1978-1997

By the end of the 1970s, social and economic indicators pointed to a rich and progressive Singapore in the midst of developing countries still battling with the problem of poverty. In 1980, after two decades of intensive expansion of the manufacturing sector largely through the aegis of foreign MNCs, the manufacturing sector contributed 28 per cent of the GDP, as compared with 12 per cent in 1960. However, to achieve sustainable development, it became clear that as countries in Southeast Asia began to compete effectively for foreign investments in low-skilled, labour-intensive industries, Singapore's previous comparative advantage in labour-intensive manufactured products was gradually being eroded. The emphasis now shifted to a strategy which could accelerate Singapore's transition from a "third-league" labour-intensive industrialising country to a "second-league" capital-intensive economy.²⁷ Thus, the "Second

²⁷ However, the industrial policy of expanding the manufacturing base through foreign enterprises was a clear mismatch to the Government's aim to elevate the general skill levels of the workforce. Industrial establishments in Singapore during this period were characterised by their small size, low capital input and usage of simple technology. In 1969, 70 per cent of manufacturing enterprises employed 10 to 39 workers while only 10 per cent had more than 100 to 300 workers.²⁷ Though foreign investors were quick to take advantage of Singapore's open-door policy and the many incentives offered by the Government they were also rational in their technological choice and organisation of work. Besides other factors, the small domestic market and the scarcity of local managerial and technical "know-how" and expertise imposed a limit to the size of the foreign firm. Therefore, apart from the shipbuilding and repairing industry and the chemical-petroleum industry, industrial firms in Singapore were largely labour-intensive, low wage and low-productivity enterprises, requiring the mere repetition of simple operations along the assembly and production line.

Industrial Revolution" was launched under the Ten-Year Plan which targeted for the manufacturing sector's share of GDP to increase from 22 per cent in 1979 to 31 per cent in 1990. The two main strategies of the restructuring programme were, firstly, the continual task of attracting MNCs to invest in high-technology type of operations and, secondly, the promotion of science and technology, such as activities in research and development. To provide a stock of basic education, skills and attitudes required for industrialization, it was timely that the Government revisited the education system and to use it as major vehicle in nation building, with the state acting as a strategic player not only in manpower planning but also in the wider process of economic development. The ability of the state to successfully manage education and skill demand, as well as supply, was and continues to be a major source of Singapore's competitive advantage.

After two decades of rapid expansion of educational opportunities for all young Singaporeans, during which universal primary and lower secondary education was achieved, the Government now decided to shift its focus on quality rather than the fulfillment of mere quantitative demands. The emphasis is on upgrading and providing quality education. It was recognized that survival-driven education was structured on the premise that children of different levels of intelligence and learning ability were expected to progress at the same rate. With the pace of teaching pegged to the average pupils, the very intelligent would find schooling a boring experience and, at the other end of the spectrum, those with learning difficulties would find it difficult to keep pace with the rest.

To support the drive towards sustainable development and reflecting the economic restructuring strategies, education was re-vamped with its emphasis on efficiency. Aimed to reduce educational wastage, a New Education System (NES) was introduced in January 1979 (see Figure 1). The NES provided for three streams in both primary and secondary school, to allow pupils to progress at a pace more suited to their abilities. Slower primary pupils were allowed up to eight years to complete primary education, while secondary pupils could take up to five years to acquire the General Certificate in Education (GCE) “Ordinary” Level and a further three years for the “Advanced” Level. A new lower secondary school leaving certificate, the GCE “Normal” was introduced. In manpower terms, the effect of the NES was to enable each pupil to go as far as possible in school, and thereby achieve the best possible educational take off for training and employment.

By the early 1980s the key features of the efficiency-driven education system were in place – a national curriculum with a stress on bilingualism, moral education and civics, science, mathematics and technical education; tracking, with regular student assessment regulated by the Ministry of Education’s Research and Testing Division; curriculum materials to fit the school syllabi and produced by the Curriculum Development Institute of Singapore; clear lines of progression to the university, polytechnics and vocational institutes; and, by 1984, a systematic and year-long professional training for principals and heads of

department. Primary streaming (at Primary 3) and secondary streaming (at Secondary 2) began in 1979 and 1980 respectively, and second-language was made compulsory for university-entrance from 1980.

