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Singapore: Rapid Improvement Followed by Strong Performance

Singapore is one of Asia's great success stories, transforming itself from a developing country to a modern industrial economy in one generation. During the last decade, Singapore's education system has remained consistently at or near the top of most major world education ranking systems. This chapter examines how this "tiny red dot" on the map has achieved and sustained so much, so quickly. From Singapore's beginning, education has been seen as central to building both the economy and the nation. The objective was to serve as the engine of human capital to drive economic growth. The ability of the government to successfully match supply with demand of education and skills is a major source of Singapore's competitive advantage. Other elements in its success include a clear vision and belief in the centrality of education for students and the nation; persistent political leadership and alignment between policy and practice; a focus on building teacher and leadership capacity to deliver reforms at the school level; ambitious standards and assessments; and a culture of continuous improvement and future orientation that benchmarks educational practices against the best in the world.

INTRODUCTION

When Singapore became independent in 1965, it was a poor, small (about 700 km²), tropical island with few natural resources, little fresh water, rapid population growth, substandard housing and recurring conflict among the ethnic and religious groups that made up its population. At that time there was no compulsory education and only a small number of high school and college graduates and skilled workers. Today, Singapore is a gleaming global hub of trade, finance and transportation. Its transformation "from third world to first" in one generation is one of Asia's great success stories (Yew, 2000).

All children in Singapore receive a minimum of 10 years of education in one of the country's 360 schools. Singapore's students were among the top in the world in mathematics and science on the Trends in International Math and Science Study (TIMSS) in 1995, 1999, 2003 and 2007. They came fourth in literacy in the 2006 Progress in International Reading Literacy Study (PIRLS). Their excellence is further underlined by the fact that Singapore was one of the top-performing countries in the 2009 PISA survey (Table 7.1 and Figure 7.1), the first PISA survey in which it participated. Singapore was rated as one of the best performing education systems in a 2007 McKinsey study of teachers (Barber and Mourshed, 2007), and was rated first in the 2007 *IMD World Competitiveness Yearbook* (IMD, 2007) for having an education system that best meets the needs of a competitive economy. At the higher education level, the National University of Singapore was ranked 34th in the world and 4th in Asia in the *Times Higher Education Supplement* Rankings of World Universities in 2010 (*Times Higher Education Supplement,* 2010). How has this little red dot on the map, as Singaporeans frequently refer to their country, a nation that is not even 50 years old, evolved from a backwater undeveloped economy into a world economic and educational leader in such a short period of time? What education policies and practices has Singapore employed? And are the lessons from Singapore's experience relevant for other countries? This chapter attempts to provide some answers to these questions. First, however, we look at the broader context.

Table 7.1 **Singapore's mean scores on reading, mathematics and science scales in PISA**

	PISA 2000	PISA 2003	PISA 2006	PISA 2009
	Mean score	Mean score	Mean score	Mean score
Reading				526
Mathematics				562
Science				542

Source: OECD (2010), *PISA 2009 Volume I, What Students Know and Can Do: Student Performance in Reading, Mathematics and Science*, OECD Publishing.
StatLink ⌐╕╜ http://dx.doi.org/10.1787/888932366731

Under British colonial rule, from 1819 onwards, Singapore developed as a major seaport at the mouth of the Malacca Straits, on the shipping lanes between Britain, India and China. During this period, it attracted large numbers of immigrants, primarily from southern China, India and the Malay Archipelago. At independence from Britain in 1959 and then separation from Malaysia in 1965, Singapore had no assets other than its deepwater port. There was no real economy, no defence, and simmering tensions with neighbouring countries. Moreover, it had to import most of its food, water and energy. The Republic of Singapore seemed an unlikely candidate to become a world-class economic and educational powerhouse.

The risks facing this nation at birth – the sense of political and economic vulnerability to larger countries and global changes – created a sense of urgency which influences policy to this day. Lee Kuan Yew, Singapore's first Prime Minister, set out two overarching goals: to build a modern economy and to create a sense of Singaporean national identity. He recruited the best and brightest people into his early government and sought to promote economic growth and job creation. In the 1960s, the emphasis was on attracting labour-intensive foreign manufacturing to provide jobs for its low-skilled workforce. In the 1970s and 1980s, a shift to more skill-intensive manufacturing led to an emphasis on technical fields. From the mid-1990s on, Singapore has sought to become a player in the global knowledge economy, encouraging more research- and innovation-intensive industry and seeking to attract scientists and scientific companies from around the globe. The results of the government's economic policies have been stunning – rapid economic growth to reach developed country levels and a per capita income in 2009 estimated at current market prices to be about SGP 52 000 (USD 39 000). One of the so-called Asian Tigers, Singapore is a free market, business-friendly and globally-oriented economy, shaped by an active and interventionist government.

The government of Singapore is a highly efficient, honest and flexible meritocracy with a strong focus on integrated strategic planning and detailed execution. "Dream, Design, Deliver" aptly characterises its approach to policy development and implementation. Singapore's small size and political stability (the same People's Action Party has ruled Singapore since Independence) have kept the vision of making Singapore a great global city constant, but have also enabled it to be versatile in responding to rapidly changing environments. With a small limited domestic market, Singapore has had to become highly integrated in the global economy. To survive several global recessions and the ever-present uncertainties of the global economy, continuous innovation has been essential.

With respect to Lee Kuan Yew's second goal of nation-building, early race riots led to a profound commitment to creating a multi-racial and multi-ethnic society. At independence, Singapore had multiple religious groups (Buddhist, Muslim, Taoist, Hindu and Christian); multiple ethnic groups (Singapore's population is about 74% Chinese, 13% Malay, 9% Indian and 3% other); and no common language. Nor did it have a common school system or a common curriculum. A series of measures were gradually put in place to realise the Singapore pledge: "One united people regardless of race, language or religion". Singapore recognises and teaches four official languages – Chinese, English, Malay and Tamil – although English is the language of government and, since 1978, the medium of instruction in schools.[1] Two years of compulsory national service unite different ethnic groups, as does the policy of mixing each group within the government-built housing where most Singaporeans live. This has helped avoid the racial and ethnic segregation that afflicts many countries. Schools play a major role in inculcating Singaporean values and character, and civic and moral education play a major role in schools. Honesty, commitment to excellence, teamwork, discipline, loyalty, humility, national pride and an emphasis on the common good have been instilled throughout government and society.

Lacking other resources, human resources were and still are seen as the island republic's most precious asset. Education was seen, from the beginning, as central to building both the economy and the nation. Its job was to deliver the human capital engine for economic growth and to create a sense of Singaporean identity. The economic goals of education have given education policy a very pragmatic bent and a strong focus on scientific and technical fields. Singapore's education system has evolved over the past 40 years in tandem with the changing economy.

SINGAPORE'S EDUCATION SYSTEM: THE PATH TO BECOMING A LEARNING NATION

Over the past 40 years, Singapore has been able to raise its education level from one similar to that of many developing countries to match the best in the OECD. The current system did not emerge perfectly-formed, but has developed in three broad phases as it was adapted to changing circumstances and ideas:

Survival-driven phase: 1959 to 1978

According to then Prime Minister Lee Kuan Yew, the aim of Singaporean education in its early days was to "produce a good man and a useful citizen". This first phase of education has been dubbed the "survival-driven" phase. In the late 1950s, 70% of GDP was from port and warehousing activities. This was not enough to sustain, let alone grow, the economy which was suffering from high population growth and significant unemployment. The government decided that there was a need to expand the industrial base and, because of the small size of the domestic market, to make it export-oriented. It set about trying to attract foreign manufacturers who needed low-skilled labour (*e.g.* textiles, garments, wood products), both to provide jobs and to gain expertise.

