INTERIM REPORT OF THE
VIRGINIA COMMISSION ON YOUTH

Comparison of Academic Achievement in Virginia with Leading Industrialized Countries

TO THE GOVERNOR AND
THE GENERAL ASSEMBLY OF VIRGINIA

REPORT DOCUMENT NO. 218

COMMONWEALTH OF VIRGINIA
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2012

COMMONWEALTH of VIRGINIA

Commission on Youth

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September 28, 2012

TO: The Honorable Robert F. McDonnell, Governor of Virginia

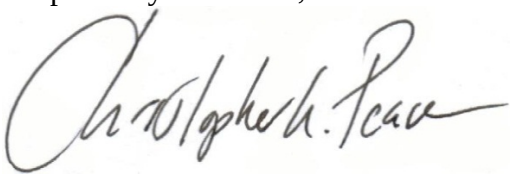
and

Members of the Virginia General Assembly

At the Commission on Youth's meeting on April 5, 2011, the Commission directed staff to conduct a two-year study comparing the academic achievement of Virginia students with students of leading industrialized nations. Commission staff presented the first year findings at the Commission's meeting on November 9, 2011.

This report represents the work of many government and private agencies and individuals who provided input to the study. The Commission gratefully acknowledges their support to this effort.

Respectfully submitted,



Christopher K. Peace

MEMBERS OF THE VIRGINIA COMMISSION ON YOUTH

From the Virginia House of Delegates

Christopher K. Peace, Chair
Mamye E. BaCote
Robert H. Brink
Peter F. Farrell
Beverly Sherwood
Anne Crockett-Stark

From the Senate of Virginia

Harry B. Blevins, Vice Chair
Stephen H. Martin
Vacancy

Gubernatorial Appointments from the Commonwealth at Large

The Honorable Gary L. Close, Esq.
Frank S. Royal, Jr., M.D.
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I. Authority for Study

Section 30-174 of the *Code of Virginia* establishes the Commission on Youth and directs it to "…study and provide recommendations addressing the needs of and services to the Commonwealth's youth and their families." This section also directs the Commission to "…encourage the development of uniform policies and services to youth across the Commonwealth and provide a forum for continuing review and study of such services."

Section 30-175 of the *Code of Virginia* outlines the powers and duties of the Commission on Youth and directs it to "[u]ndertake studies and to gather information and data . . . and to formulate and report its recommendations to the General Assembly and the Governor."

During the 2011 General Assembly Session, Senator Yvonne B. Miller introduced Senate Joint Resolution 320, which directed the Commission on Youth to study how the academic achievement of Virginia school children compares to the academic achievement of students living in leading industrialized countries. The resolution did not pass during the General Assembly Session; however, the Commission on Youth adopted the study as a two-year study initiative.

II. Members Appointed to Serve

The Commission on Youth is a standing legislative commission of the Virginia General Assembly. It is comprised of twelve members: six Delegates, three Senators and three citizens appointed by the Governor.

Members of the Virginia Commission on Youth are:

Delegate Christopher K. Peace, Mechanicsville, Chair
Delegate Mamye E. BaCote, Newport News
Delegate Robert H. Brink, Arlington
Delegate Peter F. Farrell, Richmond
Delegate Beverly J. Sherwood, Winchester
Delegate Anne B. Crockett-Stark, Wytheville
Senator Harry B. Blevins, Chesapeake, Vice Chair
Senator Stephen H. Martin, Chesterfield
The Honorable Gary L. Close, Esq., Culpeper
Frank S. Royal, Jr., M.D.
Charles H. Slemp, III, Esq.
One vacancy from the Senate

III. Executive Summary

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

- Students in the United States lag in academic performance when compared with students in other industrialized countries, particularly in science and mathematics.

- The 2009 Organisation 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 a 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 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, in order to improve and strengthen Virginia's schools and learning opportunities for its students.

Exploring other countries' educational policies has the potential to enhance Virginia's educational policy and practice. A comparison of the highest performing countries can provide valuable insights that the Commonwealth 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, and determine which aspects could be incorporated to increase student achievement in our schools.

