Misidentifying Factors Underlying Singapore's High Test Scores

A strong curriculum is not the sole reason for Singaporean students' success on international assessments.

Zalman Usiskin

Singapore students have scored exceedingly well on international tests in mathematics. In response, there has been a desire in the United States—both at the policy level and at the school level—to emulate Singapore. Because what can be identified most easily about Singapore's school mathematics can be gleaned from curriculum documents from the country's ministry and a look at some of the country's textbooks, American policymakers and school personnel have naturally latched onto these as the causes for Singapore's high performance. I suggest that four other factors are at least as important.

Singapore is an island nation situated between Malaysia and Indonesia and is about 3.5 times the area of Washington, D.C. It has a resident population of about 4,741,000—about 77% ethnic Chinese, 14% Malaysian, and 8% Indian—and a nonresident population (mostly foreign workers) of about 437,000. (The website http://www.singstat.gov.sg/stats/themes/people/hist/popn.html estimates a population of 5,183,700 in the middle of 2011, whereas the website https://www.cia.gov/library/publications/the-world-factbook/geos/sn.html estimates a population of 4,741,000 for the same period. I have assumed here that the smaller number includes only the resident population and that the other includes both residents and nonresidents. See also https://www.cia.gov/library/publications/the-world-factbook/geos/sn.html.) Singapore was founded as a British trading colony in 1819, and English has always been one of its official languages (along with Chinese and Malay); the education is conducted in English.

On TIMSS in 2007, the most recent test year, Singaporean fourth-grade students had an average mathematics score of 599 (the second highest score of all jurisdictions after Hong Kong, where the average score was 607) compared with the U.S. average score of 529. (Although well below the highest national averages, this U.S. average score was above the international average for developed countries.) Singaporean eighth-grade students had an average score of 593 (third, behind Taipei and


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Korea) compared with the U.S. average score of 508. On the 2009 PISA mathematics test given to fifteen-year-olds, Singaporean students' average score of 562 was highest in the world. (The media has sometimes reported that China scored the highest on PISA mathematics in 2009. This is quite misleading, as only Shanghai participated, and Shanghai is one of the highest-performing areas of all China, if not the very highest, for some of the same reasons as are given for Singapore here. It would be as if we considered Westchester County in New York State or the North Shore suburbs of Chicago as representative of the United States.) The U.S. average score was 487, lower than the international average (http://nces.ed.gov/surveys/international/reports/2011-mrs.asp#mathematics). Because both PISA and TIMSS use representative populations selected from all students in the respective countries, we have no reason not to believe the accuracy of the consistently high performance of Singapore students.

The rhetoric in the Common Core State Standards (CCSSI 2010) would have us believe that *the* cause for the success of Singapore's students is Singapore's mathematics curriculum and that all we have to do to bring U.S. students' performance into the top tier of countries is to change the curriculum and have U.S. students toe the line. I used to believe this line of reasoning. When I first wrote mathematics textbooks more than forty years ago, I thought that if a book had solid mathematics, if it were clearly and interestingly written for students, and if teachers taught in a fashion true to the book, then students would learn the mathematics. I was naïve. Many factors beyond the control of textbook authors, teachers, and schools significantly affect student performance.

I now believe that textbooks have had little to do with Singapore's ranking among the nations of the world on TIMSS and PISA. In saying this, I do not mean to belittle Singaporean textbooks; they are quite good. But we have in the United States textbooks that are just as good, and some of our quite good textbooks are the most commonly used textbooks throughout the country. What we do not have in the United States are four factors that account for Singaporean student high average performance. It is surprising that not one of these factors is mentioned in the essay about Singapore on NCTM's website (http://www.nctm.org/resources/content.aspx?id=1542).

FACTORS UNDERLYING SINGAPORE'S HIGH SCORES

1. Singapore's student population does not include the children of huge numbers of people who work the lower-paying jobs in Singapore.

Measured by per capita gross domestic product (GDP), Singapore is very affluent. Its per capita GDP in 2010 was estimated at $62,100, higher than Norway's ($54,600, the highest in Europe) and the United States's (at $47,200, second to Norway among countries with populations of more than 6 million) and Canada's ($39,400). In contrast, neighboring Malaysia has a per capita GDP of $14,700, the second highest in Southeast Asia. Nearby Indonesia's per capita GDP is $4,200; that of the next closest country, Thailand, is $8,700. (All per capita GDP data are from https://www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html.)