Prior to independence, only the affluent were educated. At independence, most of Singapore's two million people were illiterate and unskilled. Therefore the focus of this "survival" period was on expanding basic education as quickly as possible. Schools were built rapidly. Teachers were recruited on a large scale. The schools that had been established by different ethnic groups were merged into a single Singaporean education system. A bilingual policy was introduced so that all children would learn both their own language and English. A textbook agency was created to provide textbooks. The expansion was so rapid that universal primary education was attained in 1965 and universal lower secondary by the early 1970s. By the end of the "survival-driven phase", Singapore had created a national system of public education.

However, the quality of education was not very high. In the early 1970s, out of every 1 000 pupils entering primary grade one, only 444 reached secondary grade four after 10 years. And of these, only 350 (35% of the cohort) gained three or more passes in O-level examinations. A significant report by Dutch economic advisor Dr Albert Winsemius estimated that every year between 1970 and 1975, Singapore would be short of 500 engineers and 1 000 technical workers and would have a severe shortage of people with management skills (Lee, *et al.*, 2008). The oil crisis

of 1973 and the increasing competition from other Asian countries for low-skilled, labour-intensive industry led to a growing realisation that Singapore's comparative advantage was eroding and that it needed to evolve to a higher-skill economy. However, a large number of policy changes and changes of ministers for education caused confusion. Teacher morale was low and there was considerable attrition. Although there were attempts to expand vocational education, it had low status and was viewed as a dumping ground. In 1979, a watershed education report highlighted the high dropout rates and low standards and ushered in the next phase of reform (Goh, 1979).

Efficiency-driven phase: 1979 to 1996

During this phase of education, the focus shifted. The government's economic strategy was to move Singapore from a third-league, labour-intensive economy to a second-league, capital and skill-intensive country. So in January 1979, a new education system was introduced. Singapore moved away from its earlier one-size-fits-all approach to schooling that would create multiple pathways for students in order to reduce the drop-out rate, improve quality and produce the more technically-skilled labour force needed to achieve the new economic goals. Streaming (tracking) based on academic ability was introduced, starting in elementary schools, with the goal of "enabling all students to reach their potential while recognising that all students do not grow academically at the same pace" (Ho Peng, interview conducted for this report). Students could have more time, for example, to complete different stages of schooling. The multiple pathways included three types of high school: *i)* academic high schools, which prepared students for college; *ii)* polytechnic high schools that focused on advanced occupational and technical training and that could also lead to college; and *iii)* technical institutes that focused on occupational and technical training for the lowest fifth of students. The Curriculum Development Institute of Singapore was established to produce high-quality textbooks and instructional materials for the different pathways. While streaming was unpopular when it was introduced, drop-out rates did, in fact, decline significantly: by 1986, only 6% of students were leaving school with fewer than 10 years of education.[2] The range of efforts to raise standards also yielded results: performance in the O-level English examinations went from a 60% failure rate to a 90% pass rate by 1984, and by 1995 Singapore led the world in mathematics and science on TIMSS.

As Singapore sought to attract companies with a more sophisticated technological base (*e.g.* silicon wafers, computers), a major goal of this second phase was to produce technical workers at all levels. Concerned about the low status of blue-collar jobs, from 1992 Singapore invested significantly in the Institute for Technical Education (ITE; Box 7.2). With a number of campuses around the city, the ITE provides high-quality technical and vocational education, with high-tech facilities and amenities that are comparable to those of modern universities elsewhere. Each technical field is advised by industries in that sector to keep it current with changing demands and new technologies. New programmes can be built for multinational companies looking to locate in Singapore. There has been strong market demand for ITE graduates, and it is possible for the top graduates from the ITE to go on to polytechnics and then to university. As a result of these changes, the image and attractiveness of vocational education vastly improved. At the top end of the technical workforce, the number of university and polytechnic places was also expanded during this period to increase the pool of scientists and engineers.

Ability-based, aspiration-driven phase: 1997 to the present day

By the early 1990s, the efficiency-driven education system had yielded clear results. But, as became clear during the Asian financial crisis of 1997, the world economy was shifting to a global knowledge economy. The competitive framework of nations was being redefined and national progress would increasingly be determined by the discovery and application of new and marketable ideas. The growth of the global knowledge economy required a paradigm shift in Singapore's education system towards a focus on innovation, creativity and research.

A key instrument as Singapore intentionally navigated towards the global knowledge economy has been the government Agency for Science, Technology and Research (A* Star), which provides generous funding for research and aims to attract top scientists and scientific companies. One million foreign nationals with scientific, technical or managerial skills have been encouraged to work in Singapore in international corporations and in higher education. Singapore's three universities, and especially the National University of Singapore and Nanyang Technological University, have research partnerships with leading universities around the world with a focus in selected fields, including bioinformatics, information sciences and medical technologies.

At the school level, Singapore created a new educational vision, "Thinking Schools, Learning Nation". This major milestone in Singapore's education journey recognised Prime Minister Goh Chok Tong's belief that "A nation's wealth in the 21st century will depend on the capacity of its people to learn" (Goh, 1979). "Thinking Schools

represented a vision of a school system that can develop creative thinking skills, lifelong learning passion and nationalistic commitment in the young. Learning nation is a vision of learning as a national culture, where creativity and innovation flourish at every level of society" (Lee *et al.*, 2008).

Thinking Schools, Learning Nation encompassed a wide range of initiatives over a number of years that were designed to tailor education to the abilities and interests of students, to provide more flexibility and choice for students and to transform the structures of education. Career paths and incentives for teachers were revamped and teacher education upgraded, as described in more detail later. Curricula and assessment changes put greater emphasis on project work and creative thinking. A major resource commitment, involving three successive master plans, was made to information and communication technology (ICT) as an enabler of new kinds of self-directed and collaborative learning. A broader array of subject matter courses was created for students and a portfolio of different types of schools has been encouraged, specialising in arts, mathematics and science, and sports, as well as a number of independent schools. "We need a mountain range of excellence, not just one peak, to inspire all our young to find their passions and climb as far as they can," explained Tharman Shanmugaratnam, then minister for Education (cited in Lee *et al.*, 2008).

Major changes were also made in the management of schools. Moving away from the centralised top-down system of control, schools were organised into geographic clusters and given more autonomy. Cluster Superintendents – successful former principals – were appointed to mentor others and to promote innovation. Along with greater autonomy came new forms of accountability. The old inspection system was abolished and replaced with a school excellence model. It was felt that no single accountability model could fit all schools. Each school therefore sets its own goals and annually assesses its progress towards them against nine functional areas: five "enablers", as well as four results areas in academic performance (Ng, 2008).[3] Every six years there is an external review by the School Appraisal Branch of the ministry of Education. Greater autonomy for schools also led to a laser-like focus on identifying and developing highly effective school leaders who can lead school transformation. This is also described in more detail later.

