



# LEARNING *from* SINGAPORE

THE FINDINGS OF A DELEGATION OF NORTH CAROLINIANS THAT EXAMINED EDUCATION AND THE ECONOMY  
A COLLABORATION OF THE PUBLIC SCHOOL FORUM AND THE CENTER FOR INTERNATIONAL UNDERSTANDING, THAT WAS MADE POSSIBLE  
THROUGH FINANCIAL SUPPORT FROM THE BURROUGHS WELLCOME FUND AND FROM THE WILLIAM R. KENAN, JR. CHARITABLE TRUST



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## A Word About the Cover . . .

The cover illustration for this report was taken from the cover of a brochure describing Singapore's NUS High School of Mathematics & Science. Like North Carolina's highly regarded School of Science & Math, admission to NUS is very competitive, drawing its students from the top 10% of Singapore's schools. The striking thing about the school, as the illustration shows, is the pervasive belief that one of its students will be the next Einstein or a future Nobel Prize winner. As the following report will explain, the desire to be the best, to be a world leader, is not confined only to Singapore's School of Mathematics and Science; it permeates Singapore's educational system. A special thank you to NUS High School of Mathematics & Science for not only giving permission to use their illustration but to the Principal and faculty for opening their doors to the North Carolina delegation while in Singapore.

# LEARNING *from* SINGAPORE





# SINGAPORE



Singapore. To many it is nothing more than a red dot on a map of the world. However, to those in the corporate world it is an Asian economic power house. To those who study city living, its approach to housing, racial diversity, crime control and traffic make it a model for urban planning. To those in the education community, it is a nation that is routinely in the top two or three when it comes to the performance of its young people on international tests of science and mathematics.

How has a nation that is not even 50 years old emerged from a backwater third world economy into a world financial, urban planning and educational leader in so little time? Are there lessons that can be learned from Singapore and used to build a stronger North Carolina?

Those were the questions that led a delegation of 29 North Carolina foundation officials, elected office holders, educators, nonprofit leaders and others to travel to and study first-hand the factors that have led to Singapore's emergence.

This study is the eighth in the series called "Learning from the World" that is co-sponsored by the Public School Forum and the Center for International Understanding. Previous studies have focused on Great Britain, Denmark, the Netherlands, Japan, South Korea, China and India. The studies have been made possible through the financial support of the Burroughs Wellcome Fund and the William R. Kenan, Jr. Charitable Trust, two foundations that invest in education with a particular focus on science and mathematics.

What follows is a description of the conclusions reached by the delegation and an examination of the implications for the state of North Carolina.

# A YOUNG NATION

Unlike countries across Asia that have histories extending thousand of years back in time, Singapore's beginnings are recent. In 1819, the British East India Company, the English trading company that once spanned the globe, decided to create a trading port in what was at the time undeveloped swamp land at the tip of Malaysia. A visionary Englishman, Sir Thomas Stamford Raffles, who has a larger-than-life reputation that lives on today, led the settlement effort and by 1825 Singapore, originally known as Singapura, had become a busy port city.

For over a century, Singapore remained a British colony and continued to grow and thrive. Its growth, however, was abruptly blunted during World War II when the Japanese invaded in 1942. Singapore, considered by the British its impregnable fortress in the Pacific, fell in a matter of days. For the next 3 1/2 years, the city was occupied. English men and women along with other Europeans were imprisoned. Natives of Singapore were forced to endure prolonged hardships and, in some cases, brutality ending in death at the hands of the occupiers.

Following the withdrawal of Japanese troops at the end of World War II, the native population of Singapore began a movement for independence and in 1959 the British relinquished their control of Singapore and the city's history as an independent entity began.

Originally, Singapore aligned itself with the country of Malaysia. That alignment seemed logical. Singapore was reliant on Malaysia for most of its food, water and resources. A sizable segment of its population was Malay and the city was nothing more than an island off the coast of Malaysia separated from the mainland by only a narrow straight of water.

However, the attempt to amalgamate the city into the country of Malaysia was not successful. Singapore was essentially a Chinese city. The make-up of its people was similar to what it is today. Roughly 70% of Singaporeans were Chinese. Another 15% were Indian and only 10% were Malay.

While the decision for Singapore to separate from Malaysia was mutual, there were strains between the nations and the early history of independent Singapore was marked by tension as bitterly divided political groups fought for control of the new nation.

The important thing for this examination, however, was that the history of Singapore as a nation began in 1965. At that point, only 43 years ago, the would-be nation had no system of schooling, no constitution, no army or navy, and, as any Singaporean will tell you today, few resources.

Taking stock of its assets, Singapore could count on only three. It was situated in one of the world's busiest sea lanes. It possessed what would become the world's third largest deep water port. And it had its people. Upon those assets Singapore set out to build a nation.

## PEOPLE ARE OUR GREATEST RESOURCE

Perhaps the greatest challenge Singapore's first leaders faced was how to instill in a would-be country a sense of nationhood within its people. As noted earlier, the population of Singapore was ethnically diverse with Chinese, Indians and Malays making up the majority of the population. There was no common language and even within ethnic groups there were cultural differences. Some Chinese, for instance spoke Mandarin; others, spoke in a Cantonese dialect that was quite different.

More to the point, prior to 1965 there was no such thing as a Singaporean. The port city had been a colony of the British Empire from its founding.

The leadership of the nation realized that education would have to be a cornerstone of nation building. The threefold goal of education would be to forge a sense of nationhood through a common language and, as importantly, through instilling a common set of cultural beliefs or norms. The longer-term goal would be to develop a highly skilled workforce that would bring investments and jobs to the island nation.

From its very beginnings, education in Singapore was far more than an exercise in raising literacy standards. It was the economic and cultural key to building a nation.

This remains true today. One of the more enlightening governmental briefings the North Carolina delegation had took place at the Ministry of Manpower. Officials within the Ministry described the three distinct phases education has undergone since 1965.



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*Students greeting the North Carolina Delegation at Singapore's West Grove Primary School*

# 3 PHASES OF EDUCATION

## “SURVIVAL-DRIVEN” [PHASE 1]

The first phase of education in Singapore, in retrospect, has been named the “survival-driven” phase. It began in 1959 and lasted until 1978. As the name implies, the early educational efforts in the nation were aimed at creating a literate citizenry that had basic reading and numeracy skills. Prior to independence from Great Britain, education was largely reserved for the well-to-do or for young people who showed exceptional promise. The challenge for the new government was to create a system of universal education.

The most controversial decision made during this time would later turn out to be an economic and cultural blessing for the nation. Singapore’s leadership chose as the nation’s official language not any of the three commonly used languages – Chinese, Indian or Malay – instead, English was made the common language of education. That decision would not only tie Singapore’s citizens to one common tongue, it would make them one of the few Asian nations that universally used what had become the global language of business and what would become the global language of technology.

At the same time, the nation’s leadership made another policy decision that mollified those who opposed making English the language of education. They instituted a national policy recognizing English, Mandarin Chinese, Tamil (Indian) and Malay as national languages, and required students to be bi-lingual – learning in English, but taking coursework in at least one other language. By doing this, they preserved the heritage and language of Singapore’s major ethnic groupings while instituting universal English language education.

