

Shaping the Education of the Future — Singapore's Expectations

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Is there a need to restructure the knowledge base of education in Asia? Have our education systems not served us well? The past two decades have seen most countries in Asia showing impressive economic growth and social development. This has often been attributed to our students doing well in examinations and integrating successfully into a disciplined workforce.

However, as we approach the close of the 20th century, globalization and the accelerated pace of technological development with accompanying socio-political and cultural changes, make it imperative for our educational systems to broaden the focus beyond examination results and discipline. The future workforce will require creative and critical thinkers. Globalization poses new economic challenges especially the mobility of trained labor and those with entrepreneurial skills. The power of information and communication technology has already and will continue to dramatically alter the workplace.

How is the education system to respond? What parts of old knowledge are still relevant? What are the building blocks of the new knowledge base? There are probably no Pan-Asian answers to this issue, but if Asia is to continue to thrive, we have to equip our teachers with the necessary mindsets and skills to put in place new teaching and assessment methodologies that will help nurture among our students the need for life-long learning, creativity and innovation, values, effective communication skills, and confidence in themselves and their future.

Introduction

Most East Asian nations with the exception of Japan (which started reform

early and in its own culturally embedded ways) borrowed, or had imposed on them during the period of colonization, metropolitan, i.e., "Western-type" models based on an industrial-manufacturing model for their education systems — the curriculum, textbooks (often imported), examinations, which led to higher education at the metropolitan centers, models of teacher training, school organization, etc. These features were combined with some cultural attributes — a belief in the value of education, of merit in achievement, high levels of parental involvement, a common curriculum, frequent assessments to monitor standards, homework to ensure mastery of content, effective whole class teaching to reach all students, relatively high regard for teachers, to produce education systems that are now admired by politicians and policy makers in developed countries. East Asian education systems also emphasized values, especially values of social cohesion and produced disciplined and hardworking workers who contributed much to the rapid economic growth of East Asian countries over the last quarter century.

To a visitor from another planet (assuming he has observed and understood our present education, economic and cultural systems), it may appear strange, if not paradoxical, that Asians are now making fundamental reforms to their education systems, which after all have served them well till now.

He may well ask what we are asking at this international conference — why is there a need to restructure the knowledge base of education in Asia? How have our education systems failed us? The past two decades have seen most countries in East Asia showing impressive economic growth and social development. This success has often been attributed to our students doing well in examinations and integrating successfully into the economy as disciplined workers (Berger & Hsiao, 1988; World Bank, 1993). In the industrial-manufacturing era, discipline and hard work were valuable in the economy and as a result, our education systems were functionally relevant.

However, as we approach the close of the twentieth century, globalization and the accelerated pace of technological development with accompanying socio-political and cultural changes, make it imperative for our education systems to broaden their focus beyond examination results and discipline.

The Prime Minister of Singapore, Mr Goh Chok Tong, puts it this way. He said (at the opening of the 7th International Conference on Thinking, June 1997):

We have to prepare ourselves for a bracing future — a future of intense (global) competition and shifting competitive advantages, a future where technologies and concepts are replaced at an increasing pace and a future of changing values. Education and training are central to how nations will fare in this future. (Goh, 1998)

Workforce of the 21st Century

Thus, the workforce of the twenty-first century will require creative and critical thinkers, change-adept individuals, innovative and science/technology savvy workers and life-long learners as the world of work is no longer manufacturing-dominated and the nature of manufacturing itself has changed. Globalization poses new economic challenges, especially as regards the mobility of trained labor and those with entrepreneurial skills. The power of information and communication technologies has already begun to and will continue to dramatically alter the workplace (Lee, 1995). Developments in science are challenging established values and creating ethical dilemmas. The cloning of Dolly the sheep and the stated intention by a US scientist to try human cloning; the insertion of human genes into animals to produce vaccines, hormones, etc., are but two examples of great scientific achievements that leave human civilization with disturbing and unanswered questions.

How is the education system to respond? What parts of the old knowledge base are still relevant? What are the building blocks of the new knowledge base? What limitations to reform should we keep in mind so that the baby does not get thrown out with the bath water?

Meeting the Challenges of the Future

There are probably no Pan-Asian solutions to these issues, but permit me to present what Singapore is doing or planning to do to prepare our students to meet the challenges of the future. I hope that despite the limited single-country experience I can share with you, it will stimulate reflection and discussion among ourselves over the next few days and after we return to our respective institutions.