In 2004, Prime Minister Lee Hsien Loong introduced the idea of "Teach Less, Learn More" as the next step under the Thinking Schools, Learning Nation umbrella. Its aim was to open up more "white space" in the curriculum to engage students more deeply in learning. Despite the system's widely-recognised successes, learners were still seen as too passive, overloaded with content, driven to perform, but not necessarily inspired. Teach Less, Learn More aims to "touch the hearts and engage the minds of learners by promoting a different learning paradigm in which there is less dependence on rote learning, repetitive tests and instruction, and more on engaged learning, discovery through experiences, differentiated teaching, learning of lifelong skills, and the building of character through innovative and effective teaching approaches and strategies." (Ho Peng, interview conducted for this report) Further moves in this direction were made in 2008 with an envisioning exercise that led to Curriculum 2015. According to Ho Peng, Director General of Education in the Singapore ministry of Education, this review asserted that the Singapore education system had strong holding power and important strengths in literacy, mathematics and science, and that these should remain. However, it needed to do better on the soft skills that enable future learning. In addition, "the overload of information has put a premium on the ability to do critical analysis. Working across cultures will require language skills and a larger world view" (Ng, 2008).

A review of primary schools in 2009 focused on the question of how each child's learning can be driven by their innate curiosity and love of play. Art, music and physical education (PE) are also being enhanced in the curriculum. Finally, Curriculum 2015 re-emphasises that education must be rooted in values: "Without a moral and ethical compass, all learning will come to nought. We must rebalance content, skills and character development to achieve a more holistic education," (Ng, 2008).

Current structure

In Singapore's education system today, students receive six years of primary education, and four to five years of secondary education, followed by two years at junior college, polytechnic or the Institute for Technical Education (Figure 7.1).[4]

Primary education consists of a four-year foundation stage during which all students follow a common curriculum that emphasises English, mother-tongue language and mathematics. Science is introduced from primary 3. Other subjects taught in primary school are civics and moral education, social studies, health, physical education, art and music.

■ Figure 7.1 ■

Singapore's education system organisation
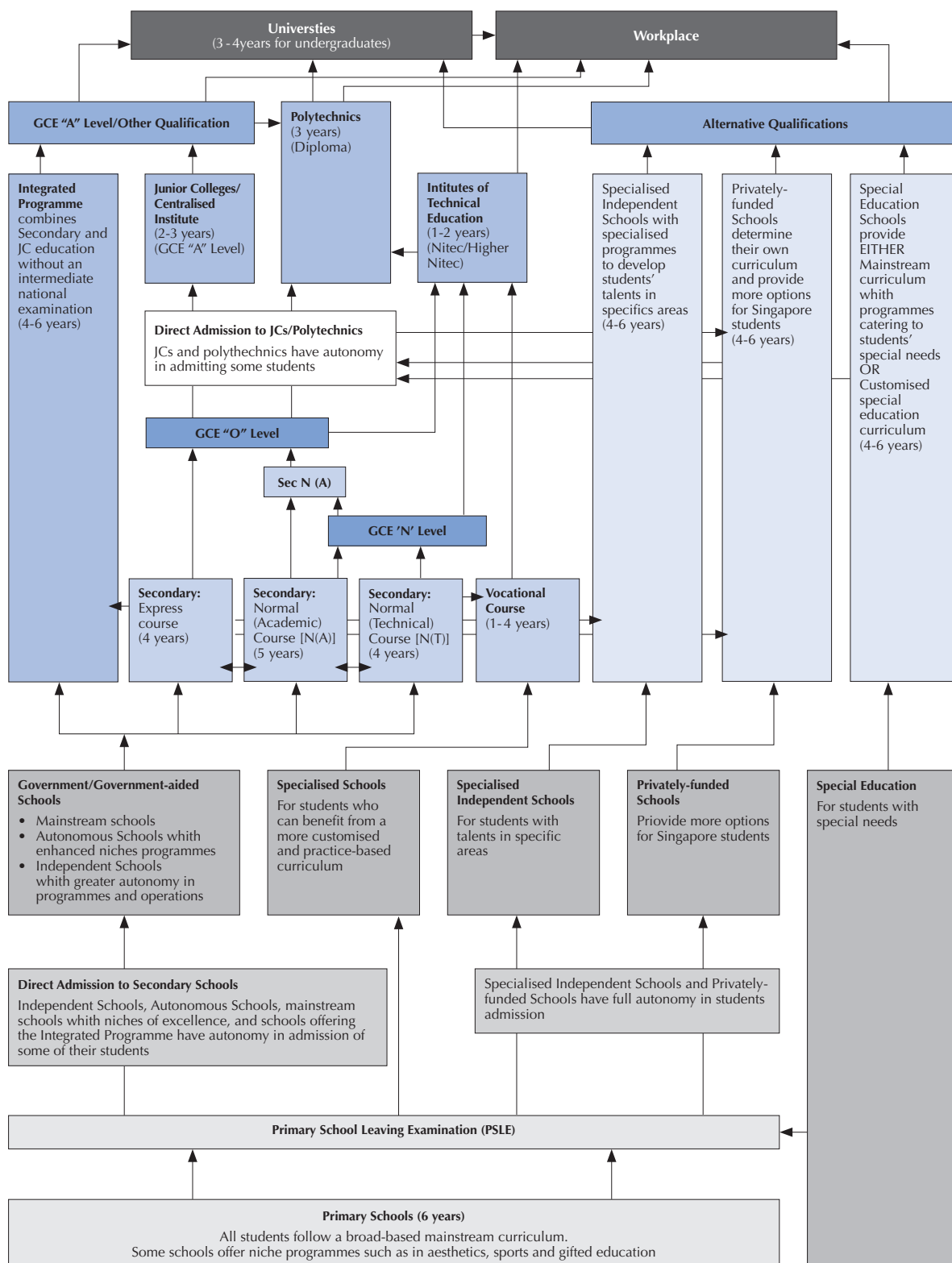
Source: Singapore Ministry of Education website: *www.moe.gov.sg/education/*.

Streaming, which was a key feature of the Singapore education system, was designed to allow students to progress at their own pace from primary 5 onwards. However, in 2008, streaming was replaced with subject-based banding. At the end of primary 6, all students sit for the Primary School Leaving Examination in English, mathematics, mother-tongue language and science. Based on the results of this examination, students are admitted to an express (60% of students), normal academic (25%) or normal technical (15%) course in secondary school.

Students in the express course follow a four-year programme culminating in the general certificate of education (GCE) O-level exam. Students in the normal academic course follow a four-year course to GCE N-level and may sit for O-levels in year five (Figure 7.2). The normal technical programme prepares students for technical higher education, jobs or the postsecondary ITE after a four-year programme leading to the GCE-N level. In recent years, more choice has been offered to students in secondary school, with a wider range of subjects at O-level and elective modules. Students who are clearly of university calibre may study in Integrated Programme Schools where they can skip O-levels; this arrangement allows them to engage in broader learning experiences that develop their leadership potential and capacity for creative thinking. There is now more horizontal mobility between courses, and students who do well are allowed to transfer between streams. The ratio among streams is further enhanced with students being able to follow subjects from a different stream. Schools specialising in sports, art and mathematics and science are also available, as well as a small number of independent schools.

After 10 years of general education, students go to post-secondary education, either junior colleges (31% of students), polytechnics (43%) or ITE (22%). Academically inclined students can take A-levels during this period and then proceed to university. Students may also take diploma courses in technical or business subjects at polytechnics. Many polytechnic graduates who have done well also go on to university. Students with GCE O- or N-levels can take skill-based certificates in technical or vocational subjects at ITE. Outstanding ITE graduates can also go on to polytechnics or universities. About 25% of a cohort goes on to university in Singapore (the number of places will rise to 30% in 2015). Many students also go abroad to university.

SINGAPORE'S SUCCESS IN EDUCATION

Singapore has pursued its vision of a high-quality education system over a long period of time and has accomplished significant improvements at each stage of its journey. What are some of the key features that have helped Singapore become so successful?

