Virginia Commission on Youth

COMPARISON OF ACADEMIC ACHIEVEMENT IN VIRGINIA WITH LEADING INDUSTRIALIZED COUNTRIES

(POSSIBLE POLICY APPROACHES IN ITALICS)

TEACHER PREPAREDNESS/EFFECTIVENESS

Findings/Conclusions	Draft Recommendations
Finding #1 – Teacher Recruitment The top-performing countries which were studied do two things to maintain their high quality teacher workforce; they maintain a high level of selectivity for individuals interested in entering the teaching profession and they compensate first-time teachers well. The hiring decision is viewed as extremely important, considering that the hiring of an individual could result in 30 years of either effective or inferior teaching. Only one in ten applicants is accepted to the teacher-training programs in Finland and one in six applicants is accepted in Singapore. Top-performing school systems recruit their teachers from the top third of each cohort who graduate: the top 5% in South Korea, the top 10% in Finland, and the top 30% in Singapore and Hong Kong. Forty-seven percent of teachers in the United States graduated in the bottom third of their college classes, 30% in the middle third, and only 23% in the top third. Furthermore, in the United States, the teaching profession ranks in the middle range 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.	1. <u>Develop and implement a rigorous teacher recruitment mechanism</u>. *a. Recruit top academic achievers who are rising college freshman or are already enrolled in college.* *b. Set academic requirements based on grade point average or SAT/ACT scores.* *c. Develop a two-stage teacher preparation admissions process. The initial paper screen is based on the applicant's matriculation exam score, upper secondary school record, and out-of-school accomplishments. The second stage incorporates a written exam and an interview, both focusing on communication skills and attitudes toward teaching.* *d. Other options?* 2. <u>Provide incentives to attract high-performing candidates</u>. *a. Offer prospective teachers monthly stipends that are competitive with the monthly salary of recent graduates in other fields. In return, they must commit to teaching for a certain number of years (three or five years).* *b. Consider developing merit-based programs that specifically target funds and recruitment efforts for academically high-performing candidates. Candidates may be awarded*

	scholarships (e.g., Florida's Teacher Scholarship and Forgivable Loan Program, Illinois' Golden Apple Scholar Program, Massachusetts' Tomorrow's Teacher Scholarship Program, and South Carolina's Teaching Fellows Programs). *c. Consider requiring awardees pay back the scholarship through teaching service in-state (e.g., one-year of teaching in specific school settings, such as rural schools or schools with high populations of economically-disadvantaged students).* *d. Develop high school internship programs to cultivate early interest in the teaching profession, particularly among students gifted in math, science, or STEM-H fields.* *e. Other options?* 3. <u>Request school divisions develop rigorous hiring processes</u>. *a. Recommend that the hiring criteria in local school divisions include appropriate university degrees, subject matter specialization, demonstration of communication skills through interviews and observation of teaching activities.* *b. Other options?*
Finding #2 – Quality of Teacher Preparation Programs Various studies have estimated how much of the variability in student achievement can be explained by the quality of the teacher. Ineffective teachers have negative longitudinal effects on student learning. If students have a less-effective teacher in the first year and the highest-level teachers for remaining years, their achievement would never exceed that of students who are assigned effective teachers for all years. 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. 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. Leaders in Finland attribute their students' success in learning to intensive investments in teacher education; all teachers receive three years of high-quality graduate level preparation. Most teachers in Finland hold master's degrees in both their content area and in education. In addition, their preparation is aimed at learning to teach diverse learners—including special needs students—with a strong focus on how to use formative performance assessments to enhance student learning.	<u>Raise the rigor of teacher preparation programs.</u> *a. Require all student teachers to be supervised and jointly evaluated by an experienced teacher, principal, and university advisor.* *b. Request the State Council of Higher Education of Virginia (SCHEV) review teacher practicums to ensure the inclusion of a variety of experiences in addition to classroom teaching, such as observation of lessons, conferences with teacher, or participation in extracurricular and professional development activities.* *c. Strengthen the exit requirements of teacher education programs to include criteria such as completion of required courses, examinations, project assignments, a teacher practicum, and other forms of assessment.* *d. Expand the use of performance-based assessments proposed in the Virginia State Board of Education Guidelines for Uniform Performance Standards and Evaluation Criteria for Teachers for beginning teacher licensing as a means of determining effectiveness before a teacher receives a professional licenses.* e. *Other options?*