As a consequence, Singaporeans cannot afford to have low-paying jobs and live well in their home country. Those jobs are done by Malaysians, who daily cross the two bridges connecting the countries to work in Singapore; by large numbers of Philippine women who come to work in Singapore, leaving their families behind (the per capita GDP in the Philippines is $3,500); and by workers from other less-developed countries who, even in low-paying Singapore jobs, can earn far more than they can in their home countries. These workers have children, but their children are tested in their home countries, not in Singapore.

Singapore is the affluent suburbs of southeast Asia. In the affluent suburbs surrounding U.S. cities, housekeepers, yard workers, clerks, and other lower-paid workers do not generally reside in those suburbs; they are day workers who travel from poor areas in the nearby cities. In the United States, the children of these day workers are tested in the United States, and they tend to have low average test scores. (Although some workers in the United States have families in other countries, they make up only a small percentage of the total U.S. workforce, far smaller than in Singapore.) In Singapore, the children of the corresponding workers do not live in Singapore and so are not tested in Singapore; they are tested in their home countries. This means that large numbers of children who would be most likely to score at the low end of the spectrum are not included in the Singapore population.

2. Singapore has a national high-stakes test at the end of sixth grade that can determine the kind of schooling a child gets for a lifetime.

In Singapore, Taiwan, Japan, and Korea, an important national test is given at the end of sixth grade. In Singapore, the test is called the Primary School Leaving Examination (PSLE), and two hours and thirty minutes of testing are devoted to mathematics. The test, based on the 2007 syllabus, has two sections. The first section, allotted fifty minutes and accounting for 40% of the total points, includes fifteen multiple-choice and fifteen short-answer questions; calculators are not allowed. The second

section (one hundred minutes, 60%) includes five short-answer and thirteen structured questions; calculators are allowed. (See http://www.seab.gov.sg/psle/2012subjectInfo.html for details.)

Performance on the PSLE is a significant factor in determining which school a student will attend for grades 7–9, somewhat similar to the ACT and SAT exams for determining colleges in the United States. But the difference is that U.S. colleges typically consider a number of factors other than test scores when deciding whether to accept a student. In Singapore and these other countries, however, test scores are the key determinant of a child's future school.

Further, Singapore is small enough that a child who lives almost anywhere on the island can attend almost any school on the island, so geography plays a far smaller role in the choice of a school than it plays in the United States. If you want to go to the best secondary schools, you have to score high on the sixth-grade test. In the United States, children in grades 6–8 might be placed in different *mathematics classes* because of previous performance; in Singapore, however, children are placed in different *schools*.

> All students can learn mathematics if they receive a well-designed curriculum and devote the time that it takes to learn such a curriculum.

3. For Singaporean students, school is their job; other activities are absent or relegated to minor roles.

School is very important in both the United States and Singapore, but three conditions distinguish the situations in the two countries. First, children in the United States, particularly those in lower-income families, have significant responsibilities inside the home, often because parents or guardians are working two jobs and are absent after school or in evenings. These responsibilities may include taking care of siblings or elderly relatives, cleaning house, and preparing meals and can start at very young ages.

Second, most American parents want their children to spend time in social activities. For young children, sports and social activities are considered more important than academic work. Indeed, we worry about a child who comes home each day to study and spends very little time with any friends after school or in the evening.

Third, starting as early as is feasible, Americans value the idea that a child should earn some money from a job. From babysitting and doing errands to, at older ages, working in stores or restaurants, Americans consider having a job a good thing for students. Further, for many students, earning money is a necessity if they want to attend college. Although highly educated parents tend to say "school is your job" and will not let their children work significant hours, the latest data (October 2010) indicates that 22.1% of high school students age sixteen and older are in the labor force (http://www.bls.gov/news.release/hsgec.nr0.htm).

4. Most Singaporean children get additional schooling beyond the school day through individual tutoring or classes.

The sixth-grade high-stakes test in Singapore puts a huge amount of pressure on both children and their teachers in the elementary grades. It leads to homework loads that are heavier than typical loads in the United States. But it does not cause schools to spend more time on mathematics and other subjects in school, and the homework loads are not inordinately heavy. Why? Because most children in Singapore—even most of the better students—either go to additional classes after school or get individual tutoring. Thus, it is not just that "school is the job" for Singaporean students. Most students obtain, at parental cost, additional schooling after school. In essence, Singaporean students have two school jobs.

It is difficult to determine the percentage of students who attend school after school or who are getting personal tutoring and, of those, what percentage are working on mathematics. A Singapore newspaper surveyed 100 parents and found that, for 97 of them, their children were getting additional schooling, the most popular subjects being mathematics and English, although it did not report how many were receiving additional schooling for mathematics (Toh 2008). However, one agency alone (http://www.toptutors.sg/) advertises that it has more than 10,000 qualified teachers and tutors. In a population of 5 million, there are about 1 million students in grades 1–16, so this single list has one teacher or tutor for every 100 students. Singapore is not alone in this practice. The vast majority of Japanese and Korean children attend juku schools, and allegedly the practice is also common in Shanghai and other high-performing areas of China.

