The Development of Education in Singapore since 1965

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The aftermath of World War II in the Pacific created severe social and economic dislocations for the people of Singapore in 1945. Although the British rulers reclaimed control of the trading port, the people clamored for political freedom and economic opportunities. There were frequent industrial strikes and unrest. The population grew from about 960,000 in 1948 to about 1.6 million in 1954. There was high unemployment and an acute shortage of public housing.

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 task of ensuring the political and economic survival of the small city-state. Colonialism had produced a lopsided economy strongly dependent on entrepot trade. As science and technology became the vital ingredients that dictated 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, Singapore was faced with the immediate task of breaking away from the long dependency on entrepot trade and embarking on an export-oriented industrialization strategy.

In the late 1960s and 1970s, individual survival matched well with the state’s ideology of survival. Singapore’s economic and political fortunes became inseparable. 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 government called on the people to sacrifice 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.
This chapter highlights key features of the development of education in Singapore over the past 40 years, focusing on how Singapore has been able to develop its education system from a level quite similar to that of many developing countries in the early 1960s to a system comparable to the best in member countries of the Organisation for Economic Co-operation and Development (OECD). The analysis is done in the context of the economic and social transformation of Singapore since 1965.

SURVIVAL ECONOMICS, SURVIVAL-DRIVEN EDUCATION, 1965–78

Since the 1950s, industrialization has been 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 because long periods of colonialism had produced imbalanced economic structures that 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 Argentine economist Raul Prebisch: Import Substitution Industrialization (ISI) aimed at reduced dependence on imported goods (Dixon 1991, 152). Essentially, ISI involves the small-scale production of non-durable consumer goods whose production requirements are compatible with conditions, such as abundant unskilled labor and unsophisticated technology, existing in countries without previous industrial experience. Rapid economic growth was 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 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; the ISI strategy was seriously undermined by the dramatic reduction in the size of the domestic market. When Singapore was part of Malaysia in 1963–1965, it could hope to take advantage of the wide hinterland market to its north. Following the separation from Malaysia, the development strategy adopted by Singapore leaders gradually shifted toward export-oriented industrialization (EOI), which, by the early 1970s, became the “new orthodoxy” strongly advocated by Bela Balassa of the World Bank for economic growth in the developing countries.

In the late 1950s, Singapore derived 70 percent of its gross domestic product from entrepot activities (Dixon 1991, 158). The country had a small and limited industrial base. The predominant industry was shipbuilding and ship repair, which was largely in the hands of governmental and public bodies, such as the...
Singapore Harbor Board and the British Naval Base. The small manufacturing sector consisted mainly of light engineering, assembly of vehicles, marine engineering, printing, and processing (Colony of Singapore 1955). Although 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 percent of gross domestic production in 1960. In the meantime, the postwar baby boom in the early 1950s and the free immigration policy had resulted in an average annual population growth rate of 4.4 percent in 1957. The unemployment rate stood at 5 percent, rising to a high of 9.2 percent 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, although it still advocated that Singapore must continue to "jealously guard its position as an entrepot" (Malaya Tribune 1953). But the task of expanding manufacturing activities for a trading port was not expected to be smooth because of the "dearth of skilled labor in Singapore" (Colony of Singapore 1954). The year 1968 was a watershed in terms of a shift in industrial strategy to more export-oriented manufacturing activities. Because of Singapore's lack of natural resources, the development of the country's human resources was of paramount importance for the government to support its EOI strategy. To achieve this end, an education system that would support the development of a literate and technically trained workforce was introduced.

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, 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 the 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 six years of education from the age of six—without discrimination on the basis 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 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 pluralistic society. The English language was seen as a necessary tool in Singapore's effort to make the world its marketplace. However, with the increasing demand for English, the government was concerned that the young could become less attuned to their own cultures and not use their mother tongues. The bilingual
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Singapore's bilingual policy is perhaps unique in the world. It is an East-West model that allows Singaporeans to attain competency in the use of the English language, the language of the West, and in the use of the Chinese language (or other indigenous languages, such as Tamil and Malay), the language of the East. This approach is particularly useful for Singapore's business internationalization strategy. The Western concept of bilingualism in schools is based more on a Latin model in which pupils will usually learn, for example, 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 soon implemented. The priority at this point 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 "conserved equal opportunity for all citizens; established the means of maintaining unity in diversity; and instituted a program for training a new generation for the needs of a forward-looking, modern, industrial and technological society" (Ministry of Education 1966). This philosophy, broadly speaking, stays intact even today. Although the government continued to provide for vernacular education, a major consequence of the transformation of the Singapore economy from 1959 onward was the consistently strong tendency for parents to enroll their children in the English language schools. In 1959 only 47 percent of children entering primary one were in the English stream, while 46 percent were in Chinese schools. Twenty years later (in 1979), the English stream enrolled 91 percent of all primary one children, with only 9 percent in the Chinese stream and a negligible number in the Tamil and Malay language streams.