Findings/Conclusions	Draft Recommendations
Finding #3—Teacher Support and Development One of the most critical findings from this comparative study is the importance of not only recruiting effective teachers but also sustaining the quality of the teaching force. There is abundant evidence that teachers who receive substantial high-quality professional development can help students achieve at higher levels. Quality staff development has evolved in high-performing countries from a remedial support system which focused on individual improvement into a dynamic, reflective, and continuous improvement process. Top-performing countries have developed rigorous systems to connect professional development and classroom teaching. In Singapore, teachers receive 100 hours of professional development; in the Netherlands; they receive more than a month; in South Korea, all third-year teachers must complete a formal training program for four consecutive weeks, six days a week, during their winter or summer break, with some financial aid available. In China, teachers at the induction stage, practicing teachers, and administrators are required to observe and provide feedback on a certain number of teachers' lessons each year. These steps are built into teachers' career ladders. Teachers in China are also classified into four grades to denote their professional status and promotion from one grade to the next often requires demonstrating lessons, contributing to induction of new teachers, and publishing in journals or magazines about education or teaching. In the United States, mentoring and induction systems often are narrow and sporadic add-ons to non-collaborative organizational structures. American teachers work in "egg-crate" classrooms and have less time to interact with their peers or with mentors. Mentors frequently do not teach the same subject or grade level as new teachers and may not even teach in the same building. Finally, teachers in high-achieving countries spend less of their time teaching classes; therefore, they have more time to do collaborative planning and engage in professional development.	<u>Improve Virginia's teacher professional development practices/programs</u>. *a. Model the practices in Shanghai, China to develop an institutionalized system to connect professional development and classroom teaching.* *b. Provide induction programs for apprentice teachers with experienced master teachers before being expected to teach full time.* *c. Create policies/incentives modeled after those in the comparison countries that encourage teachers to participate in professional development activities through paid leave each year.* *d. Create policies that encourage school divisions to hold public instruction workshops to demonstrate exemplary teaching practices.* *e. Other options?*

Findings/Conclusions	Draft Recommendations
Finding #4 – Teacher Evaluation All countries in this study (except Finland) tend to use students' achievement data to monitor teacher practices and supplement this information with qualitative assessments, such as peer reviews and classroom observations. Teacher appraisal policies vary greatly country to country. In Singapore, teachers' performance is appraised annually against 16 different competencies. Competencies include teacher contribution to the academic and character development of the students in their charge, their collaboration with parents and community groups, and their contribution to their colleagues and the school as a whole. Teachers who do outstanding work receive a bonus from the school's bonus pool. It is important to note this individual appraisal system is not based solely on student test scores, but is developed and implemented within the context of the school's overall goal for educational excellence and a strong system of professional accountability.	<u>Implement teacher evaluation policies which encourage educational excellence and professional accountability</u>. *a. Implement faithfully and institutionalize the revised teacher evaluation system policy guidelines in the Virginia Board of Education's Guidelines for Uniform Performance Standards and Evaluation Criteria for Teachers.* b. *Other options?*
Finding #5 – Teacher Compensation Most of the high-achieving countries have policies that align teacher compensation rates with other highly regarded professions. Annual earnings for South Korean lower secondary teachers are almost twice the level of national income. In contrast, teachers in the United States earn less than the national per capita income with an average teacher salary ratio of .97 to GDP per capita. This ratio is 2.0 in South Korea. In the United States, teachers earn an average starting salary of about $36,000, lower than the averages of $43,635 for computer programmers, $44,668 for accountants, and $45,570 for registered nurses. Teacher pay is not only lower than other occupations requiring the same level of education, but has also been falling farther and farther behind the past 60 years. 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. However, the Programme for International Student Assessment (PISA) data show that higher teacher salaries, not smaller class sizes, are associated with better student performance. Teachers in Shanghai and Singapore receive extra pay and promotions for high student achievement. Conversely, Finland and Canada have rejected merit pay due to the lack of an empirical research base supporting the value of such an approach. However, these two countries encourage extensive dialogues between principals and teachers about student progress.	<u>Study/revise Virginia's teacher compensation system to include components that foster excellence in teaching</u>. *a. Develop career ladders or other compensation plans that take into account various measures of teacher effectiveness for designating teachers for specific roles or rewards.* *b. Develop compensation plans that include measures such as National Board Certification and other performance-based evaluations, indicators like master's degrees and other measures of student achievement growth.* *c. Conduct a needs assessment to develop a differentiated compensation system based on teacher performance. Issues such as adequate funding, fairness, performance measurement, and buy-in will be addressed.* *d. Other options?*