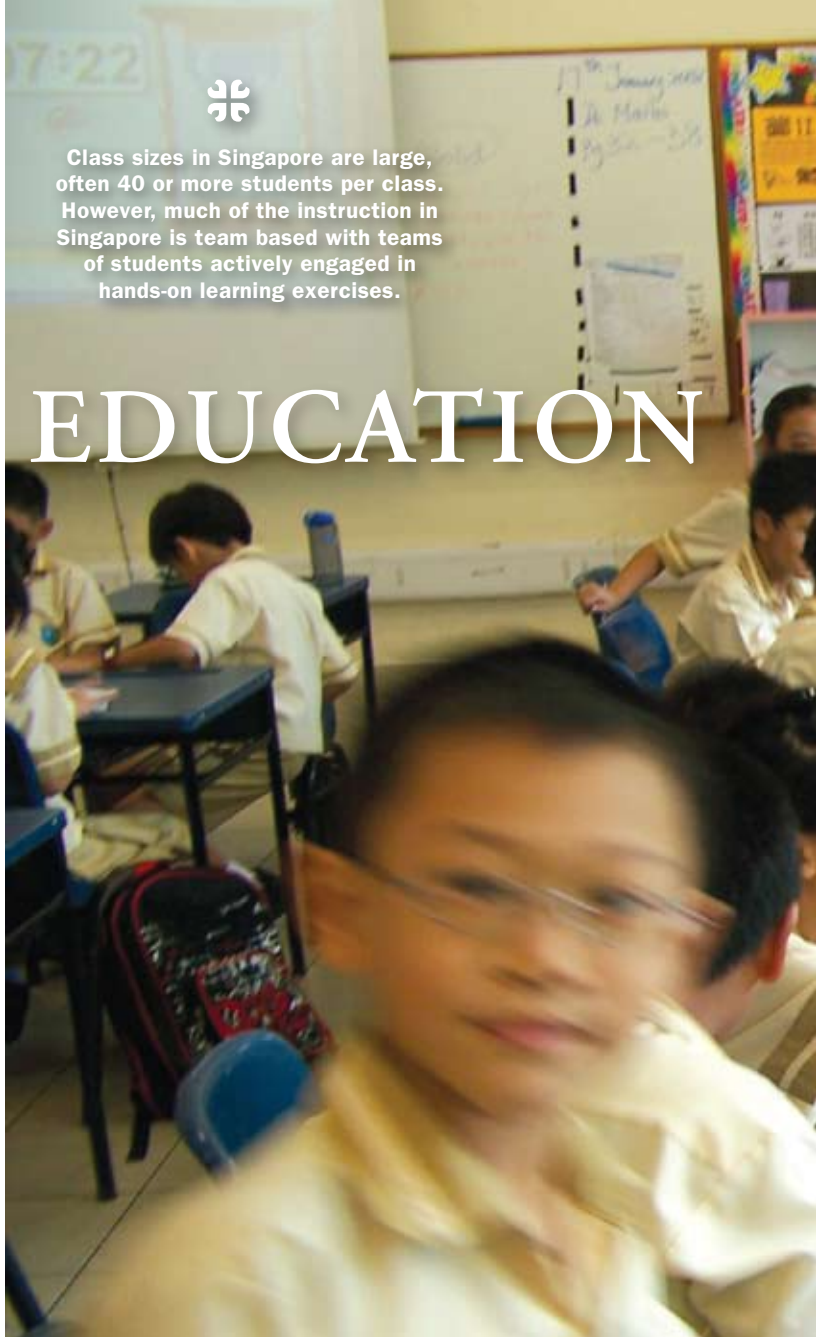
At the end of what has become known as the “survival-driven” phase of education, Singapore had created a system of mass education for all while creating the foundation for vocational and technical learning institutions.

## “EFFICIENCY-DRIVEN” [PHASE 2]

As the 1970’s came to an end, the country entered what is now called the “efficiency-driven” phase of education that would extend from 1979 until 1996. During this time, students began to be “streamed” (i.e., assigned or grouped) based on their academic ability. The goal of streaming or grouping was to enable all students to fulfill their potential while recognizing that not all students would grow academically at the same pace.



Class sizes in Singapore are large, often 40 or more students per class. However, much of the instruction in Singapore is team based with teams of students actively engaged in hands-on learning exercises.



Central to the “efficiency-driven” phase of education was moving away from what had been a “one-size-fits-all” curriculum and approach to schooling and the creation of multiple pathways for students. Those multiple pathways are best exemplified by Singapore’s three basic types of high schools – academic high schools focused on preparing young people to move on to college; polytechnic high schools focused on advanced occupational and technical training, that frequently also lead young people on to college, and technical institutes that focus on occupational and technical training for students who are in the academically lowest one-third of the student population.

During this phase, a major goal of the nation was to produce highly skilled and trained workers, especially engineers. The National University of Singapore and the Nanyang Technological Institute were built during this period of time. In fact, by the end of the eighties, Singapore was producing over 1,000 engineering graduates annually as its economic development efforts were attracting more and more jobs in technology.



### **“ABILITY-BASED, ASPIRATIONS-DRIVEN” [PHASE 3]**

Beginning in 1997 Singapore entered what is termed its “ability-based, aspirations-driven” phase. Its focus is on creating workers for a knowledge-based global economy. The array of pathways available to students has been expanded. Students have a far greater choice of coursework and majors.

As the North Carolina delegation would hear on several occasions, the three phases of education in Singapore mirrored the economic development of the nation. During the “survival-driven” phase of education, Singapore recruited manufacturing facilities and was largely focused on job creation for its people. During the “efficiency-driven” phase of education, its economic recruitment goals switched to international technology and financial companies that relied on more highly skilled workers. Today, the nation is attempting to be a world leader in areas like bio-technology that require adaptable, creative knowledge workers.

### **THE RESULTS . . .**

Today, only 43 years after the nation of Singapore came into being, the nation that had no system of universal education in 1965 can point to the following as an example of what has been achieved:

- Singapore’s literacy ranking is among the highest in the world as measured by the Progress in International Reading Literacy Study.
- Singaporean students are currently the world leaders in math and science based on their performance on TIMSS examinations, the Trends in International Mathematics and Science Study.
- Singapore was rated as the best performing education system, with an excellent teaching force, in a 2008 McKinsey & Company study, “How the World’s Best Performing School Systems Come Out on Top.”
- Singapore is ranked 1st in the IMD World Competitiveness Yearbook of 2007 for having an education system that best meets the needs of a competitive economy.



“How did Singapore accomplish what it has in less than 50 years?” was the question that the North Carolina delegation attempted to answer at the end of the study. Unfortunately, the week of governmental briefings, school visitations, discussions with educators and conversations with students, coupled with three days of briefings and extensive reading in advance of the trip, raised as many questions as were answered.

As the delegation reassembled upon returning to the United States, it wrestled with reaching a consensus on “lessons learned” from Singapore. And, in fairness to readers, the delegation was extremely mindful that the old adage “a little learning can be a dangerous thing” applies to those who would generalize about a country and its educational system after only a brief visit. With that caveat, the remainder of this report will focus on the major lessons the delegation learned from its brief exposure to Singapore and its schools.