Several factors were considered to identify countries (and regions of countries) that would generate comparative and contrasting data most beneficial to Virginia. Of the top performing countries 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 the comparison.

Based on a careful review of the literature and other available sources, five countries with high quality educational systems were selected for a more in-depth analysis. The process of country selection encompassed a range of sources (governmental, intergovernmental, and non-governmental

publications, surveys, international and national professional and academic journal articles, and websites) to identify the countries. Selection was made based on geographic diversity and availability of sufficient data.

The countries selected for comparison are:

- **Canada** was selected due to its proximity to the United States, its similarly diverse student population, and its decentralized educational system. Although not among the top five according to the TIMSS and PISA, Canada performs at the same level as Japan and New Zealand, and outscores the United States significantly.
- **Finland** is consistently ranked among the top five on international assessments and provided representation of a European nation. Finland provides outstanding education, with less emphasis on standardized testing and with fewer school system resources. This ability to do more with less may provide valuable information for improving the Virginia educational system.
- **Shanghai** is new to international assessment but significantly outperformed even the previously top performing countries in all three categories, according to PISA 2009.
- **Singapore** consistently ranks among the top countries across years, grades, and subjects, based on both TIMSS and PISA results.
- **South Korea** only has secondary school level data available on international assessments of PISA and TIMSS; however, the available data ranks South Korea among the top two in PISA Reading Grade 10 assessment and TIMSS Math Grade 8 assessment, as well as the top four in PISA Math Grade 10 and TIMSS Science Grade 8, and top six in PISA Science Grade 10.

A sixth country, The Netherlands, was added upon the request of the Virginia Commission on Youth during the preliminary presentation made in December 2011. An education profile for The Netherlands is provided as Appendix A.

This report is based on a comprehensive literature review of selected countries whose students consistently rank high on international assessments, and then compares their performance with that of students in the United States, focusing on what we know about Virginia students, whenever possible. The review attempts to identify attributes that explain/support the positive educational outcomes in the selected countries. Policies and practices that could be adopted in Virginia are identified for further study and a 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.

As the world becomes smaller through globalization and modernization, policymakers are reevaluating the goals and purposes of education. There are lessons to be learned from top-performing countries on international assessments, such as:

- Recognizing the importance of nurturing students' knowledge base and their ability to conduct higher-level thinking;
- Recruiting the most talented young people to the profession of teaching;
- Preparing teachers in both subject matter and pedagogy;
- Establishing policies that provide both accountability and autonomy; and
- Fostering collaborative structures for professional development.

IV. Study Goals and Objectives

During the 2011 General Assembly Session, Senator Yvonne B. Miller introduced Senate Joint Resolution 320, which directed the Commission on Youth to study how Virginia school children compare academically to students in other countries. The resolution did not pass during the General Assembly Session; however, the Commission on Youth adopted the study as a two-year study initiative at the Commission meeting on April 5, 2011.

A. ISSUES

The impact of globalization on economies is rapidly posing new and demanding challenges to individuals and societies. In this globalized world, people compete for jobs, not just locally but internationally. Academic achievement and excellence is vital to Virginia's economic future.