STRUCTURE AND SUPPORT OF THE EDUCATIONAL SYSTEM

Findings/Conclusions	Draft Recommendations
Finding #1 – Principal Quality The international comparison indicated that the top performers have paid attention to principal quality, particularly instructional leadership. For instance, Singapore has a unique approach to identifying and developing leadership capacities. Throughout Singapore, talent for leadership is proactively identified and nurtured. After three years of teaching, teachers are assessed annually to determine which of three career paths would best suit them: • Teaching track (including steps of Senior Teacher, Lead Teacher, Master Teacher and finally, Principal Master Teacher); • Senior specialist track (specialists in curriculum, instructional design, educational research, statistics, etc.); and • Leadership track (including trajectory of Subject Head/Level Head, Head of Department, Assistant Principal, Principal, and Superintendent). Singapore recruits the best from the talented pool of their teachers and provides top-level training to prepare them to become leaders. In the United States, there is no well-defined "teacher-to-leader" career path, nor are there policies to cultivate a high-quality talent pool. Any teacher can train as a principal or school head, and then apply for a position in a school. Despite this, there are concerns that soon there may be a shortage of qualified individuals to fill school leadership positions and promote school improvement. Approximately half of the school divisions surveyed reported a shortage in the labor pool for K-12 principal candidates, regardless of the schools' grade level or if they were located in rural, suburban, or urban areas. The major factors that keep those who were identified by their school principal as leaders or having leadership potential from choosing to be school principals are testing/accountability pressures, job stress, amount of time required, and societal problems that make it difficult to focus on instruction.	<u>Develop leadership mentoring and development programs that target the skills, knowledge, and attributes of effective leaders</u>. *a. Employ the leadership model adopted in Ontario, Canada in 2008. This model includes a strong mentoring program that has reached over 4,500 principals and vice principals, and a new province-wide appraisal program for school leaders.* *b. Implement the* Guidelines for Uniform Performance Standards and Evaluation Criteria for Principals *adopted by the Virginia Board of Education in 2012.* *c. Develop leadership policies and practices to identify and develop leadership talent among teachers based upon the Singapore model.* *d. Consider establishing a Center for Research on Teacher and Leader Excellence to promote best practices in instructional leadership across the Commonwealth.* *e. Other options?*

Findings/Conclusions	Draft Recommendations
Finding # 2 – Instruction Time Teachers in the United States spend more time per week engaged in instruction than any of the compared countries, all of which outperform the United States on international comparative assessments. The Organisation for Economic Co-operation and Development (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). Teachers in high-achieving countries spend less time teaching classes; therefore, they have more time to do collaborative planning, to provide feedback individually to students, to reach out to and engage families.	Investigate the Commonwealth's planning time, instructional time, school day structure, and time allotment requirements. *a. Review the allocation of time teachers have for planning.* *b. Consider administering surveys to examine teachers' perceptions about trade-off between larger class size and less instructional time.* *c. Consider investigating the international practices on departmentalizing the instruction at the elementary school level, which leads to teachers specializing on one subject and teaching multiple classes. These strategies shorten planning time and allow more time for teacher reflection and collaboration. As a result, teachers can modify the lessons to different classes, thereby, delivering higher quality instruction.* *d. Other options?*
Finding # 3 – Time Spent Learning United States' school children have a shorter school year, although with schools days of similar length to those in comparison countries. In many of the top performing Asian countries, compulsory instruction during the school day is often supplemented by after-school lessons. An estimated 45% of students in South Korea and Shanghai spend up to four hours per week on supplemental after-school lessons; an additional 20% spend more than four hours a week. It is estimated that children in South Korea will spend almost two years more in learning than United States students by the end of high school.	Investigate how to best maximize instructional time for students. *a. Consider providing more resources and academic programs for after-school, such as SOL tutoring, or gifted or enhanced learning activities, which are aligned with curriculum content.* *b. Other options?*