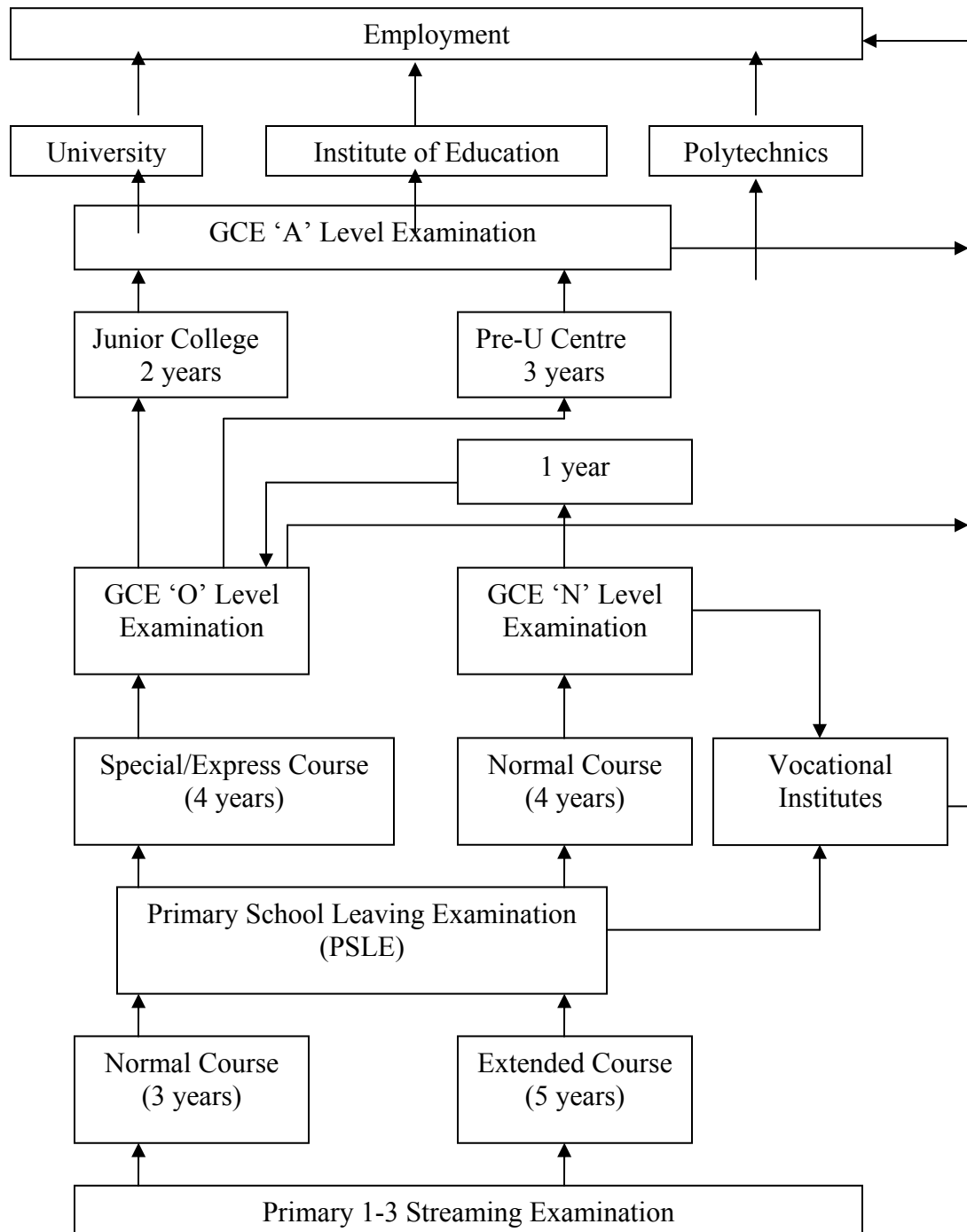
On the whole, the NES saw improvements in terms of academic results. Prior to the implementation of the new system, more than 60 per cent of pupils who sat for the PSLE and the “O” level examination failed in one or both languages. By 1984, the overall percentage passes at the PSLE in English and the second language were 85.5 and 98.7 per cent respectively. For the “O” level English, the percentage jumped to above 90 per cent. At the same, the high attrition rates at the Primary and Secondary stages of education noted in the Goh Report of 1978 declined sharply. In 1986, for example, only 3,772 pupils (or less than 1 per cent of the total school population below 16 years of age) left school without having at least 10 years of education. The success in reducing educational wastage would provide the city-state with an educated work-force able to cope with the demands of a rapidly expanding economy. As in the previous decades, education in Singapore in the 1980s and beyond, it being both a public and merit good, was (and is) heavily subsidized by the Government. In 1989, private expenditure on education was only 0.55 per cent of GDP (as compared to 0.86 per cent in 1960).²⁸

However, within the education system, there were still teething problems. The strictly top-down approach in planning, disseminating and enforcing

²⁸ Linda Low, Toh M. H. and Soon T. W. 1991. *Economics of Education and Manpower Development: Issues and Policies in Singapore*. Singapore: McGraw Hill, pp. 135-138.

educational changes was a clear reflection of the Singapore's Government paternalistic style of rule. In the process, it produced three unhealthy trends.

Figure 1



Firstly, it generated the "yes-man" syndrome and the acceptance of change without question by those below. Secondly, it inculcated an over-reliance on the top leaders for direction. Thirdly, it nurtured a spoon-feeding culture. The end-result was an education service which lacked autonomy, initiative and a general sense of detachment from the policy-makers. Within schools, teachers and children alike are "mechanically" fed by a bureaucratically designated and rigid curriculum. The double-session system imposed constraints on schools by restricting the availability of its physical facilities and imposing severe inconveniences on teachers. Not surprisingly, even by the mid-1980s, principals and teachers alike suffered from low morale and lacked the deep commitment to implement effectively the changes emanated from the top. Teachers also had to endure a poor social status, ineffective supervision and guidance and bleak promotion prospects especially for the non-graduate teachers.

With the appointment of Dr Tony Tan Keng Yam as Minister of Education in 1985, the pressing problems in the education system were tackled with great vigour. The guiding philosophy for Singapore's education system in the 1980s was explicitly expressed by the former banker who answered the call of duty to serve in the Cabinet:

I would say that our education system in the 1980s should be guided by three considerations: Firstly, preparing the child for work in a Singapore which is rapidly becoming a modern centre for brain services and technological industries. This means that he will need

to have a sound knowledge of English. Secondly, equipping him with a sufficient knowledge of his mother tongue so that he will retain a link with his cultural origins. This is the rationale for our policy on bilingualism. Thirdly, inculcating in the child an awareness of the necessity of moral and traditional values so that he will grow up to be a responsible adult, conscious of his obligations to himself, his family, his neighbours and his nation.²⁹

Unpopular policies such as the *pinyin* names and graduate mothers schemes were abolished. The former relates to the policy of expressing names of school children in *pinyin* or simplified Chinese. It was perceived by some quarters as a “politically-correct” move to affirm Singapore’s close relations with China. The graduate mother scheme (aimed to reverse the declining reproductive rates of graduate mothers) was another polemic policy measure which led to wrath of many Singaporeans. It gave graduate mothers priority for registering their children in primary schools. From 1985 to 1991 a series of well-planned educational changes were introduced which reduced wastage, increased flexibility within the school systems, gave greater autonomy to schools and provided greater access to higher education. All pupils leaving the primary school system were placed in the appropriate secondary school courses that would match their learning pace, ability and inclinations. Gifted education programme was started in 1985; English was made the main medium of instruction in all schools; pastoral care programme was started in 1987; and all secondary

²⁹ Business Times, 8 July 1980

schools to have only single-session was initiated in 1989. Changes were also made to tackle the issue of shortage of teachers. In the words of Dr Tony Tan, "The basic solution to the problem of attracting high-quality people to join the teaching profession is to pay them sufficiently".³⁰ Training programmes at the then Institute of Education were revamped and full-time training for non-graduate and graduate trainee teachers were started in July 1980.

One critical issue which did not receive much governmental attention was the failure of the education system to inculcate positive values and attitudes towards technical training and "blue-collar" jobs.³¹ Until the early 1990s, little effort was done on the upgrading of vocational and technical education. Vocational training was (and is) specifically aimed at providing a form of continual education for the less academically inclined pupils. Before 1992, those who failed their Primary Schools Leaving Examinations (PSLE) and the examination at the end of their secondary two were channelled into vocational institutes. Unlike in South Korea where vocational and technical training is held in high esteem, the Singapore's system failed to project the same image. Vocational institutes became "dumping grounds" or "catch-nets" for those who failed to meet up with academic rigour.