A forward-looking, integrated planning system

In modern Singapore, education has consistently been the building block for economic and national development. As Prime Minister Goh Chok Thong famously stated: "The wealth of a nation lies in its people."

Since the founding of the republic, the high value placed on education as the key to economic development and national cohesion in a country with no natural resources is evident in the statements of Singapore's senior leaders. But the statements about "nurturing every child" are not just political rhetoric. They have been accompanied by willingness at each stage to invest considerable financial resources in education. Education spending rose to 3.6% of GDP in 2010, approximately 20% of total government expenditure and second only to defence (Annex 7.A).

The linkage to economic development is tight and is driven from the top of the government. As Singapore evolved from an economy based on port and warehousing activities, through a low-wage, labour-intensive manufacturing economy, and then to a more capital and skill-intensive industry and finally to its current focus on knowledge-intensive industrial clusters, the education system was expected to ramp up the quality of its education and the supply of specific skills needed to make Singapore globally competitive.

Singapore has a uniquely integrated system of planning. The Manpower ministry works with various economic agencies (such as the Economic Development Board) responsible for promoting specific industry groups to identify critical manpower needs and project demands for future skills. These are then fed back both into pre-employment training and continuing education and training. In other countries, labour and education markets make these adjustments slowly over time, but the Singapore government believes that its manpower planning approach helps students to move faster into growing sectors, reduces oversupply in areas of declining demand more quickly, and targets public funds more efficiently for post-secondary education. The ministry of Education and the institutions of higher and post-secondary education then use these skill projections to inform their own education planning, especially for universities, polytechnics and technical institutes.

In short, the ability of the government to successfully manage supply and demand of education and skills is a major source of Singapore's competitive advantage. As Singapore seeks to become a global scientific hub, it is bringing together all aspects of the government – the finance ministry, economic development board, manpower ministry, education ministry, urban and environmental planning bodies, housing and immigration authorities – to create the next platform for Singapore's growth.

Singapore demonstrates strong alignment among policies and practices. One of the most striking things on visiting Singapore is that wherever one visits – whether the ministries of manpower, national development, community development, or education or the universities, technical institutes, or schools – he or she hears the same clear focus on the same bold outcomes: careful attention to implementation and evaluation, and orientation towards the future. "Milestone" courses bring together top officials from all the ministries to create a shared understanding of national goals. And a focus on effective implementation is shared throughout government. Because of the value placed on human resource development and the understanding of its critical relationship to economic development, Singapore's government provides a very clear vision of what is needed in education. This means that the ministry of Education can then design the policies and implement the practices that will meet this vision.

Close links between policy implementers, researchers and educators

At the institutional level, both policy coherence and implementation consistency are brought about by the very close tripartite relationship between the ministry of Education, the National Institute of Education (NIE, the country's only educator training institution), and the schools. The ministry is responsible for policy development, while NIE conducts research and provides pre-service training to educators. NIE's research is fed back to the ministry and is used to inform policy development (Box 7.1). Since NIE professors are regularly involved in ministry discussions and decisions, it is relatively easy for NIE's work to be aligned with ministry policies. NIE is Singapore's only institution for training prospective teachers, but professional in-service development for teachers comes from various institutions/ sources besides NIE.

Box 7.1 **Integration in action**

An example of the benefits of close tripartite co-operation is demonstrated by how Singapore moved from a purely knowledge-transmission education model to one that emphasised creativity and self-directed learning ("Thinking Schools, Learning Nation" and "Teach Less, Learn More"). This was advanced through ministry of Education policy directives, through the regular monthly meetings of cluster superintendents with principals, and through the frequent professional development opportunities for teachers. The government also funded a long-term Centre for Research in Pedagogy and Practice at NIE, which examined current teaching practices in Singapore classrooms, piloted new approaches and fed back the necessary changes to the ministry. Recently, NIE has revamped its teacher education model to produce teachers who themselves have such 21st century literacy (Low, 2010) and can create learning environments that enable their students to develop them too. Changing pedagogy is always difficult, but in Singapore there is much less of a gap than in other countries between policy and classroom delivery, and between the intended and the actual curriculum.

Policies with the means to implement them

According to David Hogan, Senior Research Scientist at NIE and interviewed for this report, the degree of institutional alignment in Singapore is very unusual in global terms. Singapore is a "tightly coupled" system in which the key leaders of the ministry, NIE, and the schools share responsibility and accountability. Its remarkable strength is that no policy is announced without a plan for building the capacity to meet it. And while there is variation in performance within schools, there is relatively little variation between schools. By contrast, more loosely-coupled systems have a much harder time bringing about reform initiatives and are often typified by an endless parade of new, sometimes conflicting policies, without building the capacity to meet them. The teacher preparation programmes in universities are also often not aligned with the reform policies. Consequently, practitioners become cynical and wait for successive reform waves to pass. There are usually also large discrepancies between schools in the extent to which reforms are carried out.

In recent years, Singapore has loosened its tight coupling somewhat. More autonomy has been given to schools so as to encourage more innovation, and NIE has the appropriate independence for an institute in a modern research-oriented university. However, there are still strong alignment among the curriculum, examinations and assessments; incentives for students to work hard; and accountability measures for teachers and principals. This makes policy making and implementation much easier and more effective than in loosely-coupled systems, like the US's system.

The advantages of a small scale

In trying to understand Singapore's success, it is also important to remember its small size. Singapore's national education system is more like that of a city or a small state, with approximately 522 000 students and 360 schools. Professor Lee Sing Kong, Director of the NIE, likens it to "turning around a kayak rather than a battleship". The stability of the government and the broad popular consensus on the purposes of education also make it possible to pursue policies for long enough to see if they have any impact.

Commitment to equity and merit

Singapore has demonstrated an unfailing commitment to equity and meritocracy. Meritocracy was a cornerstone philosophy of Lee Kuan Yew's government from the beginning. He believed it was the most efficient way to run a government and the only way to create a peaceful multi-ethnic society. The system of education during colonial times was highly elitist and separated by ethnicity and religion; he sought to replace it with a universal state-funded system in which talent and hard work would prevail.

At independence, there were large attendance and achievement gaps between the Chinese population, on the one hand, and the Tamil and Malay populations on the other. These gaps threatened the political stability of Singapore, as well as its economic development. In the first education phase, the survival phase, rapid expansion of schooling led to universal elementary and lower secondary education by the early 1970s. In the second phase, streaming was introduced to reduce the high drop-out rates from the system; although controversial, it was successful. Today, with a secondary school graduation rate of 98% (10th grade), the gaps in educational attainment have been substantially reduced. However, there is more work to be done. In the TIMMS results, for example, Singapore has very high mean achievement scores in mathematics and science but there is also a long tail to the achievement distribution. On other measures too, socio-economic status has a significant impact on achievement.

According to Professor Lee, the measures Singapore has taken to reduce the achievement gap have been both social and educational. Believing that the causes of underachievement lie in social structures such as single-parent families, Singapore has developed a system of local town and community councils that identify families in need and can provide a range of support, including financial assistance. In addition, each of the ethnic communities has a self-help community group, the Malay *Mendaki*, Indian *Sinda* and Chinese CDAC. These organisations are funded by members of each community and support children in need.

It would be interesting to explore whether Singapore's housing policies have an impact on its small achievement gap; 80% of people live in government-built, but self-owned apartments and ethnic groups are deliberately mixed in each housing block. When asked about this during interviews for this report, Professor Lee said that he did not know of any empirical studies, but thought that it seemed plausible that being in a community with high expectations for academic achievement would have an overall positive effect on children.