EDUCATIONAL INNOVATIONS

Findings/Conclusions	Draft Recommendations
Finding #1 – Virtual Learning Virtual learning is a means to provide students with more opportunities to learn. The Commonwealth of Virginia has been recognized as a leader in virtual learning. The Virtual Virginia initiative currently offers 40 different online courses, including 24 Advanced Placement (AP) courses, foreign languages, and other core course. Approximately 2,500 students from 238 Virginia middle and high schools are enrolled and the reach of the program extends to 5,700 students who receive remedial instruction through online tutorials hosted by Virtual Virginia. This application of virtual learning will provide more college level opportunities for students as well as increase graduation rates.	Support the expansion of virtual learning opportunities in Virginia. *a. Investigate multiple sources of funding, such as enrollment tuition, federal or state grants, or external funders, to ensure the sustainability of the virtual schools.* *b. Develop a plan to ensure equitable access to virtual learning resources, in particular, for the at-risk student population.* *c. Request more research in the field of virtual learning to have more knowledge base about what makes virtual learning effective.* *d. Develop a plan to create more virtual middle, elementary, and remediation courses. Currently, more courses offered are high school courses, including AP or college level courses geared toward high-achieving students working toward college credits.* *e. Consider and plan teacher professional development to require a thorough knowledge of virtual teaching strategies and the workings of specific virtual teaching platforms.* *f. Investigate partnerships with other states to attain the most qualified teachers in specialized fields.* g. *Other options?*
Finding # 2 – Science, Technology, Engineering, and Mathematics–Healthcare (STEM-H) 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. Moreover, the achievement gaps between student population groups, black/white, Hispanic/white, and high-poverty/low-poverty, are close to one standard deviation in size. International comparison data suggest that the underperformance of United States students in STEM-H disciplines might be explained by differences in United States	Develop a plan to implement rigorous and coherent STEM-H curriculum that deepens STEM-H learning over time. *a. Strengthen science education at elementary and middle school level. Teachers can cover less material, but cover it in depth. For example, separate science into sub-subjects like biology, physics, and chemistry starting at middle school level.* *b. Enhance Virginia's STEM-H curriculum to promote mastery.* *c. Develop gender-specific student programming to encourage participation in STEM-H-related classes.* d. *Build cooperation with STEM-H-related business and industry where students can obtain "real life" experiences in the technology sectors*. *e. Increase the proportion of in-field STEM-H teachers, particularly in Title I schools.* f. *Other options*?

standards, curricula, and textbooks. Traditionally, the standards and curriculum in the United States have been broad but superficial. The overall supply of mathematics and science teachers has been rising to meet total demand, but there are local imbalances, with many schools struggling to fill openings in STEM-H subjects with qualified teachers. In particular, schools in high-poverty communities often do not have access to knowledgeable teachers. In addition, there are many mathematics and science teachers who lack the level of preparation in the subject areas and teaching that the professional community deems adequate. Too many middle and high school teachers teach STEM subjects out of their field. For instance, a 2008 study indicated that 40% of mathematics classes in high-poverty schools were taught by out-of-field teachers. Employers in many industries lament their findings 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-H positions in the United States. In order to expand the number of students who ultimately pursue advanced degrees and careers in STEM-H fields, the action must start at the K-12 level. An inadequate preparation in STEM-H subjects in basic education has major consequences in higher education. STEM-H degrees account for only about one-third of all first university degrees awarded in the United States, compared with more than one-half of the degrees awarded in China, India, and Japan.	
Finding #3 – The Achievement Gap The international assessments reveal a significant 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. Canadian 15-year-olds, on average, are over one school year ahead of the 15-year-old in the United States in mathematics and more than half a school year ahead in reading and science. The PISA data indicate that socio-economic disadvantage has a particularly strong impact on student performance in the United States. For example, two students from different socio-economic backgrounds	1. <u>Develop strategies to improve the equitable allocation of high-performing teachers to needy schools</u>. *a. Provide incentive pay to attract high-performing teachers to high-needs schools or high-needs fields and to pay them additional stipends to serve as mentors or master teachers.* *b. Evaluate the results of Virginia's pilot program that awards up to $5,000 to teachers in schools identified as "hard-to-staff" and who obtain high student achievement growth with their students to gauge whether this program can be implemented statewide.* *c. Other options?* 2. <u>Develop a statewide school turnaround strategy for low-performing schools</u>. *a. Pilot a school turnaround pilot based on the Shanghai model.*