The negative perception of vocational and technical training was only tackled seriously by the Singapore Government in the late 1980s. As the young continued to show an aversion towards blue-collar jobs, the danger of the country

³⁰ Straits Times, 8 July 1980.

³¹ The African countries too are trying to break down the persistent stigma of vocational training schools being seen as second-best alternatives after failure to enter conventional academic secondary schools. In addition, the curricula of vocational training centres in most countries suffer from rigidity that ignores the signals in the market regarding changes in the skills needed.

not possessing a sufficient pool of technically-skilled local workers became obvious. This scenario prompted a serious warning by Lee Yock Suan, the Minister of Education in June 1994: “Singapore will be poorer if everyone aspires to and gets only academic qualifications but nobody knows how to fix a TV set, a machine tool or a process plant. We need a world-class workforce with a wide variety of knowledge of skills to achieve a world-class standard of living.”³²

Several institutional changes were introduced in recent years to enhance the image of technical and vocational education in Singapore. In 1992 the Vocational and Industrial Training Board (VITB) was totally revamped and renamed as Institute of Technical Education (ITE). Sprawling ITE campuses, with excellent educational and sports infrastructure and cutting-edge technological support, were built in several locations throughout the island. Beginning in 1992, pupils who did not fare well at the end of the primary education were channelled to a new Normal Technical secondary stream before gaining admission to the new post-secondary institutes of ITE. They would now be given the necessary time to master basic skills, especially proficiency in the English Language. Scholarships were also made available for top ITE graduates to pursue diploma courses in the polytechnics.³³ Beginning August 1994, ITE launched its attachment programmes for Secondary Two Normal (Technical) Technical stream students. The objective was to familiarise them with the state-of-the-art campuses and, more importantly, to “remove any fears of machinery and tools or

³² Straits Times, 14 June 1994.

³³ Straits Times, 30 Dec 93. Each year, about 400 out of 3500 ITE graduates join the polytechnics for a diploma course. For a comprehensive understanding of the development of technical education in Singapore, see Mickey Chiang. 1998. *From Economic Debacle to Economic Miracle: The History and Development of Technical Education in Singapore*. Singapore: Times Edition.

hang-ups about blue-collar jobs".³⁴ Market demand for the well-trained "ITE-graduate", especially by some 650 participating companies under ITE's apprenticeship scheme, led to a rise of their starting salary, from an average of about S\$700 per month in 1994 to about S\$1200 per month in 2005. There were also many "success stories", highlighted in the newspapers, of ITE students making it to the polytechnics and eventually acquiring university degrees. In short, although enrolment into these training schools is still limited to those who find it difficult to go the academic route, the image of vocational training has totally changed for the better.

Singapore, however, entered into the 1980s still severely hampered by shortage of labour at three critical levels - skilled labour, qualified technical and engineering personnel and management trained in modern techniques. As at 1984, Singapore's workforce of 1.1 million was considered small and about 10 per cent were guest workers. The tight labour market for skilled workers and professional soon led to crimping and counter-crimping of such personnel, especially in the fast-expanding shipbuilding and repairing industry and the chemicals-petroleum industry.³⁵ As a short-term solution, the Government encouraged the inflow of skilled personnel by liberalising "the conditions under which such people can come into Singapore, acquired permanent residence and eventual citizenship".³⁶

³⁴ Mickey Chiang. 1998. From Economic Debacle to Economic Miracle: The History and Development of Technical Education in Singapore. Singapore: Times Edition, p. 64.

³⁵ Chia Siow Yue, "Growth and Pattern of Industrialization in You Poh Seng and Lim Chong Yah (eds.) The Singapore Economy. Singapore: Eastern Universities Press, 1971, p. 219.

³⁶ Goh, Economics of Modernization, p. 274.

Clearly, it is not an easy task to re-construct a trading culture into a manufacturing culture, especially one which has strong underpinnings in science and technology. In the first place, education in Singapore has long been historically characterised by a "white-collar" mentality. The majority of school leavers and university graduates obtained academic and professional qualifications. They gravitated towards clerical and administrative posts in the tertiary sector, mainly in insurance, banking, trading and in the government service. A useful socio-cultural explanation for the continuation of this "white-collar" mentality is the perception held by many Chinese families that administrative posts were seen as compatible to the scholar class under the Confucian social hierarchy. They command high prestige, prospect and job security.³⁷ This "white-collar" complex at this time was considered undesirable and inconsistent with the government's policy to shift towards a "blue-collar" workforce. Unfortunately, this historical legacy continues to plague Singapore in the 1980s and beyond.

At the tertiary level, in line with the Government's effort to enlarge the pool of scientific and technical manpower and its overall economic vision to transform Singapore into a developed nation, total enrolment in local degree and diploma courses increased by more than 300 per cent (20,305 students in 1980 and 62,683 students in 1992) during the period 1980 to 1992.³⁸ Increasing university

³⁷ Straits Times, 10 April 1968

³⁸ Ministry of Education Annual Report, various years As a matter of comparison with some OECD countries, the Netherlands enrolments in the higher education sector increased by 13 per cent from 1980 to 1988; in Japan, university undergraduate enrolments rose by about 9 per cent between 1978 and 1989; and in Norway, the corresponding figure was 10 per cent between 1979 and 1986. The main reason for increased

enrolment, however, does not hide the fact that Singapore was critically short of university graduates to run the economy. In the early 1980s, only 9 per cent of annual cohorts of students entered universities or polytechnics (as compared to 20 per cent in Taiwan and 40 per cent in Japan). Rigidities in the education system and, more specifically, in the admission process to the two local universities, also prevented the rapid expansion of the graduate population. Admission was (and is) based upon the student achieving a certain level of results in the "A" Level General Certificate in Education examination. Further restrictions were in the form of quotas of enrolment for the various faculties (such as law and medicine) and the second language requirement.

While the increasing number of polytechnic and university graduates did help to change the profile of the workforce, the Government recognised that, to become a technologically-advanced city-state, the country needed a sustainable supply of indigenous scientists and engineers. In order for Singapore to develop its own indigenous technological capability, it is important that the lion's share of the supply of scientists and engineers must come from native-born students educated and trained in local universities and polytechnics.³⁹ In 1990, out of every 10,000 Singapore workers, 114 were engineers by qualification, but only 29 were research scientists and engineers.

enrolments is the stronger presence of women within the student population. See *Technology and the Economy: The Key Relationships*, OECD, 1992, p.137.