Free primary education was 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 British rule, government English schools and missionary English schools had good buildings. However, most of the other vernacular schools, especially in the rural areas, were built and supported by
private organizations or individuals and not well resourced. Beginning in 1959, the responsibility for building all new functional schools was passed on to the Ministry of Education. Total primary and secondary education enrollment in public schools rose from 459,816 in 1965 to 488,590 in 1975. Tables 1.1 and 1.2 show the enrollment figures and gross enrollment ratios in Singapore's public educational institutions, respectively, since 1965. (The early 1970s saw a decline in primary enrollment because of successful family planning strategies implemented by the government.) A total of 83 new school buildings were completed between 1959 and 1965, a rate of about one school a month for seven years. The accelerated building program equaled the demand of the primary-school-going population in 1964. Even with this program, however, it became necessary for school buildings to be used by two sets of children, that is, double sessions, to accommodate the rapid increase in enrollment. 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

Table 1.1 Students in Public Educational Institutions

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<tbody>
<tr>
<td>Primary</td>
<td>355,096</td>
<td>328,034</td>
<td>277,875</td>
<td>261,553</td>
<td>290,261</td>
</tr>
<tr>
<td>Secondary</td>
<td>104,720</td>
<td>160,556</td>
<td>163,900</td>
<td>180,982</td>
<td>213,063</td>
</tr>
<tr>
<td>Pre-university</td>
<td>6,671</td>
<td>13,782</td>
<td>24,699</td>
<td>21,690</td>
<td>28,901</td>
</tr>
<tr>
<td>Institute of Technical Education (ITE)</td>
<td>1,193</td>
<td>9,830</td>
<td>18,894</td>
<td>9,476</td>
<td>21,603</td>
</tr>
<tr>
<td>Polytechnics</td>
<td>3,208</td>
<td>9,276</td>
<td>21,619</td>
<td>46,841</td>
<td>64,422</td>
</tr>
<tr>
<td>National Institute of Education (NIE)</td>
<td>5,603</td>
<td>685</td>
<td>1,125</td>
<td>2,482</td>
<td>3,676</td>
</tr>
<tr>
<td>Universities</td>
<td>4,996</td>
<td>8,540</td>
<td>16,958</td>
<td>34,591</td>
<td>59,441</td>
</tr>
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Table 1.2 Gross Enrollment Ratios (%)

<table>
<thead>
<tr>
<th>Year</th>
<th>1965</th>
<th>1975</th>
<th>1985</th>
<th>1995</th>
<th>2005a</th>
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<tbody>
<tr>
<td>Primary</td>
<td>108</td>
<td>108</td>
<td>110</td>
<td>98</td>
<td>101</td>
</tr>
<tr>
<td>Secondary</td>
<td>57</td>
<td>70</td>
<td>90</td>
<td>105</td>
<td>106</td>
</tr>
<tr>
<td>Pre-university/ITE</td>
<td>10</td>
<td>20</td>
<td>41</td>
<td>38</td>
<td>69</td>
</tr>
<tr>
<td>Polytechnics/NIE/ universities</td>
<td>6</td>
<td>6</td>
<td>14</td>
<td>39</td>
<td>58</td>
</tr>
</tbody>
</table>

a. Figures for 2005 are preliminary and include private educational institutions.
admitted, they [the children] are assured of a 10-year primary and secondary education finishing at the minimum age of 16" (Straits Times Sept. 26, 1965, Nov. 25, 1965). Because of the rapid construction of schools, universal lower secondary education was achieved as early as 1970. The overall growth in secondary education, from 104,720 students in 1965 to 160,556 students in 1975, is impressive evidence of the importance parents gave to education (beyond primary education). From a societal point of view, secondary education was the most profitable investment (Pang 1982, 94–95). The rate of return to society is 18.2 percent for a completed secondary education for males and 17.0 percent for females. In terms of types of education, an English-stream education had greater monetary payoffs to society than did other vernacular-stream education.

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 and budgeting and ensuring that there were sufficient teachers, universal primary education was attained by the mid-1960s.

In the first year of its independence, the Singapore government allotted 59 percent of the annual education budget to primary education, 27 percent to secondary education, and 14 percent to higher education (as compared with 65 percent, 20 percent, and 15 percent, respectively, in Japan) (Straits Times Nov. 25, 1965). Table 1.3 shows the annual expenditure on education from 1959 to 1967.