- Educators, parents, community leaders and policymakers at the local, state, and federal levels have focused attention on the need to address the academic achievement gap illustrated by grades, standardized-test scores, course selection, dropout rates, and college-completion rates.
- This finding is considered especially relevant, as today's high school graduates enter a global job market where highly skilled workers are in increasing demand and a number of countries have made significant improvements in closing the achievement gap.
- The United States' industry, science, and technological innovation is being overtaken by competitors throughout the world, and the United States' employers have detailed specifically and candidly the problems with the American education system:
    - In a major survey conducted in 2005 by the National Alliance of Manufacturing, when companies were asked whether K-12 schools were doing a good job preparing students for the workplace, 84 percent of the 800 participating companies indicated "no."
    - When controlling for industry segment, the Aerospace and Defense segment reported "no" 93 percent of the time.
    - The top three most frequently cited deficiencies of the education system were basic employability skills, math and science, and reading and comprehension.
- This achievement gap challenges the Commonwealth's ability to maintain a competitive advantage among industrialized countries. On international assessments of academic proficiency, United States students' performance is below other countries.
    - In the Trends in International Mathematics and Science Study (TIMSS) last conducted in 2007, middle school students in the United States ranked 11th out of 48 participating countries.
    - In the 2009 Programme for International Student Assessment (PISA), secondary school students' in the United States ranked 30th in Math, 23rd in Science, and 17th in Reading out of the 34-member Organisation for Economic Co-ooperation and Development (OECD) countries.
- In follow-up studies, researchers assert that international comparisons are problematic because the impact of other factors, such as culture and context, is difficult to measure. Variables which also impact student outcomes, such as curricula, amount and rate of preschool education, age of school enrollment, class sizes, discipline, quantity of education, attendance at additional schools, early tracking, and use of central exams and tests, are not accounted for by these studies.
- Other countries have started benchmarking their policies and practices with the world's top performers. A compilation of the attributes of leading industrialized countries' educational systems would be useful in order to gather best-practices to help Virginia keep up globally.

B. STUDY ACTIVITIES

At the Commission's meeting on April 5, 2011, the Commission approved the two-year study plan which included the activities in the outline which follows.

Year One

1. Compile a "snapshot" of Virginia's educational attributes/statistics compared to other states.
    a. Determine secondary data sources
        i. The National Assessment of Educational Progress (NAEP) of U.S. students
        ii. The Institute for Education Sciences' *Projections of Education Statistics*
        iii. U.S Department of Education' Consolidated State Performance Report (CSPR)
    b. Select metrics for inclusion in this comparison
        i. Science Technology Engineering and Math (STEM)
        ii. *No Child Left Behind Act* (NCLB) Accountability Scores
        iii. Graduation Rates
        iv. Adequate Yearly Progress Data/Test Scores
2. Compile country-by-country "snapshots" of the attributes and best-practices of other countries' educational systems.
    a. Determine secondary data sources
        i. Organisation for Economic Co-operation and Development (OECD)
        ii. American Institute for Research
        iii. Harvard's Program on Education Policy
        iv. Education Commission of the States
        v. Trends in International Mathematics and Science Study (TIMSS)
        vi. 2009 Programme for International Student Assessment (PISA)
        vii. American Institutes for Research
        viii. National Center for Education Statistics
    b. Select countries to be included
        i. Group of Eight (G-8)
        ii. OECD's Programme for International Student Assessment (PISA) survey participants
    c. Select elements to include for comparison
        i. Student data
            1. Age upon school enrollment
            2. Age upon graduation
            3. Economic status
            4. Gender
        ii. System attributes
            1. Early education/Pre-K
            2. Curriculums
            3. Student/teacher ratio
            4. Per pupil expenditures
            5. Funding
            6. Time spent learning
            7. Teacher selection/preparation
            8. Professional development
            9. Student demographic
            10. Science Technology Engineering and Math (STEM)
            11. Length of school year
            12. Standardized tests
        iii. Educational outputs
            1. Achievement scores
            2. Proficiency scores on standardized assessments
    d. Synthesize findings of literature review and formulate recommendations.
    e. Solicit feedback to recommendations from stakeholders and impacted agencies.
    f. Refine findings and recommendations.
    g. Present findings and recommendations to the Commission on Youth.

Year Two

1. Review data gathered during the first year.
    a. Select a sample of high performing countries based on educational outcomes, test scores, and ability to apply findings to the United States/Virginia.
    b. Select specific international outcomes/data.
    c. Select attributes based on clarity and portability of outcomes.
2. Convene Workgroup to assist in process
    a. Invite a representative from impacted groups

Secretary of Education	Board of Education
Superintendent of Public Instruction	Virginia PTA
Representatives from Higher Education/Academia	Virginia Manufacturers Association
Virginia Department of Education (DOE)	Career and Technical Education Officials
Virginia School Boards Association	Virginia Education Association
Virginia Association of School Superintendents	Virginia Association of Elementary School Principals
Virginia Association of Secondary School Principals	Governor's Academies/STEM
Alternative Education Representatives	Educators/Guidance Counselors
Court Service Unit Representatives	State Council of Higher Education
Business Representatives	Virginia Community College System
Industry & Technology Representatives	Private School Representatives