³⁹ This important prerequisite for technological self-reliance was mentioned by Hayashi in his analysis of Japan's experience in absorbing foreign technology. Foreign engineers and technologists can and should play only a supplementary role...in spite of the diachronic, trans-cultural nature of technology, it cannot function independently of the society and culture in which it is expected to function. Only members of that society can make the best use of a technology. In other words, only native engineers can adapt a foreign technology to their country's climate and history, can intermediate, stabilize, disseminate, and finally, root it firmly in their country. See T. Hayashi. 1990. *The Japanese experience in Technology: From Transfer to Self-Reliance*. The United Nations University Press.

Concerted efforts, including better employment prospects and higher baseline salaries, were made in the public-private sector to entice young Singaporeans to take up science and engineering disciplines in the universities. This resulted in an increase in the output of science and engineering graduates during the 1980s, as seen in Table 3.

Table 3 Output of Degree, 1981-1989

| Courses | 1980-85 | 1986-89 |
|-------------|---------|---------|
| Arts | 3792 | 4542 |
| Science | 3180 | 4105 |
| Engineering | 2467 | 5005 |

Source: Calculated from Table 15.12 and 15.13, Yearbook of Statistics, Singapore, 1989, pp. 304-5.

It can be seen that the increase in the number of graduates in science and engineering was sustained throughout the 1980s. The significant point to note is the doubling of the number of engineering graduates between the period 1980-85 and 1986-89. This was an indication of the success of the Government manpower planning "in meeting the needs of the economy for trained personnel at all levels".⁴⁰ However, the Government confirmed that "the major constraint on the expansion of technical education has been the number of qualified trainees, not the demand for graduates or the availability of places...the Engineering faculty at the University, which expanded rapidly, had difficulty in filling its places, and admitted some marginal students, and then suffered high failure rates in its

⁴⁰ Lee Hsien Loong in Parliamentary Debates, Official Reports, 28 March 1988, Vol.50, Col.1503.

five year examinations...⁴¹ The shortage of able students doing engineering was compounded by the fact that "[t]he biggest misallocation in our tertiary education is the very low proportion of girls doing engineering".⁴² Girls, some of whom even out-performed the boys at "A" level examinations, were more interested in courses like Accountancy and Business Administration because "they think [that in Engineering] they may get their hands dirty".⁴³

In terms of Research and Development (R&D) manpower need, the increase in the number of science and engineering graduates contributed to a steady rise in the pool of research scientists and engineers (RSEs). This is shown in Table 4.

Table 4 Research Scientists and Engineers (RSEs)

| Year | RSE | Labour Force ('000) | RSE Per 10,000 Labour Force |
|---------|-------|---------------------|-----------------------------|
| 1978 | 818 | 975 | 8.4 |
| 1981/82 | 1,193 | 1,128 | 10.6 |
| 1984/85 | 2,401 | 1,188 | 20.2 |
| 1987/88 | 3,361 | 1,252 | 26.8 |
| 1990 | 4,329 | 1,516 | 28.6 |
| 1991 | 5,218 | 1,554 | 33.6 |
| 1992 | 6,454 | 1,620 | 39.8 |

Source: 1992 National Survey of R&D in Singapore, National Science and Technology Board.

It was also in the mid-1980s that Singapore launched its National IT Plan that marked the development of a "wired" nation. Although measures were introduced

⁴¹ Ibid., Col.1504.

⁴² Ibid., Col.1505

⁴³ Ibid., Col.1505.

in schools to promote computer literacy, the buy-in was slow and it was not till the IT Master Plan of 1997 that strong and concerted efforts were made.

Towards a Knowledge-Based Economy (KBE) through an Ability-Driven Education, 1997 – Present

Globalization, powered by rapid technological advances, has re-defined the competitive framework of nations. In the new economy era, national wealth is increasingly determined by discovery and application of new and marketable ideas. The transition to a knowledge-based economy (KBE) shifts the emphasis of value away from production towards innovation and creativity. For Singapore and Singaporeans, the faster the Singapore economy changes, the harder it is for the citizens to be confident of their skills and employability. In short, the new economy carries a steep price – more frenzied lives, less security, more economic and social stratification, the loss of time and energy for family, friendships, community and self. These trends required the Singapore's education system and structure to be re-defined and re-aligned to meet the challenges of the new century. Stakeholders, especially the parents and the community at large, were now actively engaged. Singapore and its education system now entered into an ability-driven phase to meet the demands of the KBE.

By 1995, efficiency-driven education was producing positive outcomes. Singapore's youth performed exceptionally well in international mathematics and science tests (TIMSS 1995 and 1999). The 1995 research study involved schools

in 41 countries. It compared scores of 13 year olds in mathematics and science tests. The international average score was 500. Top of the table was Singapore with 643, followed by South Korea, Japan and Hong Kong. This feat was again achieved in 2003. While Asian values were cited as success factors, the policy of streaming students according to academic abilities in Singapore helped teachers to be more focused in their teaching. The pupils also benefited from major changes to the mathematics syllabus in 1990 and to the teaching of science since 1985 (when emphasis was placed more on thinking skills and understanding of concepts, rather than rote mastery of content). Attrition rate for secondary schools decreased significantly from 19 per cent in 1980 to 3.5 per cent in 1999.