in the United States vary more in their academic achievement than in other countries. According to PISA data, Finland's between-school variance on student achievement was only 7% in contrast with the between-school variance in the United States of 36%. In American public school systems, effective teachers are among the most inequitably distributed resources. Among 39 countries, the Unites States ranked 36th in its ability to provide equal access to qualified math teachers for low- and high-socio-economic status (SES) students. 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. In addition, low income and minority students face higher teacher turnover and tend to be taught more frequently by beginning teachers. One interesting strategy employed by Shanghai to improve weak schools is the commissioned education program. Under this program, top performing schools are assigned a weak school to administer. Such assignments are most easily implemented within the city: however, this type of exchange program is being used with poor rural schools. Such a system assists the weaker schools and benefits stronger schools by allowing them to promote teachers and administrators.	*b. Provide incentive pay to attract high-performing/effective principals to struggling schools.* c. *Other options?*

THE INTERNATIONAL ACHIEVEMENT GAP

Findings/Conclusions	Draft Recommendations
Finding # 1 – The International Baccalaureate (IB) The IB program, which was funded in 1968, is offered in 3,464 schools in 143 countries. It serves over 1,049,000 students ages 3 to 19 years. The IB program has a challenging curriculum and rigorous assessment standards aligned with the recommendations of the Commission on the Skills of the American Workforce, including international citizenship, language skills, and technological literacy. Currently, there are 1,373 IB schools in the United States. There are 327 schools that offer the Primary Years Program (PYP) for students ages 3 to 12; 468 schools which offer the Middle Years Program (MYP) for students ages 11 to 16; and 778 schools that offer the Diploma Program (DP) for students aged 16 to 19. Virginia has eight PYP schools, 36 MYP schools; and 36 DP schools.	Support, financially and otherwise, the expansion of IB programs. *a. Support the expansion of IB programs at both the middle and high school level.* *b. Request more schools with IB programs to have dual credentials (having sister schools in other countries).* *c. Request more research on IB curriculum and assessment in order to develop and implement a similar but cost-effective system in every public school.* d. *Other options?*
Finding # 2 – More Rigorous Middle School Curriculum International data indicates that the majority of United States students receive less rigorous content coverage than those in other higher performing nations. Secondary students in the United States rank lower compared to the rankings of elementary students on international tests. Consider the following findings: • United States students' international standing was stronger at the fourth grade level than at the eighth grade level in both mathematics and science relative to the 25 countries that participated in the Trends in International Mathematics and Science Study (TIMSS) at both grade levels. • United States students' international standing was stronger in eighth grade than in twelfth grade in both mathematics and science relative to the international averages for the 19 other countries that participated in TIMSS at both levels. • United States students' attitudes about science decline during the middle and high school years. Research has shown that students' attitudes about science drop dramatically at age 12 after attending	Continue to examine and improve Virginia's academic standards to ensure the rigor and quality of standards. *a. Develop more advanced math/science curriculum for grades 6, 7, and 8. For example, offer age-appropriate courses in biology, chemistry and physics in grades 6-8.* *b. Conduct more research on the best math/science textbook and pedagogical instruction practices in other countries. Suggest conducting an in-depth examination of the math curriculum developed by Singapore's Ministry of Education. This curriculum emphasizes extensive coverage of a relatively small number of concepts at early stages, and integrates math concepts, such as algebra and geometry, in secondary grade levels.* *c. Request a comprehensive development of middle school math and science textbooks, including electronic and interactive versions.* *d. Support the Virginia Board of Education's work in establishing rigorous, focused and coherent content at all grade levels, and reducing overlap and variation in implemented curricula across grades.*