Table 1.3 Annual Expenditure on Education, 1959–67

<table>
<thead>
<tr>
<th>Year</th>
<th>Expenditure on Education ($)</th>
<th>% of Total National Expenditure</th>
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<tbody>
<tr>
<td>1959</td>
<td>60,008,000</td>
<td>23.6</td>
</tr>
<tr>
<td>1960</td>
<td>57,100,000</td>
<td>23.5</td>
</tr>
<tr>
<td>1961</td>
<td>65,841,000</td>
<td>17.1</td>
</tr>
<tr>
<td>1962</td>
<td>82,307,000</td>
<td>23.4</td>
</tr>
<tr>
<td>1963</td>
<td>94,644,000</td>
<td>15.8</td>
</tr>
<tr>
<td>1964</td>
<td>103,358,000</td>
<td>31.7</td>
</tr>
<tr>
<td>1965</td>
<td>112,806,000</td>
<td>28.8</td>
</tr>
<tr>
<td>1966</td>
<td>124,076,000</td>
<td>23.4</td>
</tr>
<tr>
<td>1967</td>
<td>135,051,000</td>
<td>22.8</td>
</tr>
</tbody>
</table>

Source: Department of Statistics, various years.
Education in Singapore was financed almost entirely from state revenue. The Ministry of Education made its own annual estimates of expenditures, 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. This is quite different from the case in African countries, where private funding played a significant role in the development of schools, especially secondary schools, and often outstripped the number of state-owned schools. Besides the generous funding from the government, two other strategies were adopted to cater to the rapid expansion of the school population: teacher recruitment and the availability of textbooks.

Corresponding to the increase in pupil enrollment, the number of teachers 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. The strategy to achieve the numbers was large-scale recruitment of teachers-in-training (with at least a full ordinary-level, or O-level, Cambridge certificate) at the then-Teachers Training College. During this period, part-time teaching programs were introduced: training in the morning and teaching in the afternoon and vice versa (depending on the type of program). This was a realistic approach during the years of rapid expansion.

In tune with the government policy of equal treatment for all four language streams of education, the government scheme for the loan of free textbooks offered assistance to pupils in all four language streams. 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 Publishing 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, attributable to the low cost of production achieved through a competitive tender system administered by the EPB with private printers. The cost recovery associated with textbook development was not a primary concern because "Singapore has so far been able to finance its own educational expansion program largely because of the resourcefulness of its people" (Straits Times Nov. 25, 1965).

The period of survival-driven education also saw the review and upgrade of technical and vocational education. In 1964, the government established secondary vocational schools for the first time, with an enrollment 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 the labor market, was designed to be directly applicable to specific occupations. This was a continuation of the tradition of training workers for specific occupations that had been followed since the turn of the twentieth century.
The Survival-Driven System of Education in Singapore 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, 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 installation in establishments where basic vocational skills are required, consisted largely of subjects such as woodworking, domestic science, arts and crafts, and technical drawings. By 1968, the Ministry of Finance concluded that the prospective output of technically trained workers produced by the school system would not be sufficient to meet the requirements of new industries. Reaching this conclusion did not require any elaborate process of manpower planning. 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 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 training in 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, electrochemical, electromechanical, precision engineering, metalworking, and woodworking industries (Clark 1971). From 1970 to 1973, for example, 1,789 trainee welders received formal technical training. 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 Development Programme aimed at producing industrial skills. Foreign governments that donated machinery and expertise included Japan, Britain, and France. Several vocational training centers were set up as a result of this external support.

In an effort to keep pace with the rapid developments in technical and vocational education, extensive teacher training and retraining programs 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 no mean achievement as the labor market was getting increasingly tight. Besides teachers specifically trained in technical subjects, academic subject teachers were also encouraged to be retrained 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.

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repair of motor vehicles, refrigeration, air conditioning, carpentry, masonry, and plumbing. Enrollment at the secondary level continued to grow, rising from about 148,000 in 1969 to 176,000 in 1979. Enrollment in VITB institutes also rose from 2,800 to 14,000 during the same period. By 1976, close to 20 percent 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.

While the British laissez faire policy did not produce systemic changes to the educational landscape in colonial Singapore, the Singapore leaders introduced a flurry of "haphazard changes" (Straits Times Mar. 24, 1976). Singapore's education planners failed to see early enough that the bilingual requirements of the system were not differentiated in terms of pupil ability. Those who failed to make the grade at the Primary School Leaving Examination (PSLE), which was a selection tool for 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 percent of the leaving-primary cohort entering into secondary schools. As many as seven different ministers were at the helm of educational changes and, at one stage, Singapore had 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" (Straits Times Mar. 24, 1976). There was a serious communication gap between the Ministry of Education and the schools. This lack of dialogue led to all kinds of interpretations of policy decisions; at one point, 78 notifications were issued to schools in a short period of nine months.