To begin with, it is necessary to understand a little about Singapore's education system. As a British colony, Singapore inherited the British education model and the assumptions on which the model was built;

however, while the British moved into comprehensive schooling, Singapore continues with a tracked system. During colonial times, the curriculum was weighted heavily in terms of the humanities and social science disciplines. It was also a system segregated along medium-of-instruction sectors with the non-English educated, especially the Chinese-educated, hostile and alienated from the English-dominated government.

Post-war education policy has sought to build a national system of education built upon equality of treatment, a national curriculum and common examinations and consistent emphasis on value inculcation to unify the different cultural groups and promote national solidarity. Equally significant in the curriculum was an emphasis on science and mathematics education, technical subjects and the building up of an infrastructure of first vocational, then technical institutions to feed an economy that had been developed upon an export-to-developed markets strategy (Gopinathan, 1974, 1995).

Over the years, the education system has matured and by all accounts is an effective one. Years of good economic growth have enabled the government to invest heavily in education and schools are well resourced. The government has tied curriculum reform to economic change to ensure a close fit between economic needs and school outcomes; access to tertiary education has been restricted to about 20% of the cohort while polytechnic education has expanded to cater to 40% of the cohort (Lee, 1997).

Singapore's Ministry of Education started the process of reform two years ago when it launched several major initiatives, viz., making greater use of IT, reducing curriculum content, improving assessment modes, teaching creative thinking skills, revamping and increasing career paths for teachers, stressing national education (values/responsible citizenship), and giving schools more resources and greater autonomy. Why did the Ministry embark on these steps? Prime Minister Goh explained at the Thinking Conference in June 1997:

We cannot assume that what has worked well in the past will work for the future. The old formulae for success are unlikely to prepare our young for the new circumstances and new problems they will face. We do not even know what these problems will be, let alone be able to provide the answers and solutions to them. But we must ensure that our young can think for themselves, so that the next generation can find their own solutions to whatever new problems they may face. Singapore's vision for meeting this challenge is encapsulated in four words THINKING SCHOOLS, LEARNING NATION (TSLN). It is a vision for a total learning environment, including students,

teachers, parents, workers, companies, community organizations and government. (Goh, 1998)

The Deputy Prime Minister, BG Lee Hsien Loong, followed on in November 1997 at an education forum for Polytechnic students. He said:

Our schools and tertiary institutions must become learning organizations, not teaching factories. Teachers and lecturers should continuously seek to improve, to pick up best practices elsewhere and to challenge students to find better solutions. These changes in our education system need to be supported by a national environment that promotes a learning mindset and a society which upholds the fundamental values of equal opportunity and meritocracy. This is the way to become a learning nation.

Let me elaborate a little on the TSLN vision, the commitment to IT, why National Education has a special relevance to Singapore and how school teachers and leaders are being prepared to meet the twin challenges of the future: how to make a successful transition to being a knowledge-based economy and how to ensure the citizens remain cohesive and develop collective instincts as Singaporeans.

The Thinking Schools, Learning Nation (TSLN) vision is the overall descriptor of an entire education system geared to meet the challenges of the twenty-first century. The fundamental tenets of pursuing educational excellence (via a strong national curriculum and high national standards) and instilling values in the young to become responsible citizens will remain the cornerstone of Singapore education, but where it is necessary to change the form, delivery and substance of the education we provide, Singapore plans to re-examine, revisit and even reinvent them.

Education Review

Thus, several bold reforms have been, are and will be taking place. First, the Ministry has embarked upon an ambitious review of the education system, its structure, assumptions, curriculum, etc., chaired by Ministry of Education's Permanent Secretary, and involving a large number of practitioners. In the area of curriculum, an External Review Team was established to help in forging a more forward-looking, relevant and suitable national curriculum. The Director-General of Education, Mr Wee Heng Tin (1997) described in broad terms how the curriculum needs to be revised. These are:

Reduction of content in each subject, with emphasis on broad-based learning at the earlier stages and greater depth and specialization at the higher stages of education;

Emphasis on the joy of learning and development of habits of continual learning;

Development of skills for higher order thinking, effective communication and teamwork at all levels, and

Incorporation of National Education themes and the use of information technology in the curriculum

He added:

for the curriculum revision to succeed, changes must be systematic; they cannot be piecemeal efforts independent of one another. Such major changes to the curriculum must be accompanied by adjustments to other areas in the context of teaching and learning. Teaching strategies will shift emphasis from teacher to learner, classroom cultures will change and our assessment and examination system will be transformed. Modifications to teacher training and ultimately school appraisal, will support the change in focus.