On the educational side, children who require additional support in learning to read are identified through screening tests at the start of first grade. These children are provided with daily systematic intervention by teachers in small groups (8-10 students) in learning support programmes so that they do not fall behind. About 12-14% of children need such support for reading. The curriculum includes phonics and English language development since many of the children speak languages other than English at home. Learning support programmes also exist in mathematics. In addition, while most preschools in Singapore are privately funded, the government provides funding support to preschools that cater for low-income students.

In recent years, Singapore has replaced streaming in elementary schools with subject matter banding. It has also created more opportunities for students to move horizontally between streams at the secondary level and beyond – to create more flexibility in the system and to recognise "late bloomers". Another remarkable feature of the Singapore education system is the value, attention and resources it devotes to lower level achievers, not just high achievers. This focus on "levelling up", so that the lowest stream gets very high quality training, exemplifies the "many pathways" approach and is discussed in the section below on the Institute for Technical Education. The resources devoted to vocational and technical training are immense and the vocational and technical system is perhaps the best in the world – a significant element of the Singapore success story.

The goal of the education system is to nurture every child, no matter what their ability or achievement level. The ecology of education reform rests on these shared values. Parents want good opportunities for their children, high levels of social mobility and rising levels of income. The government has delivered them, so most parents believe in the fairness of the system.

We have avoided the large disparities in educational standards seen elsewhere, between schools for the privileged and those for the masses. We have achieved high standards across a spectrum of abilities, allowing a large proportion of Singaporeans to proceed to high-quality post-secondary and tertiary education". (Tharman Shanmugaratnam, former minister of Education, cited in Lee, *et al.,* 2008)

A strong focus on mathematics, science and technical skills

Singapore has focused on the universal development of strong mathematics, science and technical skills (Box 7.2). The country's solid foundation in mathematics and science for all students in the elementary grades seems to be a core part of students' later success. At the primary and secondary levels, mathematics and science are core subjects that every student must take. Mathematics begin when students enter school in primary 1 and science is taught from primary 3 onwards. Students have specialist teachers in mathematics and science from upper primary onwards. Deployment of teachers is a school-based decision. Some schools deploy specialist teachers in mathematics and science, although often teachers teach English, mathematics and science. From upper secondary onwards, there is a range of specialised mathematics courses at higher levels for those students who are interested. At the tertiary level, more than half the programmes are oriented towards science and technology.

Box 7.2 **Valuing technical education: The Institute for Technical Education**

In many countries, technical education is looked down upon as a dead-end option, of low quality and typically out of step with the changing needs of employers. But vocational education has been an important pathway in Singapore's journey to educational excellence. In 1992, Singapore took a hard look at its own poorly-regarded vocational education and decided to transform and reposition it so that it was not seen as a place of last resort. Dr Law Song Seng led the creation of the Institute for Technical Education (ITE), which transformed the content, quality and image of vocational education. Its goal was to build a world-class technical education institution that is "effective, relevant and responsive to the knowledge-based economy" (Lee *et al.*, 2008). ITE's founders brought in leaders with a broad vision and staff committed to caring for students. They completely revamped the curriculum and workforce certification system, developed courses in new industries and consolidated existing technical campuses into three mega campuses with a sophisticated technology base and close ties to international corporations. To combat the societal prejudice against less academically-inclined students, ITE promoted and rebranded its kind of "hands-on, minds-on, hearts-on" applied learning. The result has been a doubling of enrolment since 1995, and ITE students now constitute about 25% of the post-secondary cohort. More than 82% of students in 2009 completed their training and are placed in jobs. Pay levels for ITE graduates have also been strong, and the ITE track is now seen by students as a legitimate path to a bright future. Part of the reason for the success of the technical education at ITE is that students get a strong academic foundation early in their academic careers so they can acquire the more sophisticated skills required by leading edge employers. The ITE received the IBM Innovations Award in Transforming Government, given by the Ash Center for Democratic Governance and Innovation at the Harvard Kennedy School and has been recognised world-wide as a global leader in technical education.

The Singapore approach to mathematics is distinctive and has become well-known because of Singapore students' success. Developed in the 1980s from reviews of mathematics research around the world, and refined several times since, the Singapore national mathematics curriculum is based on the assumption that the role of the mathematics teacher is to instil "maths sense". In a Singapore classroom, the focus is not on one right answer; rather the goal is to help students understand how to solve a mathematics problem. The Singapore "Model Method" also makes extensive use of visual aids and visualisation to help students understand mathematics. The concrete-pictorial-abstract model used is based on an understanding of how children learn mathematics rather than on language considerations. Teachers cover far less material than in many other countries, but cover it in depth: the goal is to master mathematics concepts (Hong *et al.*, 2009). The level of mathematics in the Primary School Leaving Examination (grade 6), is approximately

two years ahead of that in most US schools (Schmidt, 2005). Singapore mathematics also blurs the distinction between algebra and geometry. These concepts are integrated into basic mathematics instruction before students reach high school. Singapore teachers are all trained in how to teach the national mathematics curriculum and meet regularly to fine tune exercises and hone lessons.

The Singapore national science curriculum in primary and lower secondary grades focuses on developing the idea of science as inquiry through three domains: 1) knowledge, understanding and application; 2) skills and processes; and 3) ethics and attitudes. To awaken students' interest in science as a useful skill, inquiry projects are based on the roles played by science in daily life, society and the environment. Co-curricular activities such as mathematics and science fairs, competitions and learning trails (applying mathematics and science subjects in outdoor settings) are designed to generate interest among students. The DNA Centre at the Singapore Science Center develops hands-on activities for learning life sciences, and the government science agency A*STAR exposes students to research done by working scientists.

Human resource management which matches the demands of the system

The high quality of Singapore's workforce today is the result of deliberate policy actions, especially dating from the 1990s onwards. Since then, high-quality teachers and school leaders have formed the cornerstone of the education system and are a major reason for its high performance. Rather than focusing on just one element, Singapore has developed a comprehensive system for selecting, training, compensating and developing teachers and principals, thereby creating tremendous capacity at the point of education delivery. Key elements of that system are described below:

- *Recruitment:* Prospective teachers are carefully selected from the top one-third of the secondary school graduating class, by panels that include current principals. Strong academic ability is essential, as is commitment to the profession and to serving diverse student bodies. Prospective teachers receive a monthly stipend that is competitive with the monthly salary for fresh graduates in other fields. They must commit to teaching for at least three years. Interest in teaching is seeded early through teaching internships for high school students; there is also a system for mid-career entry, which is a way of bringing real-world experience to students.

- *Training:* All teachers receive training in the Singapore curriculum at the National Institute of Education (NIE) at Nanyang Technological University. They take either a diploma or a degree course depending on their level of education at entry. There is a close working relationship between NIE and the schools, where all new teachers are mentored for the first few years. As NIE's primary purpose is training all Singapore teachers, there are no divisions between arts and sciences and education faculties. Thus, according to Lee Sing Kong, the conflicting priorities that plague many Western teacher education programmes are less significant and there is a stronger focus on pedagogical content. NIE has put in place a matrix organisational structure whereby programme offices (*e.g.* Office for Teacher Education) liaise with individual academic groups in drawing up initial teacher training programmes. This means that these programmes are designed with the teacher in mind, rather than to suit the interests of the various academic departments. As such, there is a stronger focus on pedagogical content and greater synergies among modules within each programme.