The low status and morale of teachers was also high on the list of complaints. According to the Singapore Teachers’ Union, resignations of teachers and principals were consistently high in the early 1970s. In 1973, there were 379 resignations (2.1 percent of the teaching force); in 1974, there were 350 resignations (1.9 percent); and in 1975, there were 306 resignations (1.7 percent).  

The year 1978 was a watershed in Singapore's educational development. To support its broad catch-up economic strategy, and working on the premise that senior servants and talented bureaucrats should assume major roles in decision making, spearheading changes, and 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
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Statistics: education wastage and the literacy level of the students. Education wastage—failure to achieve the expected standards and premature school leaving—for the years 1971 to 1974 was high. Out of 1,000 pupils entering primary one, on average 206 dropped out of school 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. Among pupils who passed their PSLE and young national servicemen with educational levels ranging from no formal education to secondary three, an average of 40 percent passed the O-level Cambridge Schools Examinations in the 1970s. This was despite the fact that the nation's literacy rate increased from 72.7 percent in 1970 to 77.6 percent in 1978 (Straits Times Aug. 11, 1978). The low English proficiency resulted in the overall low education standard. Out of 1,000 pupils entering primary one, only 440 reached secondary four after 10 years. Of this number, only 106 obtained three or more O-level passes in the Cambridge Schools Examinations.

By the mid-1970s, the adoption of the EOI strategy had enabled the country to enjoy full employment. However, it was apparent to the political leaders that to sustain robust growth rates, the people must develop competencies in science and technology. British colonialism did not leave behind a legacy of a well-planned education system that emphasized the development of technical and vocational skills. The earlier-than-expected British military withdrawal in 1971 also created, the pressing need for the supply of skilled labor resources. The long time lag to develop technical and vocational skills had made it difficult for the government to introduce measures to quickly close the technological gap. The problem was compounded by the severe shortage of local expertise in the field of science and technology who could have contributed to the development of science and technical education in schools. A study report in 1970 by Dutch economist Albert Winsemius highlighted the deficiency in terms of the shortage of skilled workers, such as engineers, management personnel, and technicians. Whatever limited pool of engineers the country had was largely taken up by the multinational corporations (MNCs) that dominated the fast-expanding manufacturing sector (Goh 1972, 275). The Singapore government had adopted an aggressive open-door policy to attract MNCs and foreign expertise into the small city-state to provide the impetus for an industrial takeoff and to close the technological gap. As explained by Goh Keng Swee, then the deputy prime 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" (Parliamentary Debates 1970). 8

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 sent out different signals and directions. The confusion was further reinforced by the ineffectiveness of the Ministry of Science and Technology (set up in 1968), which suffered from a shortage of high-level administrators and having to oversee a wide range of activities, from coordination of technical education to the promotion of research work (Straits Times Feb. 18, 1981). Eventually, on April 1, 1981, 12 years after 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 [1981], because research and development was not critical to our economic growth strategy in the last decade" (Straits Times Jun. 8, 1981). Young Singaporeans' indifferent attitudes toward 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 2 percent were work permit holders; but of the 1,600 metal process workers, 46 percent were work permit holders, and the figure was 56 percent for the 4,700 woodworkers and a staggering 60 percent for the 55,000 building construction workers (Straits Times Aug. 9, 1976). 9 Recognizing the backwardness in the development of science and technology in the country, the Singapore government adopted in the 1980s developmental strategies designed to push 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 percent of Singapore's gross domestic product (GDP), as compared with 12 percent 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, labor-intensive industries, Singapore's previous comparative advantage in labor-intensive manufactured products was gradually
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The emphasis shifted to a strategy that could accelerate Singapore's transition from a “third-league,” labor-intensive, industrializing country to a “second-league,” capital-intensive economy. Thus, the Second Industrial Revolution was launched in 1981 to accelerate Singapore’s transition to a more sophisticated technological base, thereby taking it out of competition with the lower-wage countries and lessening its reliance on labor expansion for economic growth. There were two main strategies of the restructuring program: the continual task of attracting MNCs to invest in high-technology operations, and 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, the government revisited the education system to use it as a 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 supply and demand of education and skills 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 decided to shift its focus from the fulfillment of mere quantitative demands to quality. The emphasis was on upgrading and providing quality education. 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 toward sustainable development and reflect the economic restructuring strategies, education was revamped with an emphasis on efficiency. Aimed to reduce educational wastage, a New Education System (NES) was introduced in January 1979 (see figure 1.1). 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) O level and a further three years for the advanced (A) level. A new lower-level secondary school leaving certificate, the GCE Normal (N) 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 takeoff 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 and moral, 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 syllabuses 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 departments. Primary streaming (at primary three) and secondary streaming (at secondary two) 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 academic results. Prior to the implementation of the new system, more than 60 percent of the pupils who sat for the PSLE and the O-level examination failed in one or both languages. By 1984, the overall percentages of pupils passing the PSLE in English and the second language were 85.5 and 98.7 percent, respectively. For O-level English, the percentage jumped to more than 90 percent. At the same time, 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 percent 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 provided the city-state with an educated workforce able to cope with the demands of a rapidly expanding economy. As in the previous decades, education in Singapore in the 1980s and beyond, 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 percent of GDP (as compared with 0.86 percent in 1960) (Low, Toh, and Soon 1991, 135-138).

