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Comparison of Academic Achievement in Virginia with Leading Industrialized Nations

Executive Summary

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In 2011, the Virginia Commission on Youth adopted a two-year study plan, *Comparison of Academic Achievement in Virginia and in Leading Industrialized Nations*, to explore the following issues:

- Students in the United States lag in academic performance when compared with students in other industrialized nations, particularly in science and mathematics.
- The 2009 Organization for Economic Co-operation and Development (OECD) Programme for International Student Assessment indicated that, of the 34 countries evaluated, the United States ranked 14th in reading, 17th in science, and 25th in mathematics.
- The United States falls far behind the highest scoring countries, including South Korea, Finland, Singapore, Hong Kong, Shanghai in China, Japan, New Zealand, Australia, and Canada.
- Today's United States graduates compete in a global job market where highly skilled workers are in increasing demand. While other countries have made significant improvements in education, the United States has made only incremental improvements.
- The decline in the academic achievement of American students and the failing condition of public education has been prominent among national and state concerns about the United States' ability to compete internationally.
- In the early 1980s, the Commonwealth of Virginia hosted the national meeting on "A Nation at Risk" to reform and strengthen public education. Since that meeting, Virginia education initiatives have included the Standards of Learning, the Virginia Preschool Initiative, the Governor's magnet, charter, virtual, laboratory, and alternative schools, dual enrollment, year-round schools, and career and technical education schools. These initiatives provide options for Virginia students to meet their educational needs and, as a result, significant progress in student achievement has been achieved.
- Despite progress made to date, public education in Virginia is not immune to the challenges confronting American education. Disregarding the distress signs would be imprudent and pose a significant threat to state economic status and success in the global marketplace.
- Virginia needs a cadre of scientists, engineers, mathematicians, educators, physicians, and entrepreneurs, and a steady supply of the brightest minds in all other professions and occupations in the workplace to maintain and improve Virginia's productivity and competitive edge.
- It is critical to evaluate the academic achievement of Virginia's students, relative to the reported outpacing in education by students in other countries, to improve and strengthen Virginia's schools and learning opportunities for its students.

Exploring how other countries approach educational policy issues has the potential to enhance Virginia's educational policy and practice. A comparison of the highest performing nations can provide valuable insights that the Commonwealth of Virginia may adopt or adapt. While it can be argued that comparing countries has limited meaning due to cultural and societal differences,

the purpose of this study is to present and acknowledge these differences in order to determine which aspects could be incorporated to increase student achievement in our schools.

Available data over a range of factors were reviewed to identify countries (and regions of countries) that would generate comparison and contrast most beneficial to Virginia. Of the top performing nations on the Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS) assessments, factors such as geographical region, population, population density, and gross domestic product (GDP) were used to narrow the list of countries used in our comparison.

Based on a careful review of the literature and other available data sources, five countries with high quality educational systems were selected for a more in-depth analysis: Canada, Finland, Shanghai in China, Singapore, and South Korea. A sixth country, The Netherlands, was added upon the request of the Virginia Commission on Youth during the preliminary presentation made in December 2011. Selection was made based on geographic diversity and availability of sufficient data. A wide range of sources were reviewed for each of these countries/regions, including governmental, intergovernmental, and non-governmental publications, surveys, international and national professional and academic journal articles, and websites.

This report is based on a comprehensive literature review of selected countries whose students consistently rank high on international assessments. It compares the performance in those countries with the United States, focusing on what we know about students in Virginia whenever possible. The review attempts to identify attributes that explain/support the positive educational outcomes in the selected countries. Section 3 develops an educational profile of the selected countries/regions to compare with the Commonwealth of Virginia. In addition to general information related to population and gross domestic product, in-depth information regarding the educational organization, a brief history of the educational system, financing of schools, and recent initiatives to improve student achievement is provided to add context to the quantitative data. Section 4, the major section of this report, examines and compares the selected countries/regions on a number of educational system attributes. These comparisons indicate wide differences across countries/regions. However, a comparative analysis of these high-performing educational systems also reveals certain commonalities that transcend their historical, political, cultural, and economic differences.

- **Age of attendance.** United States students are required to begin school at ages similar to students in Finland, South Korea, Canada, and Singapore. The average compulsory schooling of Singapore students is far shorter than other countries in the comparison; however, most students attend the four years of secondary school that is available.
- **Enrollment rate.** In 2010, 39 percent of children ages 3 and 4 in Virginia still were not enrolled in some type of pre-primary program. PISA data indicated that students who attend pre-primary school tend to perform better than students who do not. This advantage is greater in school systems where pre-primary education lasts longer, where there are smaller pupil-to-teacher ratios at the pre-primary level, and where there is higher public expenditure per pupil at that level of education.
- **Immigrant students.** There is a belief that only the United States faces challenges teaching non-native learners. Although the number of immigrants is growing in the United States, the immigrant population is increasing even faster in Canada and

Singapore. Furthermore, these nations are still able to outperform the United States on international comparison tests.