A small but highly significant step has been introduced in university admission criteria. Until recently, the Cambridge “A” level examination results provided the sole basis for admission to our two universities. Since 1996, winners of the National Science Talent Search (an initiative of the government to encourage bright high school students to do independent research projects) and since 1997, winners of International Science Olympiads (Mathematics, Physics, Chemistry, Computer Science) can obtain direct entry to science/engineering courses irrespective of their “A” level results. This opens the door to alternative assessment modes for tertiary education admission and thus challenges the old mindset of relying solely on school leaving or university entrance examinations.

The reduction in curriculum content is not an arbitrary exercise but rather a deliberate attempt to ensure that core concepts and knowledge are retained while freeing curriculum time to include skills that are critical for the future of our young — creative thinking, the ability to learn independently and continuously and effective communication. In order to teach students these skills, Singapore has had a Thinking Program in its curriculum since the mid-eighties.

Thus, the Thinking Program and the IT Masterplan for Education (see below) take into consideration the needs of the future workforce, which

needs to possess higher order thinking skills to be creative and innovative and also technology savvy “enough to be discerning and astute users of information as well as creators of knowledge” (Teo, 1997a).

The IT Masterplan sets Singapore's national standards for the use of IT in schools by the year 2002. Schools will be expected and helped to use IT meaningfully to meet learning objectives. By 1999, a typical primary school will have at least 150 computers and a typical secondary school about 350. These numbers will allow primary schools IT-based learning for 10% of total curriculum time and 14% for secondary schools. By 2002, the Masterplan envisages a pupil-computer ratio of 2:1 in every school, allowing for up to 30% of the curriculum time to be IT-based. Teachers will also be provided with notebooks in school and given grants to purchase their own computers. They are also being trained to integrate IT into their teaching and learning. The government has committed S\$2 billion to provide every school with sufficient computing power.

National Education has a special relevance to Singapore, which is small both in size and population. The Minister of Education said in Parliament (Teo, 1997b):

Schools must focus on National Education to instill in our young a strong sense of shared identity and confidence in the future.

Singapore is unique in that it became an independent nation under very trying circumstances and hence its people must understand the constraints and vulnerabilities that make them different from other countries. Group spirit among pupils and commitment to self, family, community and nation to bring about social cohesion are imperative.

National Education notwithstanding, the ultimate goal of education in any society is to develop the total person, not just his/her academic abilities. Hence, the ethical/moral, cognitive, physical, social and aesthetic dimensions or qualities have to be nurtured as well. In an Asian culture, we also value integrity, character, positive attitude to work, willingness to be team-players, sense of responsibility and commitment to society.

The Ministry of Education (1998), as a result of its review of education up to the present, has published a document that spells out a succinct and comprehensive list of desired education outcomes (Appendix). It identifies the attributes that every Singaporean should have and gives direction to the teaching and learning strategies to be adopted.

Educating the Trainers

I now come to a critical area of the education chain — the education of the trainers, i.e., the teachers and school leaders.

Teachers have so many roles to play in and out of the school that it is no wonder that many are concerned about undue stress. They are didactors, mentors, motivators, facilitators, disciplinarians, counselors, befrienders and even surrogate parents. We have to help them to respond to their students', society's and their own needs. The teacher of the future must be knowledgeable, resourceful, collegial, adaptable, empowered, ethical and skilled in order to foster these same characteristics in their students. The State University of New York, Cortland has an experimental program to educate teachers for the twenty-first century. This program identifies 10 core teaching skills including teaching for values and character, developing good communication skills, fostering problem solving and inquiry, promoting cooperative learning, integrating curriculum, using media, materials and technology soundly, organizing and evaluating instruction effectively, and understanding and meeting diverse needs of all students.

For teachers to respond and adapt to the diverse, changing needs of their students and the workplace, the education of teachers must be a continuum from initial to trained teacher, to peer and organizational leader. Taking cognizance of these changing needs, Singapore has just begun another fundamental review of its teacher education system. The premises upon which this review will be conducted are:

1. The teacher is the key to all our efforts in education, and
2. Teacher training/education will make a critical difference to the quality of educators we produce, to whom we will entrust the responsibility of molding the future of our nation.