IMPLICATIONS OF THE MISIDENTIFICATION

The misidentification of the causes of high scores in Singapore has led to what I believe are unfortunate policy decisions regarding the Common Core

State Standards and their implementation. First, the Common Core policy initiative is based on the notion that the average U.S. student score can be increased to match the average student scores of Singapore (and other Asian Pacific Rim countries) simply by changing curriculum and testing more often. We ignore the fact that we would need to have a high-stakes exam as early as sixth grade, a society that would accept tutoring as a fact of life for virtually all students, and parents who would be content with their children, from the earliest elementary grades through high school, doing very little but studying after school. I do not think that any of these conditions would be acceptable to the majority of American parents. We would also need families with enough resources so that children would not have to take on significant family responsibilities or get a job—a dream unless we do more to better the economic means of those at the lower end of the income distribution.

Education is assumed to be important by virtually all parents in Singapore, just as it is by virtually all parents in the United States, not just in the affluent suburbs but in the cities and rural areas as well. But students in high-performing schools in the United States have reason to believe that if they work hard, they can be successful in college and get a good job. Unless we can give enough hope to students in lower-performing schools that devotion to schoolwork will pay off, these students have little incentive to put in the amount of time that it takes to learn the mathematics that we would like them to know.

But is all hopeless? Not at all. In reference to the 1996 TIMSS, a study of school districts north of Chicago indicated that eighth-grade students in public schools in these affluent suburbs scored about as high as students in the top-scoring countries in the world (TIMSS 1999). There is no reason to believe that these school districts are that much different from school districts surrounding other large cities with similar socioeconomics. Add to that students in university and high-tech communities who traditionally score high, along with students in high-performing private schools, and it is clear that the U.S. education system is providing a goodly number of students with a world-class mathematics education.

What we learn, then, from Singapore, other high-performing nations, and high-performing U.S. districts is that virtually all students can learn mathematics to a high level if they receive a well-designed curriculum with high expectations and devote the time, both in school and out of school, that it takes to learn such a curriculum.

Our task then, is to increase the number of students who get the opportunities that students in the more high-performing areas of the United States have. One way of increasing student performance is to change the economics of education so that students and their parents do not have to work extra hours per week to afford college. But even then the average U.S. student score on international tests would not match that of Singapore's students because the U.S. school population includes the children of virtually all who work in our country.

Should we despair? Not at all. At no time in the forty-eight years since the first international testing in 1963–64 have U.S. mathematics students as a whole scored higher than students in most comparable countries. Yet through this period the U.S. economy was perhaps the strongest in the world. Further, in that first international study of 1963–64, Swedish students scored lowest, and Sweden's economy, too, has been very strong. Japan, which from the 1960s consistently has been among the highest scoring countries, had a severe recession in the 1990s and into this century, whereas the U.S. economy was strong.

There has been no connection between the performance of U.S. students on these tests and the health of the U.S. economy in relation to the rest of the world. We need to improve these scores, but it would be more prudent to use affluent American suburbs as models to emulate throughout the country rather than emulate other countries incorrectly by misidentifying the reasons for their successes.

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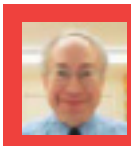

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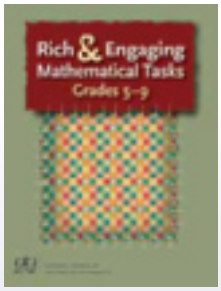

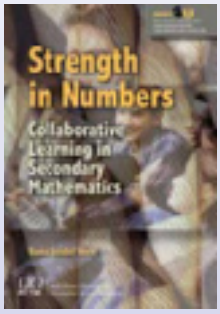

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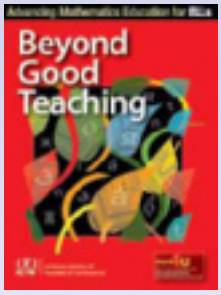

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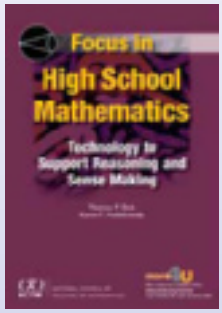

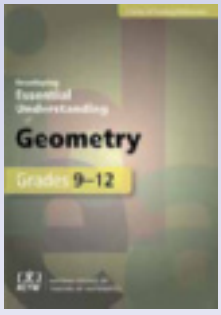

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