In brief, the delegation agreed that the primary lessons to be learned from Singapore fall into three broad areas:

LESSON 1:

The importance of vision and planning that integrates nation building, economic development and education.

LESSON 2:

The return that comes from thoughtful investments in teachers and school leadership.

LESSON 3:

The potential gains that result from harnessing research-based best practices from around the world.



# LESSONS



*A member of the North Carolina delegation, Senator Joe Sam Queen, who is an architect, examines student work done in a course on design at Singapore's Nanyang Polytechnic Institute.*

# TO BE LEARNED



## LESSON 1:

### *The Importance of Integrated Planning*

Because Singapore's leaders saw people as the primary building block to a strong economy, education was never viewed in isolation. Instead, from the beginning of the nation, the education system was designed around a manpower strategy that began with survival (i.e., raising the literacy rate), evolved to "efficiency" (i.e., focus on math and science and preparation for knowledge work, and now has moved to "aspirations.")

It is the integration of governmental planning that has made Singapore unique. At the same time it was building an educational system, for instance, it was constructing thousands of governmental housing units in the belief that home ownership would tie people to Singapore and instill in them a greater loyalty to the new nation.

Ever mindful of the challenges its diverse ethnic population posed, even Singapore's housing policies reflected its determination to avoid becoming a city divided by ethnic enclaves. New governmental housing units were allocated using numerical ethnic goals that resulted in housing patterns that reflected the overall population of the new nation.

Early on in the development of Singapore it became what is now viewed as a model of "green" or environmental planning. The

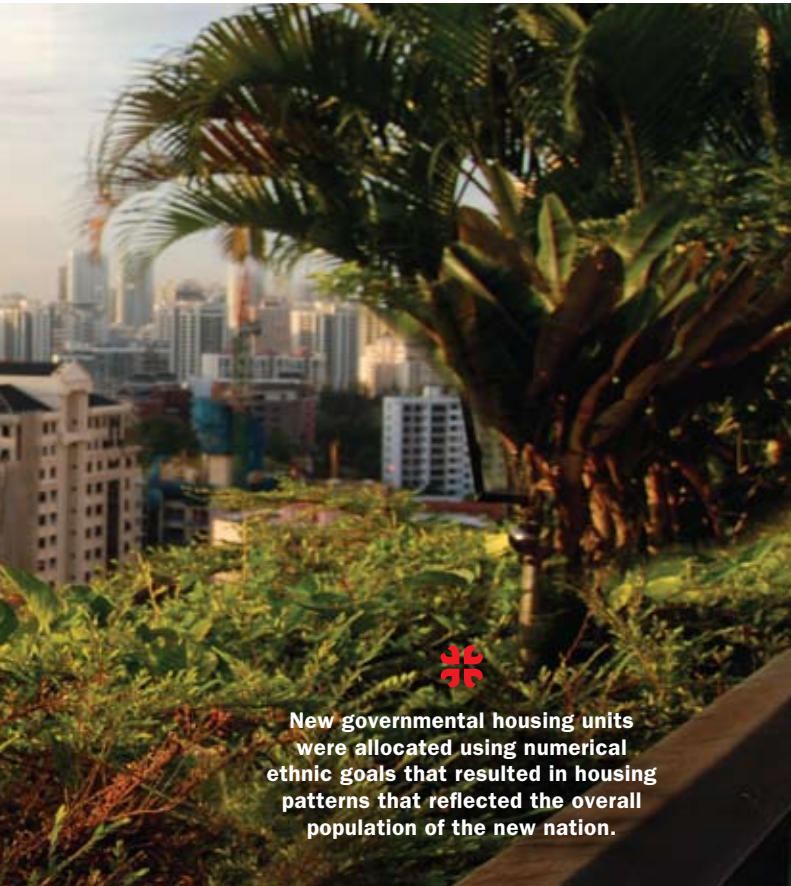
motivation behind this, however, was not idealistic nor what could derisively be termed "tree hugging."

Instead, the motivation was economic. The first area of the city to be landscaped and planted with trees and vegetation was the highway leading from the airport to the city. Singapore's founders wanted foreign visitors to have a positive first impression of the city.

From that rather humble beginning Singapore went on to develop a nationwide plan for greenways and parks. While the population of Singapore is densely packed into a relatively small space, today it can boast of wide avenues, lush vegetation and parks and greenways throughout the country.

Unlike many Asian cities, one does not find sprawling slums in Singapore. One also does not find many one or two-story homes. Instead, condominiums and apartment buildings are high rise, making maximum use of land while preserving green space around living areas.

Another part of the city's planning was to ensure that both the inner city and the areas around high-rise living areas were well-maintained and free of the litter that haunts so many cities. In what some would say is rather obsessive planning to prevent litter, Singapore now has an undercover "litter patrol" that numbers over 400. Someone discarding a cigarette butt or a paper wrapper on a street is subject to a not-so-gentle tap on the shoulder and a hefty fine — \$500 for first time offenders. Importing chewing gum into Singapore is illegal and also subject to stiff financial penalties.



**New governmental housing units were allocated using numerical ethnic goals that resulted in housing patterns that reflected the overall population of the new nation.**

Another thing one does not find in Singapore is the jumble of traffic that is so common in major cities. Part of the integrated planning for the city was a complicated plan designed to avoid the kind of congestion that nearly paralyzes many cities, especially during rush hour.

New drivers' permits are issued sparingly. It is not uncommon for a would-be driver to be placed on a waiting list that is years long. Car owners are charged very high fees for the privilege of driving and the fees are higher for those wanting the privilege to drive anywhere anytime. In Singapore, license plates are coded by fee schedules. One can choose to have the privilege of driving only after working hours and on weekends – that is the least expensive fee. Or, one can choose to drive anytime except during rush hour traffic periods for a higher fee. Or, one can pay the highest fee for the privilege of driving anywhere, anytime.

In immigration policies, an area that is becoming one of the United States' most divisive election-year issues, Singapore's planning process appears to be sparing it many of the strains that are being felt not only in the United States but throughout Europe and elsewhere.

Singapore, relative to its population of roughly 4.4 million, has a huge foreign work force – estimated to be close to one million. However, because of their closely regulated immigration policies, Singapore has avoided many of the social, educational and legal challenges experienced in the United States.

For a non-Singaporean to enter the country on a work visa, he/she must first have written proof of employment. Their visas will be issued for varying lengths of time, depending on their job skills and the demand for their labor. In the case of large manufacturing concerns, foreign workers will be provided company housing and be transported to and from their place of employment in company-owned or provided transportation.

Most foreign workers, except for the most highly skilled and in-demand, are not permitted to bring families with them. Thousands of Malays are “day workers,” coming across the narrow body of water separating Malaysia from Singapore in the morning and returning at night.

As a result of these policies, Singapore has been able to meet its manpower needs without disrupting the delicate social and economic balance within the country. Its schools are not facing the challenge of dealing with newcomers who lack a common language. Its public agencies are not faced with demands for health care, increased law enforcement and other services needed when immigrants flood into a nation. By being able to control the flow of foreign workers based on supply and demand, Singapore keeps its unemployment rate very low while meeting manpower needs in hard-to-fill jobs.