However, within the education system, there were still teething problems. The strictly top-down approach in planning, disseminating, and enforcing educational changes was a clear reflection of the Singapore government's paternalistic style of rule. In the process, it produced three unhealthy trends.

First, it generated the "yes-man" syndrome and the acceptance of change without question by those below. Second, it inculcated an overreliance on the top leaders for direction. Third, it nurtured a spoon-feeding culture. The end result was an education service that lacked autonomy and initiative and had a general sense of detachment from the policy makers. Within schools, teachers and children alike were mechanically fed by a bureaucratically designated and rigid curriculum. The double-session system imposed constraints on schools by restricting the availability of 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 nongraduate 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 vigor. 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 (Business Times Jul. 8, 1980).

Unpopular policies such as the pinyin names and graduate mother schemes were abolished. The former relates to the policy of expressing names of Chinese school children in pinyin or simplified Chinese. It was perceived in 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 mothers with university degrees) was another polemic policy measure that led to wrath on the part 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 that 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. A gifted education program was started in 1985, English was made the main medium of instruction in all schools, a pastoral care program was started in 1987, and all secondary schools were to have only single sessions starting in 1989. Changes were also made to tackle the issue of the 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” (Straits Times Jul. 8, 1980). Training programs at the then-Institute of Education were revamped, and full-time training for nongraduate and graduate trainee teachers was started in July 1980.

One critical issue that did not receive much governmental attention was the failure of the education system to inculcate positive values and attitudes toward technical training and blue-collar jobs. Until the early 1990s, little effort was made to upgrade 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 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 system failed to project the same image. Vocational institutes became “dumping grounds” or “catch-nets” for those who failed to measure up to the requisite academic rigor.
The negative perception of vocational and technical training was not tackled seriously by the Singapore government until the late 1980s. As the young continued to show an aversion toward blue-collar jobs, the danger of the country 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” (Straits Times Jun. 14, 1994).

Several institutional changes were introduced in recent years to enhance the image of technical and vocational education in Singapore. In 1992 the VTIB was totally revamped and renamed the 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 postsecondary institutes of ITE. There the students would 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 (Straits Times Dec. 30, 1993). Beginning in August 1994, the ITE launched its attachment programs for secondary two Normal Technical stream students. The objective was to familiarize students with the state-of-the-art campuses and, more important, to “remove any fears of machinery and tools or hang-ups about blue-collar jobs” (Chiang 1998, 64). Market demand for the well-trained ITE graduate, especially by some 650 participating companies under ITE’s apprenticeship scheme, led to a rise in their starting salary, from an average of about S$700 per month in 1994 to about S$1,200 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 enrollment 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.

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 enrollment in local degree and diploma courses increased by more than 200 percent: from 20,305 students in 1980 to 62,683 students in 1992. Increasing university enrollment, however, did not hide the fact that Singapore was critically short of university graduates to drive economic growth. In 1980, only about 5 percent of the annual cohort of students entered universities and 8 percent entered polytechnics (compared with 20 percent
in Taiwan and 40 percent in Japan for universities and polytechnics combined). Admission was (and is) highly competitive, and too few places were available. There were also restrictions in the form of quotas of enrollment for the various faculties (such as law and medicine), although these were determined as part of national manpower planning.

Though the increasing number of polytechnic and university graduates did help to change the profile of the workforce, the government recognized that, to become a technologically advanced city-state, the country needed a sustainable supply of indigenous scientists and engineers. For Singapore to develop its own indigenous technological capability, the lion’s share of the supply of scientists and engineers had to come from native-born students educated and trained in local universities and polytechnics. In 1990, out of every 10,000 Singapore workers, 114 were engineers by qualification, but only 29 were research scientists and engineers.