- *Compensation*: The ministry of Education keeps a close watch on occupational starting salaries and adjusts the salaries for new teachers to ensure that teaching as seen as equally attractive as other occupations for new graduates. Teacher salaries do not increase as much over time as those in private sector jobs, but there are many other career opportunities within education for teachers. Teaching is also regarded as a 12-month position. There are retention bonuses and high-performing teachers can also earn significant amounts in performance bonuses.

- *Professional development*: In recognising the need for teachers to keep up with the rapid changes occurring in the world and to be able to constantly improve their practice, they are entitled to 100 hours of professional development per year. This may be undertaken in several ways. Courses at the National Institute of Education focus on subject matter and pedagogical knowledge and lead towards higher degrees or advanced diplomas. Much professional development is school-based, led by staff developers. Their job is to identify teaching-based problems in a school, for example, with a group's mathematics performance; or to introduce new practices such as project-based learning or new uses of ICT. Each school also has a fund through which it can support teacher growth, including developing fresh perspectives by going abroad to learn about aspects of education in other countries. Teacher networks and professional learning communities encourage peer-to-peer learning and the Academy of Singapore Teachers, was opened in September 2010 to further encourage teachers to continuously share best practices.

- *Performance appraisal*: Like every other profession in Singapore, teachers' performance is appraised annually by a number of people and against 16 different competencies. Included in this Enhanced Performance Management System is teachers' contribution to the academic and character development of the students in their charge, their collaboration with parents and community groups, and their contribution to their colleagues and the school as a whole. Teachers who do outstanding work receive a bonus from the school's bonus pool. This individual appraisal system sits within the context of great attention to the school's overall plan for educational excellence, since all students in Singapore have multiple teachers, even in primary school.

- *Career development*: Throughout Singapore, talent is identified and nurtured rather than being left to chance. After three years of teaching, teachers are assessed annually to see which of three career paths would best suit them – master teacher, specialist in curriculum or research or school leader. Each path has salary increments. Teachers with potential as school leaders are moved to middle management teams and receive training to prepare them for their new roles. Middle managers' performance is assessed for their potential to become vice principals, and later, principals. Each stage involves a range of experience and training to prepare candidates for school leadership and innovation.

- *Leadership selection and training*: Singapore has a clear understanding that high-quality teaching and strong school performance require effective leaders. Poor quality leadership is a key factor in teacher attrition in many countries (Ng, 2008). Singapore's approach to leadership is modelled on that found in large corporations. The key is not just the training programme, but the whole approach to identifying and developing talent. This differs from the US or UK approach, for example, in which a teacher can apply to train as a principal or school head, and then apply for a position in a school. In Singapore, young teachers are continuously assessed for their leadership potential and given opportunities to demonstrate and learn, for example, by serving on committees, then being promoted to head of department at a relatively young age. Some are transferred to the ministry for a period. After these experiences are monitored, potential principals are selected for interviews and go through leadership situational exercises. If they pass these, then they go to NIE for six months of executive leadership training, with their salaries paid. The process is comprehensive and intensive and includes an international study trip and a project on school innovation. Only 35 people per year are selected for the executive leadership training. Asked why Singapore uses the "select then train" rather than the "train then select" model, Professor Lee Sing Kong said that while the US/UK approach is feasible, it carries a higher risk. Singapore is very confident that they consistently have the best possible leaders for their schools and that there is a wide range of inputs into their selection. Principals are transferred between schools periodically as part of Singapore's continuous improvement strategy.

By putting its energy in the front end of recruiting high-quality people and giving them good training and continuing support, Singapore does not have the massive problems of attrition and persistently ineffective teachers and principals that plague many systems around the world. Teaching has developed into a competitive and well-regarded occupation. It is also now considered to be an honour to be a teacher in Singapore.

Finally, another critical aspect of the human resource capacity of the Singapore system is the civil service. Lee Kuan Yew's philosophy of governance was to recruit very high quality people into public service. Singapore has an extremely competent civil service, including in the ministry of Education. Top civil servants are carefully selected, well-trained (many at the best universities in the world), pragmatic, hard-working and well-paid. They have a global outlook, paying attention to education developments around the world, and are accustomed to using data and evidence in decision making. They have clear responsibility for the efficiency and effectiveness of the Singapore education system.

A system which is continuously being improved

While Singapore has devolved considerable authority to schools in recent years, it is still a centrally-driven government system. In many countries, government bureaucracies are sclerotic and move about as fast as molasses. But Singapore has inculcated an attitude and developed mechanisms for continuous improvement. In addition to the ties to economic planning that drove the major shifts in educational goals between the three major phases, there is a multitude of smaller changes and improvements being made, seemingly constantly.

Officials from the ministry and NIE frequently visit schools and have a good informal idea of what is going on, unlike the remote government departments and universities in many countries. They also pay a great deal of attention to data such as the School Cockpit and Student Hub data systems (internal ministry data systems).

There is now also a high level of investment in research relative to the size of the country (Hogan, interview conducted for this report). The publication of the policy document, "Thinking Schools, Learning Nation" in 1997 led to a national education research agenda costing SGP 50 million (about USD 38 million). A wide range of different types of research has been carried out, with research design decided by researchers not the government. One major set of studies was carried out by David Hogan, former Dean and now Senior Research Scientist at the Centre for Research on Pedagogy and Practices at NIE (and an interview partner for this report). This six-year effort aimed to understand to what extent modern pedagogical practices were being used in Singapore classrooms. It piloted interventions to demonstrate how to move classrooms from a predominantly knowledge transmission model to a 21st century model where students engage in complex knowledge construction. This research does not just sit on a shelf, but is regularly referred to in the ministry's deliberations.

Singapore has also made extensive use of international benchmarking as a tool for improvement and to move up the educational value chain. Staff of the ministry, NIE, and the schools all visit other systems and explore international best practice. Typically, the visits and research focus on very specific issues and on what does and doesn't work in implementing particular policies. For example:

- Singapore's mathematics curriculum was developed after reviewing mathematics research and practice from around the world.
- Recently, ministry of Education personnel visited the United States and other countries to examine language teaching to non-heritage speakers (heritage speakers of a language are those who learn it at home).
- Ministry staff have also visited a number of countries, including Hong Kong, Australia, Scotland and Sweden, to examine new kinds of assessments.

As a result, Singapore classrooms incorporate a wide range of pedagogical styles. Principals and master teachers are also encouraged to examine innovations in other countries and explore how they could be adapted for use in Singapore schools. A couple of years ago, a Washington Post reporter covered a visit by a group of Singapore principals to several schools in northern Virginia. "Why," she asked, "since Singapore is best in the world on the TIMSS international mathematics and science assessments, was a group of Singapore principals visiting science classes in northern Virginia schools?" The Singapore response: "There is no perfect system in the world. There are pockets of excellence in many places; the key is how to adapt them to the local context and implement them well."

Whenever Singapore seeks to create a new institution, it routinely benchmarks its planning to the best in the world. If Singapore is not in a position to create a world-class institution in a particular field, it will try to import the expertise. For example it did this in its recent partnerships with Duke University to create a new medical centre, and with Yale University to create a liberal arts college. All Singapore educational institutions – from the National University of Singapore ("A global university centred in Asia") to individual schools – are being encouraged to create global connections in order to develop "future-ready Singaporeans".