In terms of building loyalty to a new nation, in addition to creating a universal system of schooling, a universal language and housing policies that make home ownership within the grasp of most of its citizens, Singapore instituted a policy of national service that requires all males at age eighteen to give two years of service either through the military or through a variety of jobs in the public sector.

The government also instituted “character building” and “national values” instruction in the schools. Young people are instructed to value and build upon their diversity. They are taught that teamwork is more important than an individual acting alone.

There was little left to chance in Singapore. Instead of the country evolving by happenstance, it evolved by adhering to a vision of becoming a global leader, of becoming an Asian economic power.

Parks, trees, the absence of litter, traffic that flows steadily were not decisions made only to improve the quality of life in Singapore; they were steps taken to make Singapore the kind of city foreign corporations would want to invest in, a place that foreign managers would want to be assigned to live and work in. The goal of education was not only to raise the literacy rates of Singapore's people, it was designed to give the nation a workforce that would attract the kind of jobs that would allow its people to enjoy a higher and higher standard of living.

While many can take credit for the integrated planning that has enabled Singapore to advance to where it is in less than 50 years, observers give much of the credit to Lee Kuan Yew, Singapore's prime minister for over 30 years and still a force in Singaporean politics. The name he gave to a biography that tracks the development of Singapore is a testament to the power of integrated planning aimed at reaching a vision. The book's title is “From Third World to First,” a title that aptly describes Singapore's 43 year evolution.

# LESSON 2:

## *Investing in Educators*

In recent years Singapore has gained a reputation for its policies regarding teachers and school administrators. In the months before the North Carolina delegation visited Singapore an international McKinsey and Company study entitled, “How the World’s Best Performing Countries Come Out on Top,” cited Singapore as an international leader for its investments in a high-quality workforce. Within weeks of the delegation returning to the United States, a *Time Magazine* cover feature on teachers and teaching included an article highlighting Singapore for its enlightened policies regarding the development of teachers.

Based on what the delegation was able to observe while visiting Singapore, the recognition they are receiving is deserved. Looking first at their investments in teaching and their approaches to building a quality teaching force, consider the following:

- Candidates wanting to become teachers must go through a rigorous screening process that admits far fewer students than candidates.
- Teacher candidates are recruited from the academic upper one-third of high school graduation classes.
- Once accepted as a teacher candidate, prospective teachers not only have their full tuition paid, but they are paid 60% of a beginning teacher’s salary while they are studying to become a teacher. The practice is called “bonding” (i.e., one is obligated, or bonded, to fulfill an obligation to their employer, in this case the nation of Singapore).
- All teacher candidates attend the National Institute of Education, Singapore’s only teacher preparation institute with an enrollment of over 5,000 students.
- The National Institute of Education (NIE) is a self-contained college; subsequently, all of the faculty, whether teaching teachers how to teach math and science or focusing on teaching reading, are part of the same faculty team, in contrast to American colleges that are usually divided into departments that frequently have little collaboration between education departments and other departments such as math and science.
- Once on the job, teachers are paid throughout the year – teaching is a 12 month position, not a nine or ten month position as is the case in the United States.
- The beginning pay for teachers is higher than that of medical doctors starting out in their field.
- During the year, teachers are provided with time to spend the equivalent of 100 hours on staff development activities designed to sharpen their skills.
- High performing teachers who meet a variety of criteria can earn annual bonuses equal to as much as two months pay. It is important to note that individual schools receive a block of funding for bonus payments and teams of school managers award them to teachers based on a variety of criteria including teachers’ work with colleagues, work with students in extra curricular activities and relationships with parents. The performance of students is merely one of the criteria considered when bonus payments are awarded.

The net effect of these policies is that polls find teaching to be the most highly regarded profession in Singapore. It is not only competitive but it is an honor to become a teacher.

The policies regarding teachers, while impressive, do not tell the entire story of what makes education a respected profession in Singapore. According to surveys seeking to find out why so many leave teaching in the United States, the quality of school leadership at the school building level accounts for much of the teacher attrition found in the United States and more specifically in North Carolina.

### **DEVELOPING LEADERSHIP**

In short, leadership matters. And in Singapore, the investment made in teacher quality is matched by that the nation makes in developing high-quality school leaders. Singapore’s approach to developing school leadership will sound very familiar to those who work in large corporations that routinely invest millions in talent identification programs and have sophisticated internal training programs for management. Their approach to developing leadership, however, is very different than that found in North Carolina schools or, for that matter, in states across the nation. Here are highlights of the Singaporean system:

- Singapore has a formalized talent identification and training program that begins when one is hired as a teacher. Throughout one’s career as an educator in Singapore, an employee will annually be rated based on “leadership potential.”
- In Singapore, the process of talent identification and training begins with what they call “middle management” – curriculum specialists, grade or team leaders and departmental chairs in secondary schools. Candidates for middle management positions are identified based on their leadership potential ratings and then interviewed and screened by a committee of school leaders.
- If selected for a middle management position, the successful candidate undergoes leadership training tailored to the position he/she is assuming.
- Once on the job, middle managers become part of the leadership team within a school. Team members collectively make decisions on issues ranging from teacher evaluations, to bonus recipients, to promotions, to management of the education program.
- While a middle manager, one continues to be rated each year on leadership potential. From this pool of middle management will come candidates for assistant principals.
- As in the process of selecting middle managers, candidates for assistant principal positions will undergo an interview and screening process and, if selected, they will receive extensive training in school leadership prior to assuming the position.
- The process of annual rankings based on leadership potential continues for assistant principals and they will comprise the pool from which school principals are chosen.



Teacher candidates are recruited from the academic upper one-third of high school graduation classes.

- If one is selected to be a school principal, he/she will first undergo two years of state-provided training. One year will be residential at a leadership training institute; the second year will be spent interning at a school. During the second year, the principal candidate will be sent abroad to spend up to six weeks studying education in another country.
- Principals are routinely transferred from one school to another every 5 or 6 years. Singapore believes this brings a fresh perspective to schools and sees it as part of their continuous improvement strategy.
- Finally, as one moves up the educational management ladder in Singapore, one's salary moves up accordingly. School principals in Singapore routinely earn six figure salaries comparable to that of a medium or large school system superintendent in North Carolina.

In both the case of teachers and school managers, Singapore makes a large investment to ensure that its young people's education is provided by high-quality educators. Its system closely resembles that of some of the best-run private corporations in America. It can be boiled down into a very simple recipe for success: recruit the best; treat them with respect; insure that their pay reflects the importance of their positions; identify and nurture potential leadership; provide the time and the tools needed to sharpen their skills. As will be discussed later when the implications of this trip are examined, Singapore's approach to developing high-quality educators may be a simple recipe to describe; however, it is not nearly as simple to implement.

## LESSON 3: *Harnessing Research-Based Best Practices*

While the delegation found Singapore's approach to planning and their willingness to invest in educators to be two of the critical factors to their success, there is one additional area that has contributed to their educational progress. The best conceived plan supported by the best educators that money can buy would not be enough were they asked to implement questionable educational strategies.

The last piece of the success equation that left an impression on the delegation was the nation's willingness to scour the world to find research-based best practices and approaches that could be applied to Singapore's schools.