Concerted efforts, including better employment prospects and higher baseline salaries, were made in the public and private sectors 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 1.4.

The increase in the number of graduates in science and engineering was sustained throughout the 1980s. Most significant: The number of engineering graduates doubled between the periods 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" (Parliamentary Debates 1988, col. 1503). 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. . . . [T]he 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 five-year examinations" (Parliamentary Debates 1988, col. 1504). The shortage of able students doing engineering was compounded by the fact that "the biggest misallocation in our tertiary education is the very low proportion of girls doing engineering" (Parliamentary Debates 1988, col. 1505). Girls, some of whom even outperformed the boys at A-level examinations, were more interested in courses

| Table 1.4 Number of Degrees Awarded by Singapore Universities, 1981–89 |
|-----------------|---------|---------|
| Courses         | 1980–85 | 1986–89 |
| Arts            | 3,792   | 4,542   |
| Science         | 3,180   | 4,105   |
| Engineering     | 2,467   | 5,005   |

Source: Calculated from tables 15.12 and 15.13, Yearbook of Statistics (Department of Statistics 1989, 304–5).
such as accounting and business administration because “they think [that in engineering] they may get their hands dirty” (Parliamentary Debates 1988, col. 1305).

In terms of research and development (R&D) manpower needs, 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 1.5.

It was also in the mid-1980s that Singapore launched its National Information Technology (IT) Plan, which marked the development of a “wired” nation. Although measures were introduced in schools to promote computer literacy, the buy-in was slow, and it was not until the IT Master Plan of 1997 that strong and concerted efforts were made.

Table 1.5 Research Scientists and Engineers (RSEs)

<table>
<thead>
<tr>
<th>Year</th>
<th>Number of RSEs (thousands)</th>
<th>Labor force (thousands)</th>
<th>RSEs per 10,000 labor force</th>
</tr>
</thead>
<tbody>
<tr>
<td>1978</td>
<td>818</td>
<td>9.75</td>
<td>8.4</td>
</tr>
<tr>
<td>1981–82</td>
<td>1,153</td>
<td>1.28</td>
<td>10.6</td>
</tr>
<tr>
<td>1984–85</td>
<td>2,401</td>
<td>1.188</td>
<td>20.2</td>
</tr>
<tr>
<td>1987–88</td>
<td>3,361</td>
<td>1.252</td>
<td>26.8</td>
</tr>
<tr>
<td>1990</td>
<td>4,329</td>
<td>1.516</td>
<td>28.6</td>
</tr>
<tr>
<td>1991</td>
<td>5,218</td>
<td>1.554</td>
<td>33.6</td>
</tr>
<tr>
<td>1992</td>
<td>6,454</td>
<td>1.620</td>
<td>39.8</td>
</tr>
</tbody>
</table>


TOWARD A KNOWLEDGE-BASED ECONOMY THROUGH AN ABILITY-DRIVEN EDUCATION, 1997–PRESENT

Globalization, powered by rapid technological advances, has redefined the competitive framework of nations. In the new economic 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 toward innovation and creativity. For Singapore and Singaporeans, the faster the Singapore economy changed, the harder it was for the citizens to be confident of their skills and employability. In short, the new economy carried a steep price: more frenzied lives; less security; more economic and social stratification; and the loss of time and energy for family, friendships, community, and self. These trends required Singapore’s education system and structure to be redefined and realigned to meet the challenges of the new century. Stakeholders, especially the parents and the community at large, became actively engaged. Singapore and its education system 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 compared mathematic and science test scores of 13-year-olds in 41 countries. The international average score was 500. At the top of the list 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 Singapore policy of streaming students according to academic abilities helped teachers to be more focused in their teaching. The pupils also benefited from major changes to the mathematics syllabus in 1990 and from the 1985 shift in the method of teaching science that placed more emphasis on thinking skills and understanding of concepts, rather than on rote mastery of content. Attrition rates for secondary schools decreased significantly, from 19 percent in 1980 to 3.5 percent in 1999.

The next milestone was the June 1997 shift in strategic paradigm, from an efficiency-driven education to an ability-driven one, encapsulated in the vision "Thinking Schools, Learning Nation" (TSLN). 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 toward ability-driven education in the late 1990s was timely and imperative. Undoubtedly, for nations to survive and prosper in the 21st century, the quality of education would be a critical factor for success and would differentiate the wealth of nations. Singapore's leaders learned much from the examples of the United States, Great Britain, and Japan. While the Americans were (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 they consistently revisited and refined their educational system, from primary to postgraduate 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 10 years of general education, including six years of compulsory education at the primary level, during which they could participate in a variety of programs according to their ability (see figure 1.2). 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 primary school, the young Singaporean now can choose from a range of educational institutions that cater to different strengths and interests. For example,
While Asian students placed more emphasis on the vision to learn from an early age and to learn from an early age, many British students focused on rote learning and their teachers placed more emphasis on the vision to learn from an early age and to learn from an early age. Indeed, the overall objective of education in the education system that spans secondary and junior college education, without the GCE O-level examination at the end of secondary school.