- **Student/teacher ratio and class size:** Class size and student-teacher ratios are significantly correlated to public school expenditures and student achievement. Student-teacher ratios are higher in South Korea, Singapore, and Shanghai, which fund teacher pay comparatively well (comparable to salaries of other professionals in the given country). At the sacrifice of higher pay, lower student-to-teacher ratios drive education costs upward, as seen in the United States and Virginia. Finland has been able to maintain low student-to-teacher ratios while paying teachers comparatively well. Class size affects how much time and attention teachers give individual students, as well as the social dynamics among students. However, extant research finds a weak relationship between reduced class size and student performance.
- **Time per week teacher is engaged in instruction.** Teachers in the United States spend more time per week engaged in instruction than any of the compared countries. The OECD found that primary teachers in the United States spent an average of 1,097 hours a year on instruction (or six daily lessons of 50 minutes), while South Korean teachers spent a total of 840 hours on instruction and Finnish teachers provided instruction an average of 677 hours a year (or about four daily lessons of 45 minutes).
- **Time spent learning.** School children in the United States spend less time engaged in learning than students in comparison countries. They have a shorter school year, although they have schools days of similar length. However, compulsory instruction during the school day is often supplemented by after-school lessons, especially in many of the top performing Asian nations. An estimated 45% of students in South Korea and Shanghai spend up to four hours per week on supplemental after-school lessons. While South Korea and Shanghai teach the importance of hard work, Finland teaches another lesson. One of the most striking features of Finnish schools is that their students have fewer hours of instruction than students in other countries.
- **Funding.** PISA data indicated that expenditures per student account for an estimated 9% of the variation in a country's mean performance. However, an increase in spending does not guarantee an increase in mean scores; in comparison to the leading nations reviewed in this study, the United States spent significantly more per student and a higher percentage of the GDP. It is not just the volume of resources that matters, but how countries invest resources and how well they succeed in directing the money to where it can make the most difference.
- **School choice.** In educational reforms regarding school choice, there has been an assumption that if students and their parents are given the right to choose schools based on academic criteria and personal educational needs or preferences, this will foster competition among schools to provide better quality education. Competition results from private and parochial schools, charter schools, and other forms of school choice that allow students to select schools beyond those determined by geography. The educational systems in Canada, Shanghai, South Korea, and the United States have similar level of competition, while the competition is lowest in Finland and greatest in Singapore. PISA data indicated that the extent of competition is positively associated with student performance. However, once the socio-economic background of the students and schools are taken into account, the relationship weakens. The reason is that socio-economically advantaged parents are more likely to choose schools that are competitive in academics,

while socio-economically disadvantaged parents are more concerned with low expenses and financial aid than academic achievement when choosing a school. Research indicated that choice and competition can lead to greater achievement gaps and lower social mobility.

- **Teacher preparation and selection.** A number of studies have found teacher education and preparation are significantly related to increases in student achievement. Generally, all educational systems require prospective teachers to complete both educational and professional preparation requirements. The educational requirements in China and Singapore for elementary teachers are lower than those established for secondary teachers; however, there is a movement to bring requirements for elementary teachers up to par with secondary teachers. All educational systems require prospective teachers to receive professional preparation in both subject matter and pedagogy, or expertise in knowing what and how to teach. The top performing nations maintain a high level of selectivity for people interested in entering the teaching profession. For instance, only one in ten applicants is accepted to the teacher-training programs in Finland and one in six applicants is accepted in Singapore. In the United States, the teaching profession is not very selective and has the perception of being a non-competitive, easy-entry occupation. Forty-seven percent of America's teachers graduated in the bottom third of their college classes, 30% in the middle third, and only 23% in the top third.
- **Teacher compensation.** Most of the high-achieving countries have policies that align teacher compensation rates with other professions that are traditionally deemed as attractive. The United States has the lowest ratio of teacher salary to the GDP per capita, with an average of 0.97; on the other hand, the ratio is 2.0 in South Korea. As mentioned earlier, teacher salaries are related to class size: if spending levels are similar, school systems make trade-offs between smaller classes and higher salaries for teachers. PISA data show that higher teacher salaries, not smaller class sizes, are associated with better student performance.
- **Teacher evaluation.** All countries in this study (except Finland) tend to use students' achievement data to monitor teacher practices and complement this information with qualitative assessments such as peer reviews and classroom observations. Teacher evaluation is a frequently-debated issue in many countries. The policies regarding teacher appraisal vary greatly from country to country.
- **Assessment.** Student performance assessment is a common practice in many countries. PISA data indicated that the rationale for assessments and the nature of instruments used vary greatly across the countries. It is found that grade-by-grade standardized testing, an educational strategy most popular in the United States, is absent in the countries with the most successful educational systems. Some of high-achieving countries only administer national testing at gateways, such as the end of primary, lower secondary, and upper secondary school. Schools and teachers are expected to assess their students' learning on a regular basis as a part of quality instruction. Furthermore, other countries use gateway assessments for accountability purposes to a lesser extent than the United States.
- **International gap in student achievement.** The international assessments reveal a significant amount of student achievement gap between the United States and other leading countries. For instance, PISA indicated that Shanghai, Canada, Finland, and South Korea all perform at between one-half and one proficiency level above the OECD average in mathematics. Put it in another way, Canadian 15-year-olds, on average, are