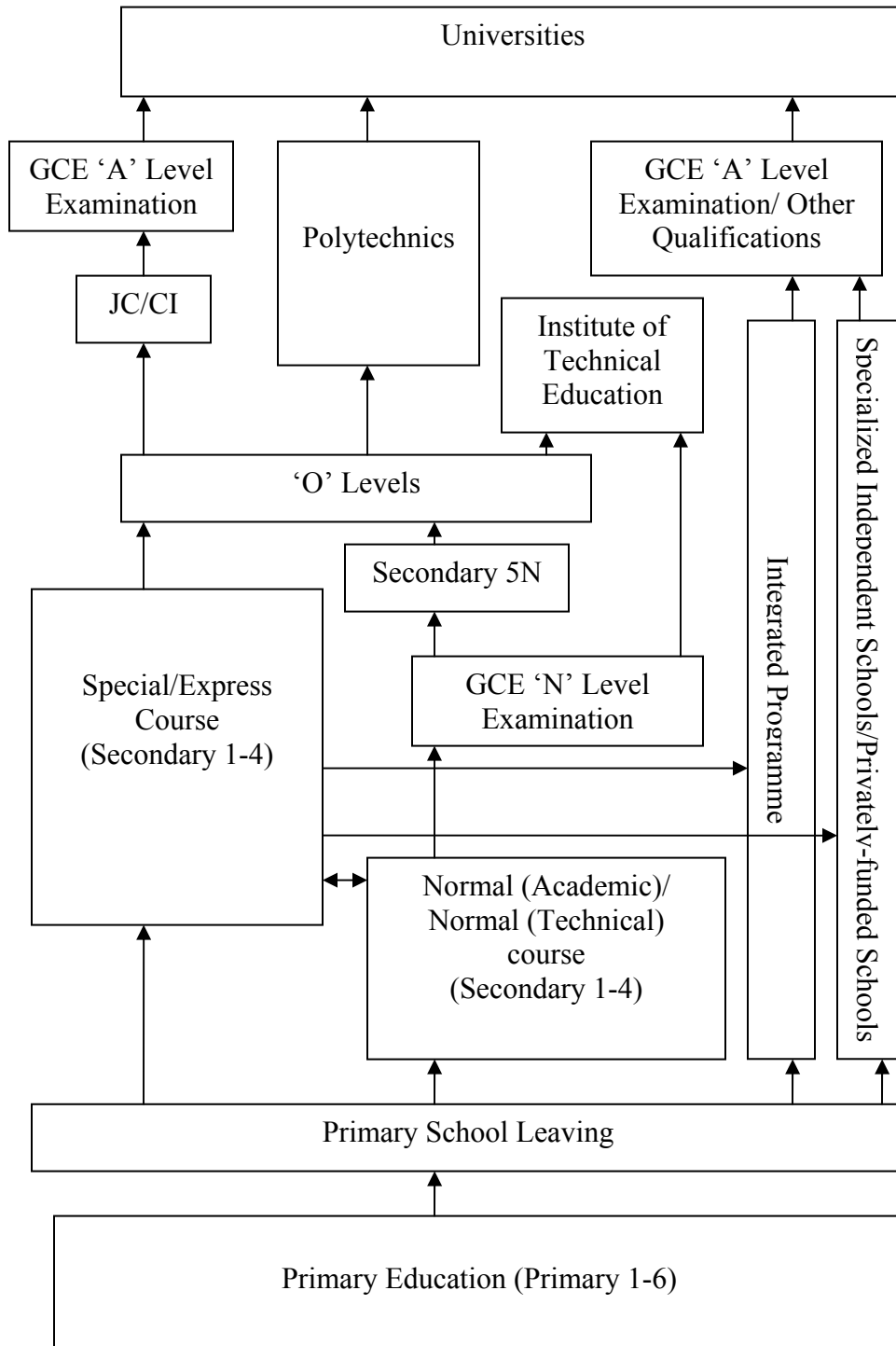
The next milestone was a shift in strategic paradigm - from an efficiency-driven education to an ability-driven one, and initiated in June 1997, encapsulated in the vision "Thinking Schools, Learning Nation" (TSLN).⁴⁴ The vision of TSLN hinges on the premise that, devoid of natural resources, the future sustainability and wealth of the small city-state depends on the capacity of its people to learn – and to learn continuously throughout their lives. The decision to make a radical shift towards ability-driven education in the late 1990s was timely and imperative. Undoubtedly, for nations to survive and prosper in the twenty-first century, the quality of education would be a critical success factor and would differentiate the wealth of nations. The Singapore's leaders learned much from the examples of the United States, Britain and Japan. While the Americans were

⁴⁴ The "Thinking Schools, Learning Nation" concept or vision was launched by then Prime Minister, Mr Goh Chok Tong on 2 June 1997. See also, Leslie Sharpe and S. Gopinathan, "After effectiveness: new directions in the Singapore school system?" *Journal of Education Policy*, (17) 2: 151-166.

(and are) unsurpassed in producing highly creative and entrepreneurial individuals, there were serious concerns about the low average levels of literacy (including technological literacy) and numeracy among young Americans. Similar trends were also experienced by young British students. The Japanese also acknowledged the limitations of its mass-oriented school system, with its government-controlled curriculum but consistently revisited and refined their educational system, from primary to post-graduate education, to sustain its standing as one of the most innovative and competitive nations in the world. Like Japan, Singapore seeks to keep the best of the old in the education system while forcing through needed changes.

Ability-driven education would give all youth an all-round 10 years of general education, including six years of compulsory education at the primary level, during which they could participate in a variety of programmes according to their differences in ability (see Figure 2). The school system features a national curriculum, with major national examinations at the end of the primary, secondary and junior college years. However, the ability-driven education provides greater flexibility and choice. Upon leaving from primary school, the young Singaporean now has a range of educational institutions that cater to different strengths and interests. For example, brighter students could apply to join the Integrated Programme (IP) - a new component in the education system. It spans secondary and junior education without intermediate examination at the end of secondary school. As in the past decades, the assumptions that drive the education system are clearly instrumental in nature. Policies are introduced to fulfil society's need,

Figure 2



“with a heavy emphasis on school-based socialisation to build loyalty to the new state and manpower-oriented curriculum policies to ensure that school learners have the skills to meet labour market needs”.⁴⁵

A responsive education structure was developed. The overall objective was to motivate Singaporeans to continually acquire new knowledge, learn new skills, gain higher levels of technological literacy, develop a spirit of innovation, enterprise and risk-taking, without losing their moral bearings or their commitment to the community and nation.⁴⁶ To achieve a “quantum improvement” in Singapore’s whole process of education, several major initiatives were launched, including, revamping career paths for teachers, teaching creative thinking, introducing collaborative learning strategies, stressing national (or citizenship) education, making more use of new technologies in teaching and learning, and giving schools more resources and greater autonomy. In essence, the ability-driven education has two key features:

- Maximal development of talents and abilities. Ability-driven education is premised on the belief that every child has some talent or ability. The scope and scale of talent within each student differs, but everyone should excel according to the combination of talents and abilities he possesses.

⁴⁵ S. Gopinathan and Ho Wah Kam. “Educational change and development in Singapore”. In Tony Townsend and Yin Cheong Cheng (eds.) 2000. *Educational Change and Development in the Asia-Pacific Region: Challenges for the Future*. Lisse: Swets & Zeitlinger, p. 166.