I must hasten to add that while the Ministry of Education is revisiting and re-examining our teacher education system, we, at the National Institute of Education (NIE), Singapore's sole teacher education institution, have already embarked on major curricular changes to all the initial teacher education programs, revamped the management training programs for school leaders (potential principals and heads of departments) and introduced new packages for training level and subject heads and senior teachers. The latter three promotional grades were introduced in 1996 and emphasize the commitment of the Ministry of Education to increase the career paths for teachers.

Where initial teacher training is concerned, we aim at making our student teachers active, collaborative, inter-disciplinary and reflective learners. This set of attributes, we hope, will stay with them throughout their careers. Not only the curriculum has to be restructured and modes of assessment re-evaluated, a radical shift in thinking is required to broaden the perspectives of the teacher and pupil, beyond the text, class and school to the community, nation and the world!

Hence, in the review of the undergraduate arts and science programs (for a start), we are introducing what we term "core skills," which represent the essential modules all students have to read, regardless of their discipline or specialization, e.g., Critical Reading and Writing (communication skills); Society and the Teacher (social responsibility, national education, values); Environmental Studies and Global Issues (inter-disciplinary learning, linking study to real world).

An essential component of a student teacher's training is practice in school or the Practicum. As in other professions (law, medicine, engineering, accounting) where practitioners take on the role of mentor and supervisor for interns, NIE is forging a stronger partnership with schools. The new category of senior teachers will be actively involved in the supervision of the practicum.

Schools as Learning Organizations

At the school leader's level, the current programs for potential principals and heads of departments are based on the premise that the future school head must lead the school according to sound management principles. The current delivery strategy is based on the belief that reflective practice is the key to successful innovation. While the present program seeks to introduce management principles and practices into the school organization, the future program must seek to help principals design schools as learning organizations. Management principles and practices related to the top-down, command and control paradigm must give way to the disciplines of the learning organization in a rapidly changing world.

The course for heads of departments will focus on departmental management and curriculum design, development and evaluation. The aim is to prepare them with the knowledge base and skills required for their roles as instructional leaders and change agents in the school system.

Level and subject heads will be provided supervisory and curriculum management skills while senior teachers will be equipped with conceptual

understanding and skills required for their professional roles as mentors to new and less experienced teachers.

Throughout their careers, the concept of life-long learning will permeate the profession and it is envisaged that teachers will spend about 5% of their working time per year on continual or in-service training. This works out to be about 100 hours or 1 working day a month.

One of the characteristics of the learning organization is that staff are encouraged to take responsibility for their own development and take part in decisions about it. The government introduced independent and autonomous schools to give selected institutions this level of ownership and autonomy and to ensure high standards through healthy competition and rivalry. It now wants to test the desirability and feasibility of devolving greater autonomy to more schools. The "school cluster," introduced just a year ago, started with 24 schools grouped into 4 clusters of 5-7 schools each. The cluster concept permits schools to retain their individual identity and strengths while at the same time enhancing the pooling and sharing of resources and expertise according to need. Collaboration among schools is encouraged in this way that promotes collegiality and innovation.

Conclusion

Singapore is not the only nation trying to reshape its education system for the future. As I said at the beginning, there are no Pan-Asian solutions to the issues of education reform (i.e., what should or should not go into it, what needs to be retained). We cannot predict with any measure of certainty what the future may bring, what types of job our grandchildren will have, but I hope, in sharing the Singapore experience with you, I have given an idea of the direction that education systems in Singapore, in the region and throughout the world are heading.

What is important to ensure the survival of nations and economic growth is that governments, the private sectors and the citizenry must have the will and determination to provide ample resources and even make sacrifices for education, especially the education of teachers.

In equipping teachers with the necessary mindsets and skills to put in place new teaching/learning and assessment methodologies and expanding their scope and horizons, they will in turn help nurture among the young, the need for life-long learning, creativity and innovation, values, effective communication skills and confidence in themselves and their future!

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Appendix The Desired Outcomes of Education

*What we do in schools today
will shape the Singapore of the future*

1. Every so often, a country should ask what it wants the formal education system to do for its citizens. Each review should affirm what should remain, what need greater focus, what need new emphases, and what may be dropped. The result should be a succinct and comprehensive list of desired education outcomes.