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; and develop a spirit of innovation, enterprise, and risk taking without losing their moral bearings or their commitment to learning. For example,
to the community and nation (Gopinathan 1999). To achieve a quantum improvement in Singapore’s whole process of education, the government launched several major initiatives, 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, 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 or she possesses.
- Maximal harnessing of talents and abilities. Education must inculcate the 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 offers opportunities to harness 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 cocurricular activities to identify talents and abilities and to develop customized programs to meet individual students’ aptitudes and skills. These specialized programs include the Music and Art Elective Programs, Gifted Education Program, and specially designed physical education and Chinese classes. As mentioned earlier, vocational training under the ITE was also given a strong boost. Government recurrent per-student expenditures on technical and vocational education increased from S$4,883 in 1991 to S$8,018 in 2004. Infrastructure, facilities, and technical equipment are consistently upgraded to ensure they match industrial needs.

All these structural changes and education initiatives were matched with changes in education funding. During the past two decades or so, several new moves related to the financing of education were created by the Ministry of Education. In 1991, an innovative scheme, known as the Edusave Scheme, was announced. It offered grants to each child between 6 and 16 years of age to meet specified education expenses, such as the costs for educational visits to other countries and enrichment programs outside the formal school curriculum. 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. An endowment fund was also established with a capital sum of S$1 billion to be increased yearly up to a total of S$5 billion. Government recurrent expenditures on education increased from S$2,013 per primary student in 1991 to S$3,541 in 2005, and
quantum government teachers, stressing technologies in autonomy

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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 into the "thinking curriculum" to motivate students to be creative and independent learners. S$2 billion (for the period 1997–2002) funding was set aside to introduce ICT in schools and to have pupils spend 30 percent of curriculum time learning with, or through, computers. The Ministry of Education provided the initial training and infrastructure expenditures, after which principals were given the funds for upgrading courseware and professional development programs. The second Master Plan continued this rationale of adopting ICT as a key enabler in making student-centered learning and assessment a reality, and in helping Singapore to reach the objectives of ability-driven education and the vision of TSLN. The second Master Plan adopted a systematic and holistic approach by integrating all key components in the education system—curriculum, assessment, pedagogy, professional training, and culture.

CONCLUSION

As with OECD countries, Singapore has entered what Robert Reich describes as the "Age of Terrific Deal," where choices are almost limitless and it is easy to switch to something better (Reich 2001, 13). Social and economic forces are exerting themselves strongly for educational change, the outcomes of which, in turn, affect every aspect of Singapore society. Pragmatic Singaporeans are becoming better educated and more well traveled. But income disparities are widening. As the stakes in getting a good education continue to rise and with meritocracy consistently emphasized, 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


Singapore is perhaps one of the few countries in the world to provide a generous employment package for the teaching profession to retain teachers and maintain a high-quality teaching force. Besides remunerations that are comparable (or even better) to those for beginning lawyers, engineers, and even medical doctors in the government service, each teacher is entitled to 100 fully paid hours of professional training per year. A Connect Plan, which provides monetary rewards for teachers who stay in service after a certain number of years, was also introduced. Finally, in the spirit of lifelong education, school leaders and teachers are encouraged to take sabbatical leave to pick up new knowledge and skills—and not necessarily in an education institution, but in other sectors as well, such as the hospitality industry.

Hence, the increase in the amount of funds, as mentioned in the Ministry of Education (2005, 49), has contributed to the development of education in Singapore since 1965.
end of the spectrum are socially and economically dysfunctional families whose children are likely to form the bulk of school dropouts 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 competitiveness
- 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 significant is the fact that a proactive approach toward engaging parents and the community as "partners in education" will be adopted.

Education provides the city-state of Singapore with 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. Singapore's case study has shown that strong political leadership and will have 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 recognize 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 toward attaining good education is sustainable because the nation possesses the economic and social environment that allows 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 returned.

NOTES

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 antifreedom movements and would nullify 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, under the leadership of Lee Kuan Yew, won convincingly. Lee became the first prime minister. At the same time, the state flag and national anthem, "Majulah Singapura," were adopted. 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
families whose
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 happen to
pursue their
marketable

island of Singapore was formally separated from Malaysia and became a sovereign, democratic, and independent city-state.