⁴⁶ S. Gopinathan. 1999. “Preparing for the Next Rung: economic restructuring and educational reform in Singapore”. *Journal of Education and Work*, (12) 3, pp. 296-297. In line with these changes, the National Institute of Education (NIE), reviewed its teacher training curriculum to meet the objectives of TSLN. NIE ensured that its pre-service training curriculum and professional development programmes stay relevant and responsive. One key factor for its successful role is the close and strong tripartite relationship between the Ministry of Education, schools and the institution.

- Maximal harnessing of talents and abilities. Education must inculcate the development and infusion of appropriate national values and social instincts so that young Singaporeans can be committed to Singapore and actively contribute to the growth of the nation. Ability-driven education also harnesses the talents and abilities of all teachers and leaders, both in schools and at the Ministry of Education.

Schools were strongly encouraged to take ownership of their curriculum and co-curricular activities to identify talents and abilities and to develop customized programmes to meet individual student's aptitudes and skills. These specialised programmes include the Music and Art Elective Programmes, Gifted Education Programme and specially-designed physical education and learning of Chinese classes. As mentioned earlier, vocational training under the ITE was also given a strong boost. Government recurrent expenditure on technical and vocational education per student increased from S\$4,883 in 1991 to S\$8,018 in 2004. Infrastructure, facilities and technical equipment are consistently upgraded to ensure they matched industrial needs.⁴⁷

All these structural changes and education initiatives were matched with changes in education funding. During the last two decades or so, several new moves related to the financing of education were created by the Ministry of Education. The first was the Government committing itself to increasing spending

⁴⁷ Many African countries have infrastructure and equipment for technical and vocational training that are for the most part obsolete and inadequate to cater to the needs of industries. The problem is compounded by the high costs of importing new equipment.

on education from four to five per cent of the GDP. In 1991, an innovative scheme, known as the Edusave Scheme, was announced which enabled grants to be given to each child between six and 16 years to meet specified education expenses, such as expenses for educational visits to other countries, enrichment programmes outside the formal school curriculum, etc. Hence, the Edusave financial provision incorporates an element of choice in the use of funds, serving to customize the use of education facilities according to needs. The scheme also ensures equity in educational provision among different ethnic groups. An endowment fund was also established with a capital sum of S\$1 billion to be topped up yearly up to S\$5 billion. Government recurrent expenditure on education per student increased from S\$2,013 per primary student in 1991 to S\$3,541 in 2005 and S\$2,843 per secondary student in 1991 to S\$5,390 in 2005 respectively.⁴⁸

At the teacher-training level, Singapore is perhaps one of the few countries in the world to provide generous employment package in order to retain teachers and maintain a high-quality teaching force. Besides remunerations which are compatible (or even better) with beginning lawyers, engineers and even medical doctors in the government service, all teachers are entitled to fully-subsidized 100 hours of professional training per teacher per year. A “Connect Plan” was also introduced which provided monetary reward for teachers who stayed in service after certain number of years. Finally, in the spirit of lifelong education, school leaders and teachers are encouraged to take sabbatical leave

⁴⁸ Ministry of Education. 2005. Education Statistics Digest 2004, Singapore, p. 49.

to pick up new knowledge and skills – and not necessarily in an education institution but in other sectors, such as the hospitality industry.

It was also during this period that information and communication technology (ICT) “took-off” in Singapore’s schools and tertiary institutions. In the first Master Plan of 1997, the underlying rationale was that ICT could be integrated in the “thinking curriculum” to motivate students to be creative and independent learners. A S\$2 billion (for the period 1997-2002) funding was set aside to introduce ICT in the schools and to have pupils spend 30 per cent of curriculum time learning with, or through, computers. Principals were given the funds to equip the schools, pupils and teachers with the necessary infrastructure and training programmes. The Second Master Plan continued this rationale of adopting ICT as a key enabler in making student-centred learning and assessment a reality, and in helping to reach the objectives of ability-driven education and the vision of TSLN. It adopts a systematic and holistic approach by integrating all key components in the education system – curriculum, assessment, pedagogy, professional training and culture.

Critical Success Factors: Lessons for African countries

The voluminous literature and reports on education in Africa have consistently pointed to key education problems and issues which have plagued the countries in the continent for decades – accessibility to basic education for females, high dropout rates, severe shortage of teachers, insufficient schools, and lack of funds for educational purposes, textbook and transparency. Primary school enrollments

and literacy rates are still among the lowest in the world. And as many as 42 million school children in sub-Saharan Africa are not enrolled in school. There are existing constraints that affect efficiency, such as, availability and distribution of teaching materials, physical facilities and equipment, class size or teacher-pupil ration, and teacher supply and performance in classroom.

What lessons can be drawn from the experience of Singapore that could be valid for African countries? It must be noted that the situation is evidently very different between the city-state and the African countries. Singapore is able to invest far more resources in its education system than the African nations, in absolute value if not in relative terms. The Singapore Government invests heavily in education, especially at the secondary level, and in the life-long training of the labor force. Besides defence, the education sector receives the largest apportion (about 5 per cent) of the GDP each year. The overall objective is to sustain the nation's world economic competitiveness. African countries will probably not follow the same path as Singapore (or OECD countries in general), nor will they go through the same stages of development. However, there are basic lessons from the "Singapore Experience" which can be relevant to African policy makers in education.

Shedding Colonial Legacies

When Singapore became self-government in 1959 and full independence in 1965, its political leaders, led by Lee Kuan Yew, were quick to resolve that the young nation must extricate itself from the colonial baggage of the past. In the

words of Lee: “My colleagues and I are of that generation of young men who went through the Second World War and the Japanese Occupation and became determined that no one – neither the Japanese nor the British - had the right to push and kick us around. We were determined that we could govern ourselves and bring up our children in a country where we can be a self-respecting people”.⁴⁹ British colonial policies relating to education, language and citizenship were responsible for stifling the growth of racial integration and the growth of a national identity by the people of Singapore. Clearly, the priority was to eradicate the unwanted and create policies, such as in education and population control, to survive and prosper. Singapore inherited a colonial legacy of a fragmented education system consisting of English and vernacular schools. In the 1950s and 1960s, in the midst of social and political turbulence (largely arising from ethnic tension and suspicion) the Government adopted measures to do away with vernacular schools. Without any natural resources, it recognised the importance of education and the urgent need for a national system of running schools. Singapore wasted no time in devising policies to integrate the various ethnic races.