The Singaporean — an Individual, a Citizen

2. A national education system has two functions: to develop the individual, and to educate the citizen.
 - 2.1 Fundamentally, education is about nurturing the whole person. We have to recognize anew the wisdom of the traditional Asian concept of education. In its totality, this embraces development of the person in the moral, cognitive, physical, social and aesthetic spheres. The foundation of a person is his value system, from which springs his outlook on life and his goals in life. In partnership with the home, the formal education system must carefully and painstakingly shape the moral make-up of our young. Our young must also learn to relate to other people: their elders and peers, and people who may be like-minded or different. Finally, education develops the unique talents and abilities of every child to the full and teaches him to keep fit and healthy for life. An educated person is one responsible to himself, his family, and his friends.
 - 2.2 But an individual cannot exist apart from society and the nation. It is society at large which affords him the standing and security to carve out a niche for himself through his contributions. It is to the community that he has obligations and responsibilities, and from which he derives a sense of purpose and identity. Thus, formal education must cultivate instincts in our young so that they identify Singapore as their home; a home to live in, to strive to improve and, if called upon, to defend. An educated person is also one responsible to his community and country.
3. The dual roles of education reinforce and complement each other.

Indeed, the educational outcomes that we want for the individual overlap with those we desire of a citizen.

What are Outcomes For?

4. Having a set of desired outcomes allows us to assess how well our formal education system is doing. Ultimately, it is not the specific activities we undertake or the volume of activity that determine how well we do, but how these activities collectively influence the outcomes which we want to achieve.

The Outcomes of Education

5. The desired outcomes of education represent a statement of the attributes which we want every Singaporean to have. The table below encapsulates the final outcomes of formal education for the graduates of our Institute of Technical Education, Polytechnics and Universities. We expect those who aspire to be national, community, business or professional leaders to also demonstrate the qualities needed for leadership. These are given in the right column.

Outcomes of Education	
All Post-Secondary and Tertiary Students	Potential Leaders
<ul style="list-style-type: none"> • Morally upright, culturally rooted yet understanding and respecting differences, responsible to family, community and country • Believes in our principles of multi-racialism and meritocracy, appreciating the national constraints but seeing the opportunities • Constituents of a gracious society • Willing to strive, take pride in work, value working with others • Able to think, reason and deal confidently with the future, with courage and conviction in facing adversity • Able to seek, process and apply knowledge • Innovative — spirit of continual improvement, lifelong habit of learning, enterprising spirit in undertakings • Think global, but rooted to Singapore 	<ul style="list-style-type: none"> • Committed to improving society • Proactive in surmounting our constraints • Compassionate towards others • Able to inspire, motivate and draw out the best from others • Able to chart our destiny and lead • Able to forge breakthroughs in a knowledge-based economy • Creative and imaginative • Has tenacity to fight against the odds, not quitting

Intermediate Outcomes of Education

6. The characteristics above are translated into a list of developmental outcomes for each stage of the school system. Each educational level builds upon the previous stages and lays the foundation for subsequent ones. There is no sharp divide between educational levels. For example, while the main thrust in primary education is for young pupils to love Singapore, it does not mean that they do not learn to know Singapore. Similarly, even as secondary students learn to love and know Singapore, they will also learn the principles by which Singapore is led and governed.

Intermediate Outcomes of Education		
Primary	Secondary	Junior College
At the end of primary school, pupils should	At the end of secondary school, students should	At the end of junior college, students should
<ul style="list-style-type: none"> • be able to distinguish right from wrong • have learnt to share and put others first • be able to build friendships with others • have a lively curiosity about things • be able to think for and express themselves • take pride in their work • have cultivated healthy habits • love Singapore 	<ul style="list-style-type: none"> • have moral integrity • have care and concern for others • be able to work in teams and value every contribution • be enterprising and innovative • possess a broad-based foundation for further education • believe in their ability • have an appreciation for aesthetics • know and believe in Singapore 	<ul style="list-style-type: none"> • be resilient and resolute • have a sound sense of social responsibility • understand what it takes to inspire and motivate others • have an entrepreneurial and creative spirit • be able to think independently and creatively • strive for excellence • have a zest for life • understand what it takes to lead Singapore

Concluding Remarks

7. These sets of education outcomes distil what principals and teachers have always subscribed to in their professional calling. These outcomes form the bases for planning the directions for the Education Service, and for measuring its achievements in *Moulding the Future of Our Nation*.