over one school year ahead of the 15-years-old in the United States in mathematics and more than half a school year ahead in reading and science. In addition, the United States is behind other leading countries in producing advanced-achieving students. The United States has a more severe inequality in education. The PISA data indicate that socio-economic disadvantage has a particularly strong impact on student performance in the United States; in the United States, two students from different socio-economic backgrounds vary much more in their academic achievement than in other countries. Socio-economically disadvantaged students in Canada and Finland are much less at a risk of poor educational performance than their counterparts in the United States.

Policies and practices that could be adopted in Virginia are identified for further study and determination of feasibility. This report attempts to add some of the missing pieces in existing international comparisons through the inclusion of a qualitative perspective. Contextual factors provide a balance for the international literature on the quantitative differences in student achievement as measured by standardized tests. There are a few important lessons can be learned from the top performing nations on international assessments:

- **Recognizing the importance of nurturing students' knowledge base and the ability to conduct higher-level thinking.** The highest-achieving countries around the world have committed significant resources into teacher training and support over the last decade. They raised standards and created stronger pathways for teacher education, providing teachers more content and pedagogical knowledge, paid them well in relation to competing occupations, and provided them with meaningful time for professional learning.
- **Recruiting the most talented young people to the profession of teaching.** Top-performing school systems recruit their teachers from the top third of each cohort graduating from their schools: the top 5% in South Korea, the top 10% in Finland, and the top 30% in Singapore and Hong Kong. In comparison, the status and prestige accorded to teaching is much lower in the United States as compared to other occupations. Teaching has been considered a less attractive and less desirable line of work. Teachers rank in the middle range in surveys of occupational prestige—well below traditional higher-status professionals such as physicians, engineers, and attorneys, and well above blue collar occupations such as police, plumbers, and carpenters. However, competitive high salaries, comprehensive training, and high social status standing make teaching a sought-after career option in Singapore, South Korea, and Finland.
- **Principal quality.** The international comparison indicated that the top performers have paid attention to principal quality and leadership development. The education policies and practices in the high-performing countries exemplify a clear understanding that high-quality teaching and strong school performance require effective leaders. For instance, Singapore has a unique approach to identifying and developing leadership capacities. Throughout Singapore, talent for leadership is identified and nurtured rather than being left to chance. After three years of teaching, teachers are assessed annually to see which career paths (i.e., teaching track, senior specialist track, and leadership track) would best suit them.
- **Narrowing persistent gaps in student achievement: Equal allocation of education resources.** The benefits of equal access to effective teachers for all subgroups of students were evidenced by the highest-performing school systems around the world. In American

public school systems, effective teachers are among the most inequitably distributed resources. Oftentimes, disadvantaged poor, non-white, and low-achieving students have the least access to effective teachers. The students who need the strongest instruction often are taught by teachers with the least experience and expertise. School policy on teacher quality can be an important lever for raising the achievement of low income students. Research supports that having a highly effective teacher for three to four years in a row would substantially close the achievement gap across income groups.

- **Cultivating teacher collaboration and professional development.** Researchers agree that professional development that is unrelated to teacher content and pedagogy often produces minimal results because follow-up is lacking and classroom implementation is rare. Frequently, professional development in the United States is not tightly linked to the instructional agenda of the school. In comparison, the professional development in the high-achieving educational systems demonstrates the characteristics of focusing on content and pedagogy, in-depth active learning, extended duration, and collective participation. For instance, China has developed a rigorous and institutionalized system to connect professional development with classroom teaching. At the grassroots level, subject-based “teaching-study groups” engage in study and teaching improvement on a daily basis.
- **A renewed focus on K-12 STEM-H education (Science, Technology, Engineering, and Mathematics - Healthcare).** The primary driver of future global knowledge economy and concomitant creation of jobs will be innovation, largely derived from science and engineering advances. A successful K-12 STEM-H education is essential to sustainable scientific leadership and economic competitiveness. According to the National Assessment of Education Progress, about 57% of Virginian 4th graders are not proficient in mathematics when they complete 4th grade, and about 68% of 8th graders do not meet proficient levels when they complete 8th grade. Employers in many industries lament that job applicants lack the needed mathematics, computer, and problem-solving skills to succeed, and international students fill in an increasing portion of elite STEM positions in the United States. In order to expand the number of students who ultimately pursue advanced degrees and careers in STEM fields, the action must start at the K-12 level. An inadequate preparation in STEM subjects in basic education has major consequences in higher education. STEM degrees only account for about a third of all first university degrees awarded in the United States, compared with more than a half degrees in China, India, and Japan.