When the peoples of Africa gained their independence in the 1950s and 1960s (period of boom in world trade) there were hopes of new beginnings. While decades of foreign rule had led to imbalanced growth and general economic malaise, political independence had given the people the control of their destinies – they could build industries, develop cities, airports, urban

⁴⁹ Quoted in Curriculum Planning and Development Division. 1994. History of Modern Singapore. Singapore: Longman, p. 153.

infrastructure, attract foreign investment and aid – and create an education system that could sustain economic growth. Unfortunately, the legacy of the European “carve-up” of Africa mentality (when colonial boundaries were drawn without regard for the differing tribes and ethnic groups) were re-enacted in civil wars, coups and political instability. The centuries-old culture of leadership and power that is ingrained in many African societies continues to be perpetuated in personal control of possession and resources. The pattern of educational provision was a very uneven one. Colonial administration and mission schools were more concerned with the education of males than females for the simple reason that male labour was required. Colonial stratification was based on race. Although this racial element has been largely removed, the political, social and economic inequalities which developed with colonialism have remained since independence. In short, the education systems inherited by African nations at independence have had and continue to have a profound impact on the nature and direction of social change.

Political Will and Leadership

The political leadership of Singapore at the time of independence proved equal to the challenge of establishing stability, having both the capacity to make sound social and macro economic policies and the political will to make changes. Education was (and is) seen as the key to a good life and, since the early years after independence, the political leadership worked hard to provide education for all. Gender was never an issue and, indeed, the people were requested to

discard obsolete thinking that girls should only stay at home, run households and be subservient.

While it is true that educational policies and developments in Singapore before the 1990s were not all smooth-sailing and were dismantled as quickly as they were formulated (again, political will was needed here), the major goal of education in Singapore was never compromised. All young Singaporeans, regardless of race, language, gender or religion, will be educated. Throughout the decades, there was prompt introduction of new programmes to match evolving needs in the economy and a constant emphasis on education in citizenship and moral values. Though mistakes were inevitably made, as in the establishment of vocational institutes which gave training in skills a poor image (during the 1960s and 1970s), Singapore had been able to build an efficient education system. While African governments have developed policies to reduce inequalities of access to education, the result was generally not encouraging mainly because other interregional and ethnic inequalities (such as income, cash-crop farming, urbanisation) have persisted and, in some cases, become more marked.

Education for National Development

Singapore's education and training strategies were consistently in line with the nation's economic trajectory to sustainable growth. Education policy is said to be well integrated with economic policy and manpower planning. The new economic paradigm has led to sweeping reforms of the education system, such as the

initiatives to instil innovation, problem-solving skills, creativity and entrepreneurship in young Singaporeans and, at the same time, maintain a strong emphasis on content-mastery and good values. Based on its economic policies and success in attracting investment, the Government determines the quantity and quality of skills needed and directs educational institutions to produce the skills. For example, the current move to develop research and development in biomedical, pharmaceutical and digital media sectors is supported by changes to the science and mathematics curriculum, with a strong emphasis on life sciences, thinking skills and the application of scientific, mathematical and technological knowledge to the real world.

Singapore's economic growth and development since 1965 is strongly hinged on raising the technological literacy of its people. This is achieved largely through its educational system. Besides its emphasis on science, mathematics and computer education, technical and vocational education forms a core component of Singapore's education system. Although it has its fair share of problems, the Government persisted in modernising and uplifting the status of technical and vocational training. Today, Singapore's Institute of Technical Education plays a vital role in preparing young Singaporeans with the technical knowledge and skills to service the wide range of industries.

The school curriculum is constantly revisited and revised, whenever necessary, to ensure its appropriateness in the context of Singapore's overall economic and social development. Emphasis was placed on literacy, numeracy, bilingualism, science and mathematics education, the arts, and moral education.

Schools were encouraged to be innovative, take greater ownership of their programmes and resources and be more accountable to all stakeholders. This is a significant departure from the “top-down” approach taken by the Ministry of Education for several decades. African educationists should also recognise that teachers and principals are the key to the successful transformation of school governance and pedagogy. They are the ones who will nurture and train the workforce of tomorrow. They must be justifiably rewarded.

Attaining UPE and ULSE

As reiterated throughout this paper, the Singapore Government takes a very proactive role in ensuring that all citizens are literate. Planning and implementation for large-scale expansion of primary and secondary education was centralised at the Ministry of Education and carefully supervised by experienced educationists. In the early 1960s, once the drive towards universal primary education had been embraced to meet the surging demand for education, the target was quickly achieved through rapid construction of schools and training of teachers. Resources, including free textbooks to those who could not afford, and funds were fully supplied by the Government. Although schools of the 1960s and 1970s paled in comparison with the modern, condominium-like school structure of the twenty-first century, they were very well equipped and functional. Even classroom desks and chairs were designed to provide comfort and long-term usage. The Government ensured that there were sufficient secondary schools to cater to the “bulge” of primary cohorts.

More significantly, Singapore education planners were quick to recognise the need to emphasise on the quality of its education system once the numbers were achieved. This is an important transition, which, in the case of Singapore, took place in the late 1970s. Educational wastage was actively tackled.

In the case of African nations, it is not an exaggeration to state that educational challenges, such as attainment of UPE and ULSE, were taken more in response to political directives from the ruling party than in accordance with professional advice of educationists. More frequently than not, politicians' decisions overruled the rationality of educational planners who recognised the need to match expected output with available resources. In some countries, local communities were tasked with achieving universal primary education and little supervision and funding was provided by the central government.

Language Policy

The example of Singapore has shown that, to achieve national goals, it was crucial for the Government to enforce the use of a main language of instruction (in this case, the English language) throughout the education system and structure. During the early years after independence, English had been portrayed by the Chinese-educated as colonial and thus anti-national and, indeed, there were strong and violent protests. However, measures were in place to ensure that the mother-tongue language (Chinese, Tamil and Malay) is preserved and

taught as a second-language. Hence, bilingualism became a main component of Singapore's education once the city-state gained its full independence in 1965.

While the situation in Africa is far more complicated because there are many indigenous national languages to contend with, a lasting solution might be the official acceptance of bilingualism in the education system. The local or national language, for example, could be used for selected subjects and the metropolitan or ex-colonial language for the others, and both languages receiving equal emphasis.