FUTURE CHALLENGES FOR SINGAPORE'S EDUCATION SYSTEM

While all these features have helped to make Singapore the world-class education system it is today, no system should rest on its laurels. Singapore educators are certainly not complacent. As a small country in an information- and innovation-driven globalised economy, it is always vulnerable to the actions of larger players. The education system is now expected to provide the kind of high-skilled creative, flexible workers needed for the 21st century economy. And the education system is responding through a wide variety of initiatives flowing from the "Thinking Schools, Learning Nation" paradigm shift. However, one constraint is the assessment system, which sets high standards but also inhibits innovation. The Singapore ministry of Education recognises the need for change but there is, as yet, no agreed approach for measuring the new kinds of complex 21st century skills. Just as importantly, it is difficult for teachers, themselves trained in a teacher-dominated pedagogy, to fundamentally change their practice. Singapore leaders worry that as the economy continues to grow and change and as these new demands are being placed on teachers, it may become harder to recruit the kind of top-level people into teaching that are needed to support the new kinds of learning. Finally, the economic changes associated with globalisation are increasing the levels of inequality in Singapore, as in many other countries. While Singapore has significantly closed its achievement gaps and focused on bringing up the lowest achievers, there is still a stronger correlation between socio-economic status and achievement than Singapore education leaders would like.

Still, Singapore has "built a system in which students are routinely taught by well-prepared teachers who work together to create high-quality curriculum, supported by appropriate materials and assessments that enable ongoing

learning for students, teachers and schools alike" (Darling-Hammond, 2010).

LESSONS FROM SINGAPORE

Singapore is both a "rapid improver" and a "continuing high performer". To those who believe that large-scale change in educational performance is not possible, Singapore has shown several times over that significant change *is* possible. Singapore has developed a high-quality system in terms of educational retention, quality and efficiency. To become and remain high-performing, countries need a policy infrastructure that drives performance and builds the capacity for educators to deliver it in schools. Singapore has developed both. Where Singapore is today is no accident. It is the result of several decades of judicious policy and effective implementation. On the spectrum of national reform models, Singapore's is both comprehensive – the goal has been to move the whole system – and public policy-driven.

While the small-scale and tightly-coupled nature of the education system in Singapore may make its approaches seem inapplicable elsewhere, in fact, Singapore is the size of many states/ provinces or large cities in other countries. Many of its principles and practices *are* applicable to countries of a different scale and governance structure, although their implementation would have to take a different form. Some of the key lessons learned from Singapore are as follows:

- **Vision and leadership**

Leaders with a bold long-term vision of the role of education in a society and economy are essential for creating educational excellence. Changing any system takes five to ten years – where there are frequent changes of political leadership, a guiding coalition needs to be created to keep the vision moving forward rather than having a change of direction with every change of government.

- **Alignment of the education system to economic development goals**

The strong link between education and economic development in Singapore has kept investment in education a central priority, made education policies highly pragmatic, led to high-quality mathematics and science and also to world-class vocational/technical education – an area where most countries fail. It has also kept education dynamic, expecting to change as conditions change rather than being mired in the past. While the tightness of the link may not be possible in less planned economies, bringing together economic and education policy makers, business and education leaders to continually assess changes in economic conditions and how education and economic development could better work together would strengthen both.

- **Coherence of the education system**

In many countries there is an enormous gap between policies and their implementation at the school level. In Singapore, whenever a policy is developed or changed, there is enormous attention to the details of implementation – from the ministry of Education, to the National Institute of Education, cluster superintendents, principals and teachers. The result is a remarkable fidelity of implementation and relatively little variation across schools. While different mechanisms would be needed in larger, more multi-layered or decentralised systems, finding ways to bring greater alignment and to make all the parts work together is essential for producing results in the classroom in other nations' systems.

- **Clear goals, rigorous standards and high-stakes gateways**

Singapore's education system is extremely rigorous. The academic standards set by its Primary School Leaving Examination and O- and A-levels are as high as anywhere in the world. Rigour is the watchword. Students, teachers and principals all work very hard towards these important gateways. All students have a strong early foundation in the core subjects of mathematics, science, and literacy in two languages.

- **Curriculum, instruction and assessment to match the standards**

Singapore does not just establish high standards and then leave it to individual teachers to figure out how to achieve them. Serious attention to curriculum development has produced strong programmes in mathematics, science, technical education and languages, in particular, and has ensured that teachers are well-trained to teach them. Having been very successful as a knowledge transmission education system, Singapore is now working on curriculum, pedagogy and assessments that will lead to a greater focus on high-level, complex skills.

- **High-quality teachers and principals**

In earlier times, Singapore often had teacher shortages and was not always able to attract the highest quality people into teaching. In the 1990s, Singapore put in place a comprehensive and intensive human resource system to obtain high-quality teachers and school leaders who could meet its ambitions for its students. The system rests on

active recruitment of talent, accompanied by coherent training and serious and continuing support. Education policies in Singapore today are less focused on structure and more on maintaining and increasing the quality of the educational professions. In 2007, it introduced the GROW package, consisting of measures to promote teacher Growth, Recognition, Opportunity and Well-Being.

▪ Strong central capacity and authority to act

The ministry of Education in Singapore is staffed by knowledgeable, pragmatic individuals, trained at some of the best universities in the world. They function in a culture of continuous improvement, constantly assessing what is and isn't working using both data and practitioner experience. They respect and are respected by professionals in the schools. Whilst countries vary in whether the locus of authority is at the national state/province or local level, whoever is charged with developing strategy and holding authority would do well to emulate the competence and capacity of the Singapore ministry of Education.

▪ Accountability

Singapore runs on performance management. Teachers, principals, ministry and NIE staff, students – all have incentives to work hard. To maintain the performance of teachers and principals, serious attention is paid to setting annual goals, to garnering the needed support to meet them and to assessing whether they have been met. Data on student performance are included, but so too are a range of other measures, such as contribution to school and community, and judgements by a number of senior practitioners. Reward and recognition systems include honours and salary bonuses. Individual appraisals take place within the context of school excellence plans. While no country believes it has got accountability exactly right, Singapore's system uses a wide range of indicators and involves a wide range of professionals in making judgements about the performance of adults in the system.

▪ Meritocratic values

Underpinning the whole Singaporean system is the belief – for students of all ethnic backgrounds and all ranges of ability – that education is the route to advancement and that hard work and effort pay off. The government has developed a wide range of educational and social policies to advance this goal, with early intervention and multiple pathways to education and career. The success of the government's economic and educational policies has brought about immense social mobility that has created a shared sense of national mission and made cultural support for education a near-universal value.

Lee Kuan Yew's greatest fear was that his little country would fall prey to the kinds of ethnic and religious rivalries that have thwarted the development of so many other societies. He realised that what happens in the schools could be one of the most important antidotes to this threat. So the schools became a theatre in which the country would do everything possible to give all students the skills and knowledge needed to succeed, independent of their socio-economic status. Singapore makes sure that every school has a fair share of the best teachers, and assigns their best teachers to the students who are struggling. They have been especially successful at training their teachers to diagnose student challenges and figure out how to address those challenges successfully. The belief that achieving high standards is a function of effort is stoutly embraced in Singapore and extends to the great emphasis put on raising the quality of the educators. Singapore is exemplary in the professional way that its teachers view their responsibilities. All these elements of policy have combined to produce a remarkably well-performing education system.

▪ Adaptation of proven practices from abroad

The design of Singapore's education system owes a lot to lessons from other parts of the world. Focused and universal use of international benchmarking and, more recently, significant funds for research, have enabled Singapore to move up the value chain and foster a culture in which it never stands still. This system recognises the rapidity of change around the world and has the capacity and inclination to learn and adapt. Singapore fosters a global outlook for everyone – teachers, principals, and students – who are expected to have "global awareness and cross-cultural skills" and to be "future-ready". In the words of Tan Chorh Chuan, President of the National University of Singapore, Singaporeans must be ready to "scale new heights in a changed world."