3. Identify international/national best practices which can be adopted in Virginia.
    a. Review other states'/countries' research and studies
    b. Review findings from Virginia's Governor's Commission on Higher Education Reform, Innovation and Investment
    c. STEM initiatives
    d. Practices from schools that excel
    e. Innovative methods used to measure students' progress
4. Develop consensus.
5. Develop recommendations.
6. Synthesize findings of literature and workgroup recommendations.
7. Solicit feedback to recommendations from constituents and DOE/Board of Education.
8. Refine recommendations.
9. Present recommendations to Commission on Youth.
10. Prepare final report.

V. Introduction

The impact of globalization on economies is rapidly posing new and demanding challenges to individuals and societies. In this globalized world, people compete for jobs, not just locally but internationally. On November 8, 2011, U.S. Secretary of Education Arne Duncan acknowledged that "education and global job markets are much more competitive today than even a generation ago," but he noted that educators and countries need to work together to advance "achievement and attainment everywhere."[1] Inherent in this statement is the notion that schools and students in the United States must remain competitive in order to support tomorrow's economy and American prosperity. Developing new cohorts of highly qualified and competitive workers requires high-quality education systems.

Not only must the United States remain competitive globally, it needs to ensure that graduating students have the skills needed to enter the workforce of the future. For instance, employment in the

[1] U.S. Department of Education. (November 8, 2012). *Secretary Arne Duncan's remarks at the Microsoft Partners in Learning Global Forum.* Retrieved from http://www.ed.gov/news/speeches/secretary-arne-duncans-remarks-microsoft-partners-learning-global-forum.

professional, scientific, technical, and computer systems fields is expected to increase by 45 percent by 2018.[2] These are fields that rely heavily on logic, reasoning, and critical thinking. Education expert Tony Wagner has conducted scores of interviews with business leaders and observed hundreds of classes in some of the nation's most highly regarded public schools.[3] He discovered a profound disconnect between what potential employers are looking for in young people today (critical thinking skills, problem solving, collaboration, creativity, and effective communication) and what our schools are providing (passive learning environments and uninspired lesson plans that focus on test preparation and reward memorization). This problem exists not only in low performing schools but also in top schools. Youth in the United States are being equipped to work in job fields that are quickly disappearing from the economy, while young adults in India and China are preparing to compete for the most sought-after careers around the world.

Current political and socio-economic circumstances around the globe demand more competitive human capital. For the last few decades, such investment has been emphasized as an important factor contributing to economic growth.[4] Continuous improvement of educational opportunities for young people is one of the best means of human capital investment, with an enormous potential for payback.[5] For many years, researchers, policymakers, and educational practitioners have explored variables that affect student achievement. With the implementation of *No Child Left Behind Act* (NCLB) in 2001, the United States Congress emphasized the need for states and school districts to ensure that *all* students — particularly at-risk students, students who are ethnically and linguistically marginalized, and students who are otherwise disadvantaged — have access to a quality education.[6]

During the 2011 Virginia General Assembly Session, Senator Yvonne B. Miller introduced Senate Joint Resolution 320, which directed the Commission on Youth to study how Virginia school children compare academically to students in other countries. The resolution directed the Commission to:

- Compare the academic achievement of Virginia's students with that of students internationally for the past five years, especially in reading, mathematics, and science;
- Identify features in the education systems of other countries that rank higher than the United States which may contribute to the academic success of their students;
- Determine whether any of these features may be adapted for use in Virginia and the cost of implementation;
- Determine whether and which changes in Virginia's public education system are warranted in light of findings from the comparison of the academic achievement of students in Virginia with students internationally; and
- Consider other matters related to the objectives of this resolution and recommend feasible and appropriate options and alternatives.