African countries will try to short-circuit the development process – something similar to what the city-state of Singapore had done in its quest for technological excellence. However, for the African nations to do this successfully, strong and tough decisions will probably have to be made and this goes beyond the mere issue of finance. It is imperative to ask what the education system and the educational processes are meant to achieve for African societies and the individual and whether these aims coincide with the declared goals of national development. The whole education system needs to be reviewed and even some cultural changes in administration and school operations need to be introduced. The overarching objective is to strive to help young Africans obtain fluency in the basic literacies, so that they can deal with all manners of texts, assist them in mastering the fundamentals of several key disciplines, especially sciences and mathematics, and provide skills so that they can understand and participate in the formal and informal social, economic, and political systems of their respective

country. Indeed, as in the case of the Singapore leaders who constantly look into history for lessons to be learned, it is perhaps imperative that African educationists too do likewise because the key the future success seems to lie in understanding the lessons the past has to teach humanity.⁵⁰ As reinforced by Howard Gardner: “Educational systems are inherently conservative institutions, and that conservatism is in many ways justified. Still, just as educational systems eventually responded to the agricultural and industrial revolutions, just as they eventually responded to the decline of religion and the invention of print and audiovisual technologies, they will have to adapt as well the facts of the globalised, knowledge-centered economy and society. In doing so, they will have to somehow integrate the new scientific findings, their multiples (and sometimes seemingly contradictory) educational implications, with past and present historical trends, and to do so in light of their cherished values”.⁵¹

Conclusion

As in OECD countries, Singapore enters what Robert Reich describes as the “Age of Terrific Deal”, where choices are almost limitless and it is easy to switch to something better.⁵² Social and economic forces are exerting strongly on educational change, the outcomes of which, in turn, affect every aspects of the Singapore society. Pragmatic Singaporeans are becoming better educated and well-travelled. But income disparities are widening. As the stakes in getting a

⁵⁰ David Landes, 1998. *The Wealth and Poverty of Nations*. London: Little Brown and Company. In his seminal work, Landes traces the complex the causes of the wealth and poverty of nations.

⁵¹ Howard Gardner. 2004. “How Education Changes” In Marcelo M. Suarez-Orozco and Desiree Baolian Qin-Hilliard. *Globalization: Culture and Education in the New Millennium*. Berkeley: University of California Press, p. 256.

⁵² Robert B. Reich, *The Future of Success*. New York, Alfred A. Knopf, 2001, p. 13.

good education continue to rise and with meritocracy (and, lately, “talentocracy”) consistently emphasised, wealthier and more ambitious parents more aggressively resort to “school sorting” and seek the best education they can afford for their children. At the other end of the spectrum, there will be families who are socially and economically dysfunctional and likely to have children who form the bulk of school drop-outs each year.

In the years ahead, the Singapore Government will be constantly planning and reviewing educational policies and changes that are aimed to:

- Prepare young Singaporeans for the KBE and, in the process, sustain Singapore’s world competitiveness standing.
- Strengthen national identity, values and social cohesion and, in the process, sustain Singapore’s society regardless of race, language or religion.

The task at hand is not just to deal directly with pupils, teachers and schools. More significantly, a proactive approach towards engaging parents and the community as “Partners in Education” will be adopted.

Education provides the city-state of Singapore the strong fundamentals to sustain its competitiveness. With no natural resources to exploit, the development of the country’s manpower resources through a sound and robust

education system is crucial. The Singapore's case study has shown that strong political leadership and will has guided the overall education development and produced a structure and system that is relevant and responsive to the ever-changing economic and social landscape. Singaporeans recognized the importance of a good education in order to enjoy economic independence and good standards of living. It must be reiterated, however, that this drive towards attaining good education is sustainable because the nation possesses the economic and social environment that would allow its citizens to reap the full benefits of their investments in educational pursuits. Indeed, when Singapore was in the throes of economic recession (as happened during the Asian financial crisis in 1997), Singaporeans continued to pursue their quests for academic excellence with the view that they would be more marketable or employable once good economic times return.

References

Business Times, 8 July 1980

Clark, D. 1971. "Manpower Planning in Singapore". *Malayan Economic Review*, Vol. XVI, No. 2.

Chiang, M. 1998. *From Economic Debacle to Economic Miracle: The History and Development of Technical Education in Singapore*. Singapore: Times Edition.

Colony of Singapore. 1955. *Annual Report*, Singapore

Colony of Singapore. 1954. "Report of the Industrial Resources Study Groups". In Andrew Gilmour, *Official Letters, 1931 - 1956*, Mss. Ind. Ocn. s. 154.

Dixon, C. 1991. *South East Asia in the World Economy*. Cambridge: Cambridge University Press.

Goh, K. S. 1972. *The Economics of Modernization*. Singapore: Asia Pacific Press.

Gopinathan, S. 1999. "Preparing for the Next Rung: economic restructuring and educational reform in Singapore". *Journal of Education and Work*, (12) 3: 295-308.

Gopinathan, S. and Ho, W. K. "Educational change and development in Singapore". In Tony T. and Yin C. C. (eds.) 2000. *Educational Change and Development in the Asia-Pacific Region: Challenges for the Future*. Lisse: Swets & Zeitlinger, Chapter 7.

Hayashi, T. 1990. *The Japanese experience in Technology: From Transfer to Self-Reliance*. The United Nations University Press.

Landes, D. 1998. *The Wealth and Poverty of Nations*. London: Little Brown and Company

Lim, J. J. 1980. "Bold Internal Decisions, Emphatic External Outlook". *Southeast Asian Affairs*, Institute of Southeast Asian Studies, Singapore
Ministry of Education. November 1966. "Progress in Education in Singapore, 1959 to 1965".

Low, Linda, Toh, M. H. and Soon, T. W. 1991. *Economics of Education and Manpower Development: Issues and Policies in Singapore*. Singapore: McGraw Hill.

Ministry of Education. *Annual Report*, various years

Ministry of Education. 2005. *Education Statistics Digest 2004*, Singapore

Parliamentary Debates, *Official Reports*, 28 March 1988, Vol.50, Col.1503.

Reich, R. B. 2001. *The Future of Success*. New York: Alfred A. Knopf.

Pang, E. F. 1982. *Education, manpower and Development in Singapore*. Singapore: Singapore University Press.

Suarez-Orozco, Marcelo M. and Qin-Hilliard, Desiree Baolian. 2004. *Globalization: Culture and Education in the New Millennium*. Berkeley: University of California Press.

Sharpe, L. and Gopinathan, S. 2002. "After effectiveness: new directions in the Singapore school system?" *Journal of Education Policy*, 17 (2):151-166.

The Straits Times, various years.

The Malaya Tribune, 13 March 1953.

The Mirror, 22 April 1968.

You, P. S. and Lim, C. Y. 1971. *The Singapore Economy*. Singapore: Eastern Universities Press.