### SINGAPORE MATH

The area of education most frequently cited in discussions about Singapore is their approach to the teaching of mathematics. The "Singapore approach" has received so many commendations that it is now being franchised and used in other countries, including the United States.

What makes their approach to mathematics different? First, it is based on the assumption that the role of a math teacher is to instill "math sense," the ability to understand and solve mathematical problems. In a Singapore math classroom there is no such thing as "one right way" to solve a math problem; instead, the goal is to enable students to understand how to solve a math problem.

Singapore's math textbooks and curriculum outlines are much scantier than those found in the United States. As opposed to covering hundreds of concepts, Singaporean teachers cover far less

material, but they cover it in depth. Their goal is mastery of basic mathematical concepts, not quantity of material covered.

Singapore also blurs the distinctions between different levels of mathematics. Instead of discrete courses in Algebra and Geometry, algebraic concepts are introduced to students while in elementary school. Geometric concepts are integrated into basic math instruction long before students reach high school.

In short, the nation has a philosophy of teaching mathematics that is the result of research, fine tuning and teacher training. That philosophy is best described in their own words; the following is quoted directly from the "Singapore Rationale for Mathematics Instruction:"

"Educators in Singapore see mathematics as an excellent vehicle for the development and improvement of a person's intellectual competence in logical reasoning, spatial visualization analysis and abstract thought. Students develop numeracy, reasoning, thinking skills, and problem solving skills through the learning and application of mathematics. These are valued not only in science and technology, but also in everyday living and in the workplace. The development of a highly skilled scientifically and technologically based manpower requires a strong grounding in mathematics. An emphasis on mathematics education will insure that we have an increasingly competitive workforce to meet the challenges of the 21st century. Mathematics is also a subject of enjoyment and excitement, which offers students opportunities for creative work and moments of enlightenment and joy."

Because of Singapore's small geographic size and approach to teacher training, all teachers receive the same training on how to teach mathematics. Subsequently, the philosophy toward math education is instilled in all of its teacher trainees.

It is also important to note that once on the job, teachers routinely observe one another and critique teaching methods and approaches. They fine tune exercises and approaches used to



*Delegates Ken Jenkins, Diane Scott and Bettie Kirkman with students at Canberra Primary School*

teach mathematics. Subsequently, the philosophy and teaching strategies they were taught to use in college are finely honed after they enter the classroom.

While Singapore is best known for its approach to mathematics, it should also be noted that it is a world leader in student performance in science and in literacy. In those areas it is also important to note that teachers have been prepared according to a national philosophy of how to teach science and reading. Science and reading teachers also critique one another's work and sharpen their teaching approaches through a collaborative system.

### THE PRACTICE OF "STREAMING"

One practice adopted by Singapore educators engendered considerable discussion within the North Carolina delegation. That is the practice that Singaporeans call "streaming" or grouping or assigning students based on academic ability.

The practice of streaming has fallen out of favor in most educational circles in the United States. More often called "ability tracking" in the United States, critics of the process argue that when one groups lower ability students into a single classroom it almost certainly condemns them to remain low performing, while if the same children were included in classrooms with academically advanced students they are more likely to progress.

It should be noted that while ability tracking is out of favor in the United States, educational observers are quick to observe that we maintain separate courses and programs for Academically Gifted (AG) children and that high schools are routinely academically grouped through students being assigned to general classes as opposed to Advanced Placement classes.

In any event, Singapore's educational system begins streaming or grouping students by ability levels in the elementary grades. They contend that it enables them to take more time with less gifted students while holding them to the same rigorous standards.

While the North Carolina delegation was divided on its view of the practice of streaming, based on the performance of Singapore young people on international subjects, especially math and science, it appears it is successful in giving its students a strong foundation program.

### THE SINGAPOREAN APPROACH TO HIGH SCHOOL

Nowhere are the contrasts between Singaporean education and that in North Carolina more evident than in the pathways offered to students beginning in what would be the 10th or 11th grades in North Carolina. In contrast to North Carolina, Singapore, like almost all other industrial nations, has distinctively different types of high schools.

To generalize, students in the academic upper one-third of Singapore's schools will attend schools designed to prepare them for college admission. The next one-third of students will attend Polytechnic Institutes designed to give students preparation for the workforce with a special emphasis on industries that are dependant on math, science and technological foundations. The lowest academic one-third will attend Technical Institutes preparing them for employment in a wide variety of occupations.

Admittance to these is largely dependant on an exit examination taken in the equivalent of North Carolina's tenth grade. While results on those examinations are the major determinant for placement, it is important to note that students can and do move from one type of school track to another. Roughly 40%, as an example, of students who attend Polytechnic Institutes will go on to college.

Another difference between Singapore's high school experience and that in North Carolina is that it begins at a later age. North Carolina high schools typically include grades 9-12. In North Carolina terms, Singapore's high schools begin at the 10th or 11th grade level and, depending on the program or major a student





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**The technology and equipment available would rival North Carolina's best equipped community colleges and, in many cases, the state's four-year colleges and universities.**

selects, the length of time required to complete a program may extend beyond what would be considered high school in the United States.

It is not inaccurate to think of Singapore's Polytechnic and Technical schools as more closely resembling a North Carolina community college than a typical North Carolina high school. In fact, the physical environment of Singapore's Polytechnic and Technical schools more closely resembles a community or four year college than do they resemble North Carolina high schools.

The schools visited by the North Carolina delegation had large atriums with modern artwork. There were large, open food courts offering students their choice of food ranging from Chinese to Indian. It should be noted that secondary schools rely on private small business operators to operate food stalls and stores selling school-related books and materials.

A major difference that was immediately apparent to the delegation from North Carolina was the large investment Singapore makes in its secondary schools. The technology and equipment available would rival North Carolina's best equipped community colleges and, in many cases, the state's four-year colleges and universities.

That investment in equipment and technology was necessary for the Institutes to achieve their mission, or what at the Nanyang Polytechnic Institute are called their "strategic thrusts" designed to make them an international polytechnic of distinction. Those thrusts are:

**Market-Oriented Planning** – tailoring education to meet the needs of industry and the nation, while satisfying the aspirations of the young and preparing them to meet the challenges of the future.

**Adaptive Training Systems** – responding to market conditions and changes in technology with flexible and adaptive training systems.

**Capabilities Development** – developing capabilities to provide a sound foundation for the Polytechnic's programmes, through intensive staff training and R&D activities that harness a wealth of talents.

**Transnational Cooperation Partnerships** – close and active collaborations with foreign governments, industry leaders and academic institutions worldwide.

**Application and Development Oriented Training** – marrying the learning and working environment to provide realistic, effective and relevant learning experiences.

**Regional and International Orientation** – cultivating an entrepreneurial spirit and a global mindset in students to help them rise up to the challenges of a competitive and borderless world.

It is readily apparent from the Polytechnic's "strategic thrusts" how closely intertwined education planning is with the economic aspirations of Singapore. It is even more apparent when one considers the goals of the Polytechnic's six schools as described in their words:

**Engineering** – responding to growing demand in manpower in critical areas such as electronics, telecommunication, infocomm, water-fabrication, mechatronic and advanced manufacturing.