 While the specific details of Singapore's education system remain particular to Singapore, the lessons from its education journey to excellence can be generalised for other settings. Success requires a clear vision and belief in the centrality of education for students and the nation; persistent political leadership and alignment between policy and practice; a focus on building teacher and leadership capacity to deliver reforms at the school level; ambitious standards and assessments; broad support in the population; and a culture of continuous improvement and future orientation that benchmarks educational practices against the best in the world.

WHERE IS SINGAPORE ON THE EDUCATIONAL CONTINUUM?

Singapore could be the "poster child" for the education development continuum described in Chapter 1 of this report (Figure 1.1). From a standing start in 1960, this small country has steadily advanced to the point at which it is now widely recognised as having one of the world's leading economies and most advanced and successful education systems. As this chapter has pointed out, that was no accident. Singapore's leaders were determined from the beginning not just to attract foreign business investment with low-cost labour, but to raise incomes in Singapore as rapidly and widely as possible. They knew that education and training had to be key elements in their strategy. More than any other country in the world, Singapore has aggressively pursued a policy of advancing in education and other arenas by systematically benchmarking the world's best performance and creating a world class education system based on what they have learned through their benchmarking.

■ Figure 7.2 ■
Singapore: Profile data

Language(s)	English (official language); Malay (national); Mandarin Chinese; Tamil[5]
Population	4 987 6006
Growth rate	5.3%[7] (OECD 0.68%; World 1.19%)[8]
Foreign-born population	Chinese: 74%; Malay: 13.4%; Indian: 9.2%; Other: 3.2%[9]
GDP per capita	USD 37 293[10]
Economy-Origin of GDP	Electronics, petroleum refining, chemicals, mechanical engineering and biomedical sciences sectors[11] Manufacturing: 26% (2005)[12]
Unemployment	3.2% (2008)[13] (OECD average 6.1%)[14]
Youth unemployment	Females (15-24 year-olds): 11.1%; Males (15-24 year-olds): 6.9% (2007)[15] (OECD average 13.8%)[16]
Expenditure on education	2.8% of GDP[17]; (OECD average 5.2%)[18] 15.3% of total public expenditure[19], (OECD average 13.3%)[20] of which: 21% on primary education 33% on secondary education 34% on tertiary education 12% on unknown[21]
Enrolment ratio, early childhood education	No data (regional average 49%)[22]
Enrolment ratio, primary education	106.2% (2007)[23] (regional average 110%)[24]
Enrolment ratio, secondary education	76.4% (2007)[25] (regional average 77%)[26]
Enrolment ratio, tertiary[27] education	No data (regional average missing)[28]

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Interview partners

Ho, Peng, Director General of Education, Ministry of Education, Singapore

David Hogan, Principal Research Scientist, National Institute of Education, Singapore

Lee Sing Kong, Director, National Institute of Education, Singapore

Pang, Elizabeth. Programme Director, Literacy Development, Curriculum Planning and Development Division, Ministry of Education, Singapore

Wong, Siew Hoong, Director of Schools, Schools Division, Ministry of Education, Singapore

Representatives from the Economic Development Board, Housing Development Board, Ministry of Manpower, National University of Singapore, Ministry of National Development, NUS School of Science and Math, Victoria High School, Chongfu Primary School, Assumption Pathway School, Institute of Technical Education, National Institute of Education, A*Star, Keppel Offshore and Marine, and Marshall Cavendish who met with a delegation from North Carolina State Board of Education, January 2010.

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Notes

1. This evolution from four languages to English was a result of parental choice, rather than government decree.

2. This figure dropped to 4% in 2000, 2% in 2006 and 1.2% in 2009.

3. The five enablers are leadership, staff management, strategic planning, resources and student-focused processes. The four result areas are outcomes of holistic development of students (which includes academic results), staff well-being results, administrative and operational results and results of engagement with partners and community.

4. Polytechnic education lasts three years, leading to a diploma; ITE education lasts two to three years, depending on the qualifications sought.

5. "Republic of Singapore Independence Act". *http://statutes.agc.gov.sg/non_version/cgi-bin/cgi_getdata.pl?actno=1997-REVED-RSI&doctitle=REPUBLIC%20OF%20SINGAPORE%20INDEPENDENCE%20ACT%0A&date=latest&method=whole.*

6. *Population (Mid Year Estimates) & Land Area.* 2009. Statistics Singapore, *www.singstat.gov.sg/stats/keyind.html#popnarea.*

7. Annual population growth rate, 2008, *http://data.worldbank.org/country.*

8. OECD (2010), *OECD Factbook 2010,* OECD Publishing. Annual population growth rate (data from 2007).

9. http://www.singstat.gov.sg/

10. Singapore". International Monetary Fund. *http://www.imf.org/external/pubs/ft/weo/2010/01/weodata/weorept.aspx?sy=2007&ey=2010&scsm=1&ssd=1&sort=country&ds=.&br=1&c=576&s=NGDPD%2CNGDPDPC%2CPPPGDP%2CPPPPC%2CLP&grp=0&a=&pr.x=43&pr.y=11.*

11. Gross Domestic Product by Industry" (PDF). Singapore Department of Statistics. 2007. *http://www.singstat.gov.sg/stats/themes/economy/ess/essa11.pdf.*

12. Gross Domestic Product by Industry" (PDF). Singapore Department of Statistics. 2007. *http://www.singstat.gov.sg/stats/themes/economy/ess/essa11.pdf.*

13. *http://data.worldbank.org/country.*

14. OECD (2010), *OECD Factbook 2010,* OECD Publishing. Total unemployment rates as percentage of total labour force (data from 2008).

15. *http://data.worldbank.org/country.*

16. OECD (2010), *Employment Outlook,* OECD Publishing. Unemployed as a percentage of the labour force in the age group: youth aged 15-24, data from 2008.

17. UNESCO-UIS (2010), *UIS Statistics in Brief: Singapore,* data from 2008.

18. OECD (2010), *Education at a Glance 2010,* OECD Publishing.

19. UNESCO-UIS (2010), *UIS Statistics in Brief: Singapore,* data from 2008.

20. OECD (2010), *Education at a Glance 2010,* OECD Publishing.

21. UNESCO-UIS (2010), *UIS Statistics in Brief: Singapore,* data from 2008.

22. UNESCO-UIS (2010), *UIS Statistics in Brief: Singapore.* Percentage represents gross enrolment rate for MF; 2008 (regional average 49%).

23. *http://data.worldbank.org/country,* from UNESCO-UIS.

24. UNESCO-UIS (2010), *UIS Statistics in Brief: Singapore.* Percentage represents gross enrolment rate for MF; 2008 (regional average 110%).

25. *http://data.worldbank.org/country,* UNESCO-UIS (2010).

26. UNESCO-UIS (2010), *UIS Statistics in Brief: Singapore.* Percentage represents gross enrolment rate for MF; 2008 (regional average 77%).

27. The OECD follows standard international conventions in using the term "tertiary education" to refer to all post-secondary programmes at ISCED levels 5B, 5A and 6, regardless of the institutions in which they are offered. OECD (2008), *Tertiary Education for the Knowledge Society: Volume 1,* OECD Publishing.

28. UNESCO-UIS (2010), *UIS Statistics in Brief: Singapore,* data from 2008.