middle school for six weeks. • Almost half of all Chinese teachers emphasized prior knowledge while only 7% of teachers in the U.S. reviewed prior knowledge before introducing a new math concept. • Chinese teachers gave better explanation and instruction in solving math programs. As a result, Chinese students had better understanding of math concepts. Singapore has moved from a purely knowledge-transmission education model to one that emphasizes creativity and self-directed learning. Having been very successful as a knowledge transmission education system, Singapore is now working on curriculum, pedagogy, and assessments that value high-level, complex skills, as exemplified by their national education slogans, "Thinking Schools, Learning Nation" and "Teach Less, Learn More." In contrast, the reform in the United States is driving its educational system toward centralization of elementary and secondary education and is increasingly more test-oriented.	*e. Offer students more opportunities to take challenging classes, beginning at the elementary school level.* *f. Recommend schools to review and revise curricula on a regular schedule, for instance, every five or ten years. Curricula should concentrate on the topics that must be mastered in order to understand the material presented in the following year.* *g. Other options?*
Finding # 3 – Assessing Virginia's Students Performance 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. Overall, the United States most pervasively uses achievement data for accountability purposes. 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 student 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. The PISA study pointed out a sharp divergence between the forms of testing used in the United States and those used in higher-achieving countries. Whereas United States tests rely primarily on multiple-choice items that evaluate recall and recognition of discrete facts,	<u>Recommend Virginia consider additional methods to measure students' achievement</u>. *a. Request the Virginia Department of Education to develop a plan for Virginia to participate in the 2015 TIMSS and/or PISA assessment as a "separate" country. The plan will discuss recommendations regarding the most appropriate assessment, implementation issues, and potential public and/or private funding sources. The Department will report on the status of this plan to the General Assembly and to the Commission on Youth prior to the 2014 General Assembly Session.* b. *Request the Virginia Department of Education design a new generation of assessment to assess a broader range of student skills and knowledge. Instead of relying on multiple-choice computer-scored tests, which educators and researchers believe cannot accurately measure higher-order thinking skills, the assessment should be diversified to include essay-type responses or even oral examinations.* *c. Other options?*

most high-achieving countries use open-ended, performance-based items that require students to analyze, apply knowledge, and write extensively. The educational reform initiatives in the top-performing Asian countries—Singapore, Shanghai, and South Korea—have become more “American”, becoming increasingly decentralized and learner-centered. Meanwhile, the United States reforms are moving in precisely the opposite direction. There is abundant evidence both in the United States and around the globe that accountability through high-stakes standardized testing will not, in and of itself, promote the skills that are demanded by both today’s economy and the economy of the future. States are beginning to use international comparisons to benchmark their students’ performance and determine whether they are challenging their students. Massachusetts and Minnesota participated in the 2007 TIMSS as independent "countries." Both Massachusetts and Minnesota scored well above the national and international average on the 2007 TIMSS; Massachusetts’ fourth graders led peers in all 59 participating countries and states except Hong Kong and Singapore in math, and Minnesota students outperformed all but Hong Kong, Singapore, Chinese Taipei, and Japan in the same subject. Hong Kong and Shanghai, like Massachusetts, participate in the TIMSS as separate "countries. Massachusetts was able to conduct an item-by-item comparison of performance on test questions in its math and science curricula. The state noted that only 15% of students scored at the advanced level, compared with only about 40% in Hong Kong and Singapore. Eight states, in addition to Massachusetts, participated in the TIMSS as independent "countries": Alabama, California, Colorado, Connecticut, Florida, Indiana, Minnesota and North Carolina.	