The Singapore Science Centre

**Business** – training professionals with a focus on regional and international banking, financial trading, insurance, risk management, retail, leisure and other related sectors.

**Health Sciences** – upgrading the health care professions, specifically nursing, physiotherapy, occupational therapy and radiography.

**Design** – to provide industry with design professionals skilled in product innovation, computer animation, multimedia applications and product design and development.

**Information Technology** – meeting the demand for professionals in IT, e-commerce and digital media design with an emphasis on the development of emerging technologies.

**Life Sciences** – responding to the national imperative to train Life Sciences professionals to meet manpower requirements in the post-human genome era in industries such as proteomics, genomics, genetics, and developmental biology.

### **FOSTERING CREATIVITY & PROBLEM-SOLVING SKILLS**

For those who bridle at the thought of schools treating students merely as widgets to be put into a manpower supply/demand slot, it must be noted that the North Carolina delegation came away impressed with the apparent well roundedness and balance in the curriculum. While the focus on math, science and technology is pervasive, schools also focus on character development and instilling a love of learning.

These efforts were perhaps best seen at the NUS High School of Mathematics and Science, similar in many respects to North Carolina's highly-regarded School of Science & Math. What is called the school's Innovation Programme has as its goal stimulating creativity and innovative thinking. The school describes its goals as attempting to inculcate in students:

- Understanding and insight of cultures, preferences and values.
- A sense of the practical as well as an eye for beauty.
- An ability to use “generating and focusing” tools effectively, to frame problems, design solutions and critique their own design.
- A sense of excitement for the future; to embrace ideas and to embrace change.

At the heart of the Innovation Programme is a Future Problem-Solving Program that has students working in teams to brainstorm challenges, choose an underlying problem, brainstorm solutions to the problem, create criteria for solving the problem and developing an action plan. Students work in problem solving teams as they attempt to solve problems as diverse as transportation systems for Singapore or determining the relationship between weather and headaches.

### **LEARNING & PROBLEM-SOLVING IN TEAMS**

The problem-solving team approach observed in Singapore's school of math and science was not unique to that school. Throughout the observations of schools in Singapore the delegation routinely saw students working and learning in teams of 4-6, especially in science classrooms.

It should be noted that schools in Singapore are large and, by American standards, class sizes are even larger – frequently numbering over 40 students per classroom. However, under closer examination what is to American eyes a class of 40 children is in actuality 8 groups of 5 children working and learning together through problem-solving exercises that lend themselves to team collaboration.

It is also interesting to note that while the pendulum of educational change in the United States is beginning to swing back toward smaller schools, enrollment in both elementary and secondary schools in Singapore is much larger than the typical North Carolina school.

This difference engendered considerable discussion among the North Carolina delegation. Are larger school and class size enrollments possible because of the respect given to education in Singapore? Is it the result of cultural differences between Asia and the United States? Also, for the most part, students with special education needs are not mainstreamed with the rest of the student population after the 6th grade.

While the delegation was unable to reach a consensus on those issues, it was evident that educators in Singapore had found strategies like team teaching and hands-on learning activities that made it possible to deal with far more children than would be found in a North Carolina classroom.

# MAJOR LESSONS LEARNED





The importance of integrated governmental planning, the immense potential that comes through investing in educators and the gains possible through harnessing research-based education strategies and best practices from elsewhere, were the three broad lessons learned from Singapore. Much more could be said about each of them, but in all three categories it was striking that when Singapore sets out to accomplish a goal or make changes in its educational system, it routinely benchmarks itself by comparisons to the best in the world. When it set out to create Polytechnic Institutes, for instance, its goal was to create an institution that would be a regional, indeed an international, model.

The desire for excellence was evident from the Ministry of Education to the schools of Singapore. In briefings, school principals routinely described their benchmarking and internal measurement approaches.

Ironically, much of what the delegation observed in Singapore was based upon research and experimentation conducted in the United States. That was validated when the North Carolina delegation met a delegation of educators from Caribbean countries that were in Singapore to study their approach to preparing teachers. One, a college professor from Barbados who had done her graduate work in the United States, said, “They have taken your research and used it to build their system!”

One member of the North Carolina delegation only half-jokingly responded, “No they took our research and applied it. We’re good at studying things; we’re not very good at implementing.” While it would be vain for American educators to believe Singapore’s success rests on ideas stemming from American schools, it is not unfair to say that much of the credit for what Singapore has accomplished is the result of scouring the world for the best educational practices and having the political will to implement them.

That leads to the implications of the lessons learned from this brief study of education in Singapore.

# IMPLICATIONS RECOMMENDATIONS



Students in classroom at Singapore's NUS High School of Mathematics and Science



## IN THE AREA OF INTEGRATED PLANNING

Singapore's educational accomplishments stem from a vision and a planning process designed to reach the vision. The overarching vision, of course, was to make Singapore a leading city/nation in Asia. To reach the vision, it was necessary to build on Singapore's strongest resource – its people – through a system of education that would position the country to function in a global economy. As has been commented on earlier, manpower development and education planning were viewed as one in the same from Singapore's earliest years.

In contrast to Singapore, the founders of the United States viewed education as a matter for states and localities. The founding fathers did not frame a national education strategy, and until very recently there have been few serious attempts to frame a national education strategy. In fact, the closest thing the United States has to a vision for education is for all students to be able to meet relatively low proficiency levels in math and reading by the year 2014 (i.e., No Child Left Behind).

At the state level, education planning historically has taken place in isolation, separate and apart from economic development planning – and, for the most part, it still does. Beginning in the mid twentieth century states began to see colleges and universities as part of a greater economic development strategy and some, like North Carolina, realized early the potential of business and education partnerships leading to the creation of economic engines like the Research Triangle Park.

More recently as agriculture and manufacturing, the traditional economic underpinnings of many states including North Carolina, began to decline, community colleges have come to be viewed as an integral part of economic development planning as worker training and retraining grew in importance.

What is lacking nationwide and at the state level, however, is an integrated system of planning that sees education at all levels, from pre-school to graduate school, as a building block for a stronger economy. For policymakers and business leaders this is a serious omission. Creating a plan that will, for instance, reduce today's high school dropout rates is not only a plan that could benefit tens of thousands of young people, it is an economic development strategy.

### **RECOMMENDATION 1:**

*North Carolina should create an integrated planning process that brings together the Department of Commerce, representatives of major employers throughout the state, regional Economic Development representatives, the Department of Public Instruction, the Community College System and UNC to design educational and economic development goals aimed at making the state more globally competitive.*

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## IN THE AREA OF INVESTING IN EDUCATORS

The lack of a national vision or plan for education has resulted in fifty different educational systems within the United States. Each state has its own curriculum expectations, its own testing programs, its own system of certifying teachers and its own rules and regulations governing who can be a school administrator.

Within states, including North Carolina, a variety of colleges and universities prepare candidates for teaching. In North Carolina there are 46 such programs at public and private four-year institutions.

Depending on the strength and philosophy of faculty members within those schools of education there can be extreme differences in how teachers are prepared. To look at just one example of those differences, what has been termed the “phonics war” has been raging within the educational community for decades. Some educators feel the most effective way to teach reading is to use a phonics-based approach; others feel the best method is what is called the “whole language” approach; still others feel a blend of the two results in the best outcomes. How teacher candidates are taught to teach reading will depend on where their school of education falls in the debate over phonics.