2. The Malays were (and are) considered the indigenous people living in Singapore at the time the British founded Singapore in 1819. Hence, the Malay language became Singapore's national language. Singapore's national anthem is sung in the Malay language.

3. 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.

4. 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, restructuring, 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 training and awarded grants to employers to sponsor (up to 90 percent) employees for VITB's skill courses and apprentices.

5. Objectively, the resignation rates of 1.7 to 2.2 percent for this period were not particularly high. The rates today remain more or less in the same range as they were in the 1970s.

6. Since the 1950s, more and more parents sent their children to English stream schools. In 1960, 49 percent of all students were registered for the English stream, and by 1970, 66 percent were. In 1982, the figure went up to 90 percent. 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.

7. Dr. Albert Winsemius was the leader of a United Nations Industry Survey Mission to Singapore in 1961. 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.

8. 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 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 R&D in Singapore's indigenous firms. Compared with the newly industrializing countries in East Asia and in Japan, Singapore in the 1970s suffered from low labor productivity growth. Between 1973 and 1978 “real productivity growth in Singapore averaged about 3 percent per annum, compared to an average of 7 percent for Hong Kong, Taiwan, and South Korea,” according to Goh. These labor-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 larger MNCs, transfer and diffusion of technology and skill was very rare. See also the speech by the Minister of Trade and Industry quoted in Lim Joo-Jock (1980, 279).
9. 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 $1,800.

10. However, the impact of an expanding manufacturing base through foreign enterprises on the general managerial and technical skill levels of the workforce was not easily seen. Local industrial establishments in Singapore during this period were characterized by their small size, low capital input, and use of simple technology. In 1969, 70 percent of manufacturing enterprises employed 10 to 39 workers, while only 10 percent had more than 300 workers. 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 organization of work. The small domestic market and the scarcity of local managerial and technical know-how and expertise imposed a limit on 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 labor-intensive, low-wage, and low-productivity enterprises, requiring the mere repetition of simple operations along the assembly and production line.

11. Streaming—the separation of students into different categories or streams—is a prominent feature of the Singapore education system. The rationale behind streaming, which began in 1984, is to allow the system to best address the needs of each student according to his or her academic ability, preventing a scenario in which the best students are bored by a standard curriculum and the weakest students struggle to pass. Such reasoning makes perfect sense in Singapore's context, which stresses meritocracy. Although the virtues of streaming are much debated, it is in many ways one of the most successful features of Singapore's education system. Streaming has been blamed for inducing excessive and unnecessary stress in students. Vast amounts of tuition, "mugging" (a term used to describe repeated, excessive study), and the resultant stress are part of the lives of many students in the education system. Others see streaming as a form of social class stratification, where the brighter students go on to earn university degrees and polytechnic diplomas and the Normal-stream students end up with certificates of vocational training and work as nonprofessionals. In short, the streaming system is perceived to limit the students' potentials. Success stories featuring Institute of Technical Education (ITE) students eventually heading to university or becoming successful entrepreneurs often make the front page in the newspapers, adding strength to the argument that streaming is unnecessary. However, of the thousands in the Normal stream in each cohort, only a scant few make it to the university. From a national perspective, the streaming system is efficient: It allows the appropriate allocation of resources and adoption of the right teaching methods for the right students, and provides learning environments more suited to the individual student.

12. 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 centers in most countries suffer from rigidity that ignores the signals in the market regarding changes in the skills needed. Each year, about 400 out of 3,500 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).

13. Ministry of Education Annual Report, various years. In some OECD countries, enrollments in the higher education sector also increased during this period. In the Netherlands,
enrollments in the higher education sector increased by 13 percent from 1980 to 1988; in Japan, university undergraduate enrollments rose by about 9 percent between 1978 and 1989; and in Norway, the corresponding figure was 10 percent between 1979 and 1986. The main reason for increased enrollments is the stronger presence of women within the student population. See OECD (1992, 137).

15. This important prerequisite for technological self-reliance was mentioned by Hayashi in his analysis of Japan's experience in absorbing foreign technology. According to Hayashi (1990), "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, carry intermediate, stabilize, disseminate, and finally, root it firmly in their country."

16. The "Thinking Schools, Learning Nation" concept or vision was launched by then-Prime Minister Goh Chok Tong on June 2, 1997. See also Sharpe and Gopinathan (2002).

17. 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 preservice training curriculum and professional development programs would 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.

18. 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.

REFERENCES

Ministry of Education. Annual Report, various years.


*Streits Times*. August 9, 1976.


*Streits Times*. July 8, 1980.

*Streits Times*. February 18, 1981.

*Streits Times*. June 8, 1981.