Unlike Singapore, there is no consistency in how teachers are taught. Worse yet, unlike Singapore there is not an agreement on how to teach a subject like mathematics. Schools of education approach the teaching of math or reading based on their faculty preferences and strengths. Local school systems are free to adopt text books and curriculum material that vary widely in approaches. Subsequently, there is neither consistency in the preparation of teachers nor in the methods that will be used once a teacher candidate is on the job.



When looking at the preparation of school managers similar differences exist between Singapore and North Carolina. In contrast to Singapore’s identify and grow-your-own system of school leadership development, in North Carolina and indeed throughout the United States, school leaders are largely self-selected.

Someone wanting to become an assistant principal or principal simply enrolls in a college or university offering a Master Degree program in school leadership (17 in all in North Carolina) and begins taking coursework. Prior to enrolling there is rarely any screening to determine if the candidate has strong leadership potential.

Once enrolled, it is simply a matter of completing the required number of courses and submitting a dissertation, when required. When completed, the candidate is deemed to have met North Carolina’s requirements for school leadership.

Once hired, very few North Carolina school systems have a required program of additional leadership training. Fewer yet have a sequential, systematic approach to building leadership skills over time. While state-supported programs like the Principals Executive Program (i.e., PEP) provide training for school principals, the state does not have a sequential, systematic approach to developing school leaders; instead, such training is usually dependant on whether a school superintendent views the investment of time away from school as worth the return. It is, at best, a haphazard system.

“Haphazard” is, in fact, a good word to describe North Carolina’s approach to developing educators. Because of the shortage of teachers in the state, there is virtually no screening process for teacher candidates. In contrast to Singapore which draws teacher candidates from the upper academic one-third of graduating high school classes, teachers in the United States typically come from the bottom half.

In contrast to Singapore which provides financial incentives to prospective teachers from the time they enroll in schools of education, North Carolina offers financial support to only a handful of education scholarship winners. In starker contrast to Singapore, once on the job teachers and educators are not paid salaries comparable to or greater than those paid to other professions; in fact, low salaries are one of the most frequently cited reasons fewer and fewer young people choose to go into teaching.

The contrasts could go on – North Carolina does not provide adequate staff development time; it does not invest in the middle management of schools; it does not systematically identify and develop school leaders.

### RECOMMENDATION 2:

*Scour the world for best practices in the area of identifying and supporting high-quality teachers and school administrators and completely revamp the system which exists – from how candidates for education are selected, to determining where and how they will be trained, to developing a system of compensation that will attract and retain high-quality applicants to creating a sequential, coherent program of staff development for teachers and administrators.*

## IN THE AREA OF BEST PRACTICES

Singapore's approach to teaching math and science was discussed earlier. They focus on mastery, rather than quantity of material covered. They utilize "hands-on" approaches that stress solving problems in teams. Many of the approaches utilized by Singaporeans are similar to those that the State Board of Education's Blue Ribbon Commission on Testing and Accountability recently recommended that North Carolina should adopt. Those recommendations lay out a roadmap that could result in a far more effective approach to the teaching of math and science.

### RECOMMENDATION 3:

*The State Board of Education should adopt the recommendations regarding the teaching of math and science that were made by the Commission on Testing and Accountability and move North Carolina's approach in these areas closer to the approaches used by the world's top performers on math and science performance comparisons. Further, the State Board of Education should use its accreditation criteria, the standards by which college and university schools of education are held accountable, to ensure that the State's philosophy of teaching mathematics is being used to prepare candidates for teaching.*

At the high school level, North Carolina can learn much from Singapore. Its multiple pathways for high school students not only gives the nation a well-prepared workforce, it offers students engaging, hands-on instruction that prepares them for life after graduation. It recognizes that a one-size fits-all approach to high school course work is unlikely to engage all young people and its high graduation rate is testimony to the impact its approach is having.

While North Carolina in recent years has begun promising experimentation with initiatives like Learn and Earn, the establishment of Health Science and Technology high schools and other initiatives aimed at giving more focus to the high school years, the effort is in its infancy. Hampering the experimentation is the degree to which vocational or occupational training has come to be devalued in contrast to Singapore or other industrial countries that pride themselves in the quality of their workforce preparation.

### RECOMMENDATION 4:

*Aggressively expand the effort to create multiple and focused pathways to high school graduation that have begun in recent years. Such an effort should be aligned with economic development needs of the state and of regions within the state and should be jointly developed by the Department of Public Instruction, the Community College System and UNC, working with industry leaders and the Department of Commerce.*

The educational experience of a Singaporean student is infused with course work and experiences that better prepare them to function and succeed in a global environment. In addition to requirements that all students become multi-lingual, Singapore schools have partnerships with schools in other countries, Singapore's Polytechnic Institutes welcome students from other countries and schools develop partnerships with multinational companies. The government also finances student and teacher exchanges with other nations.

The focus on giving students a global orientation is not unique to Singapore. Previous delegations have seen the same global focus in schools in China, Denmark and elsewhere.

In North Carolina, the State Board of Education recently adopted a goal that would make young people better prepared to succeed in a global environment. Thus far, however, that recommendation has not been supported by action steps.

### RECOMMENDATION 5:

*North Carolina should rebuild its elementary foreign language program and strive to have students who are fluent in languages, not simply students who have taken two years of a foreign language. Additionally, course work in cultural awareness and linkages to schools in other countries should be supported.*

The last delegation observation that has profound implications for North Carolina is that the process of becoming a world leader in preparing young people to succeed in a global environment is not going to happen without accompanying investments in building a world class educational system. Singapore's investment in educators has resulted in it having a well-paid, well-prepared and well-respected teacher and administrator workforce. Its investment in state-of-the-art equipment, technology and facilities is enabling it to give its young people a world class education foundation.

In contrast, teachers in North Carolina are paid less than teachers throughout the country, not to mention that they are paid far less than those in other professions. North Carolina has a \$10 billion backlog in school facility needs – not to mention what would be required to outfit the infrastructure, equipment and technology of schools to make it comparable to what was seen in Singapore.

### RECOMMENDATION 6:

*Creating a system of schooling that is globally competitive will not happen because policymakers want it to happen. It will only happen if the state musters the political will to make it happen by investing in an educational system that, like Singapore, will make it a magnet for economic growth in a global economy.*



*Music students and their teacher at Canberra Primary School.*

# CONCLUDING *thoughts*

Singapore is the eighth country that has been studied as part of the “Learning from the World” examination of education systems elsewhere. For delegation members who have been a part of two or more of these studies, there was unanimity that what was observed in Singapore came as close to “putting it all together” as any nation yet examined.

While it is entirely possible that if the stay had been longer, the study more intense, there would have been issues uncovered that might have diminished the delegation’s first impressions. It must be mentioned, for instance, that the delegation grew very aware of differences between government in Singapore and government in the United States.

Many will remember an instance several years ago where a student from the United States was sentenced to be caned in Singapore for vandalizing automobiles. The incident sparked angry reactions in the U.S.

In similar fashion, incidents of censorship in Singapore, aimed primarily at foreign economic correspondents who painted an unflattering picture of Singaporean government, sparked similar negative reactions from media around the world.

Government in Singapore is controlling – some might say overly controlling. It was mentioned earlier that the country employs plain clothes litter patrolmen. It imposes an automatic death penalty on anyone found in possession of large quantities of drugs.

It does not encourage the kind of free flow of ideas found in the American press. In fact reading the first eight or ten pages of Singapore’s largest daily newspaper is like reading the feature articles usually reserved for the Living section of an American newspaper. Virtually all of the articles portray the best of Singapore life and are followed by news of wars, famine and corruption elsewhere. The message that is reinforced with every reading of Singapore’s largest newspaper is that life in Singapore is good; elsewhere things are chaotic.

The nation is a democracy, albeit, it has been called a “strong-man democracy.” The nation’s founding premier was in office for

roughly 30 years and while his far-sighted policies have helped move the country to its first world status, in many instances, he used governmental controls in ways that would spark great resistance in the United States.

On the other hand, as delegation members remarked frequently, the trade-offs for heavy-handed governmental control are much in evidence. One can safely walk the streets of Singapore day or night. There is virtually no litter. One does not see homeless people on the streets. There are not blighted slum neighborhoods. Traffic flows freely. Citizens enjoy one of the highest standards of living found in Asia.

This report will leave it to others to debate the pros and cons of governmental trade offs in Singapore and confine itself to what it observed of the nation’s educational system.

That said, the delegation’s impression of Singapore’s educational system was very positive. As noted earlier, the Singapore approach to schools and schooling is extremely thoughtful. Its goals are lofty – nothing less than being among the best in the world will do.

While study after study concludes that the quality of educators is, in the final analysis, the primary determiner that separates good schools from mediocre schools, Singapore has mustered the political will and the investments necessary to insure that all of its young people are taught by highly-qualified teachers who are led by highly trained and competent school managers.

The important thing for North Carolina is that there is nothing being done in Singapore that could not be done in North Carolina. Because of the size of the state, there are things that would have to be adapted to North Carolina, but best practices used in Singapore could be adapted and used in schools across the state.

The question is whether a study like this will be a catalyst for change? Will a glimpse of what is possible when a nation applies sound planning and research-based solutions to its schools, inspire policymakers, business leaders, educators and others across North Carolina to reach the conclusion that the state’s young people deserve no less?

# SINGAPORE DELEGATION

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Mr. Keith Blatz, *Videographer, UNC-TV*

Dr. Queta Bond, *President, Burroughs Wellcome Fund*

Dr. Valerie Brown-Schild, *Director, Kenan Fellows Program, Kenan Institute for Engineering, Technology & Science, NC State University*

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Mr. John Dornan, *Executive Director/President, Public School Forum of NC*

Senator Katie Dorsett, *Senate, North Carolina General Assembly*

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Ms. Meredith Henderson, *Director of Programs, The Center for International Understanding, University of North Carolina*

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Dr. Hope Williams, *President, North Carolina Independent Colleges & Universities*

Mrs. Eszter Vajda, *Report/Anchor, UNC-TV*

Representative Doug Yongue, *House of Representatives, North Carolina General Assembly*



1st Row, left to right: Jo Ann Norris, Meredith Henderson, Estza Vajda, Diane Houston, Dr. Ken Jenkins, Dr. Doris Jenkins, John Dornan, Elizabeth "Bettie" Kirkman, Dr. Diane Scott, Cindy Thompson, Dr. Valerie Brown-Schild, Sen. Joe Sam Queen, Enriqueta "Queta" Bond; 2nd Row, left to right: Dr. Ludy Van Broekhuizen, Rep. Joe Tolson, Dr. Sam Houston, Keith Blatz, Ted Fiske, Dr. Helen "Sunny" Ladd, Carr Thompson, Mary Donny, Rep. Doug Yongue, Dr. Mary McDuffie, Dr. Duane Kirkman, Dr. Hope Williams, Pat Orrange; Not Pictured: Dr. June Atkinson, Sen. Katie Dorsett, Dr. Tony Habit

# ITINERARY

## *Learning from Singapore - January 11-21, 2008*

|                      |   |
|----------------------|---|
| <b>FRI, JAN 11</b>   | Depart from North Carolina  |
| <b>SAT, JAN 12</b>   | In transit  |
| <b>SUN, JAN 13</b>   | Arrive in Singapore<br>Guided tour of Singapore<br>Group dinner   |
| <b>MON, JAN 14</b>   | Orientation briefing session<br>Guided tour of Parliament<br>Guided tour of the Asian Civilizations Museum  |
| <b>TUES, JAN 15</b>  | Visit to and briefings at the Ministry of Education<br>Visit to the National Institute of Education (NIE) at Nanyang Technological University<br>Dinner with Singaporeans in small groups   |
| <b>WED, JAN 16</b>   | Visit to the Ministry of Trade and Industry with briefings by the Ministry of trade and Industry and the Ministry of Manpower Company visits in small groups to:<br>Chartered Semiconductor Manufacturing Ltd<br>Keppel Offshore and Marine<br>SAS Institute<br>Cisco Systems<br>A*STAR, Biopolis<br>Debriefing Session |
| <b>THURS, JAN 17</b> | Primary School visits in small groups<br>Group A to Canberra Primary School<br>Group B to West Grove Primary School<br>Post-secondary School visits in small groups<br>Group A to Institute of Technical Education (ITE) College East<br>Group B to Nanyang Polytechnic   |
| <b>FRI, JAN 18</b>   | Briefing by National University of Singapore<br>Secondary school visits in small groups<br>Group A to NUS High School of Mathematics and Science<br>Group B to Catholic High School<br>Visit to the Singapore Science Centre<br>Debriefing Session<br>Group dinner and cultural activity                                |
| <b>SAT, JAN 19</b>   | Optional cultural visits  |
| <b>SUN, JAN 20</b>   | Depart for return to North Carolina   |

# RESOURCES

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 Erwin Chan, Director, Practices & Alliances, SAS Singapore  
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 Rasham and Renu Dhillon, Parents of primary school students

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National Institute of Education (NIE)  
 Canberra Primary School  
 West Grove Primary School  
 Nanyang Polytechnic  
 Institute of Technical Education (ITE) College East  
 NUS High School of Mathematics and Science  
 Catholic High School  
 Singapore Science Center

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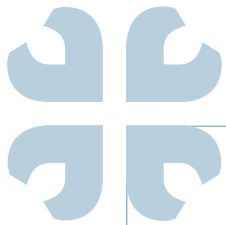
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## PHOTOGRAPHY

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# A SPECIAL *thank you*

is extended to UNC-TV for sending a reporter and photographer with the delegation and airing a week-long series of feature stories on the findings of the delegation. This is the second “Learning From” series that has been documented by UNC-TV which also accompanied the delegation that studied education in India. In both cases, UNC-TV’s participation was made possible by financial support provided by the North Carolina Science, Mathematics and Technology Education Center and the Burroughs Wellcome Fund. Readers can access the documentary on “Learning from Singapore” at the UNC-TV website.

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