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[2] U.S. Department of Labor, Bureau of Labor Statistics. (2010). *Occupational Outlook Handbook, 2010-11 Edition.* Retrieved from http://www.bls.gov/oco/oco2003.htm.

[3] Wagner, T. (2008). *The global achievement gap: Why even our best schools don't teach the new survival skills our children need.* New York: Basic Books.

[4] Glomm, G., & Ravikumar, B. (1992). Public versus private investment in human capital: Endogenous growth and income inequality. *Journal of Political Economy, 100*(4), 818-834.

[5] Baker, D. P., Goesling, B., & LeTendre, G. K. (2002). Socioeconomic status, school quality, and national economic development: A cross-national analysis of the "Heyneman-Loxley Effect" on mathematics and science achievement. *Comparative Education Review, 46*(3), 291-312.

Chudgar, A., & Luschei, T. F. (2009). National income, income inequality, and the importance of schools: A hierarchical cross-national comparison. *American Educational Research Journal, 46*(3), 626-658.

[6] U.S. Department of Education. (2001). *No Child Left Behind Act of 2001.* Washington, DC: Author.

While Senator Miller's resolution did not pass the Virginia General Assembly, the Commission on Youth adopted a two-year study plan for *Comparison of Academic Achievement in Virginia and in Leading Industrialized Countries* to explore the following issues:

- Students in the United States lag in academic performance when compared with students in other industrialized countries, particularly in science and mathematics.
- The 2009 Organisation 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 countries can provide valuable insights that the Commonwealth of Virginia may wish to consider. While it can be argued that comparing countries has limited meaning due to cultural and societal differences, the purpose of this report is to present and acknowledge these differences and determine which aspects could be incorporated to increase student achievement in Virginia's educational system.

The review methods were employed to identify countries (and regions of countries) that would generate comparative and contrasting data most beneficial to Virginia. Of the top performing countries on the Programme for International Student Assessment (PISA)[7] and Trends in International

[7] PISA involves extensive and rigorous international surveys to assess the knowledge and skills of 15-year-old students. PISA is the result of collaboration of more than 70 countries interested in comparing their own student achievement with

Mathematics and Science Study (TIMSS)[8] 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.

This report is based on a comprehensive literature review of selected countries whose students consistently rank high on international assessments and compares the performance in those countries with students in 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. 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.

VI. Methodology

The findings of this report are based on several distinct study activities.

A. RESEARCH AND ANALYSIS

The Commission on Youth contracted with the School of Education at the College of William and Mary to conduct an extensive literature review. Patricia A. Popp, Ph.D. and James H. Stronge, Ph.D. of William and Mary served as the principal investigators for the study. In addition to the literature review, three researchers from William and Mary participated in site visits to Shanghai, providing first-hand observations and interactions with this city's educational system.

For this study, an analysis of high-performing international educational systems was conducted to identify best practices that may be appropriate for inclusion in Virginia's educational system. The research team reviewed data, reports, and research studies to identify the attributes of educational systems, both in Virginia and in the United States. A review of the literature addressing features of the educational systems from high-performing countries was also conducted. Existing data sources and international assessments were used for this analysis. The primary data sources included the following:

- Organisation for Economic Co-operation and Development (OECD);
- Trends in International Mathematics and Science Study (TIMSS);
- 2009 Programme for International Student Assessment (PISA);
- American Institutes for Research;
- National Center for Education Statistics; and
- Studies published in educational research journals.

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the student achievement in other countries. Every three years, PISA compares outcomes for 15-year-old students on measures of reading, literacy, mathematics, and science. PISA's assessments are designed to determine not only whether students have mastered a particular curriculum, but also whether they can apply the knowledge they have gained and the skills they have acquired to the new challenges of an increasingly modern and industrialized world. Thus, the purpose of the assessments is to inform countries on the degree to which their students are prepared for life. [Source: OECD. (2011)]. *Strong Performers and Successful Reformers: Lessons from PISA for the United States.* Retrieved from http://dx.doi.org/10.1787/9789264096660-en.

[8] Developed and implemented at the international level by the International Association for the Evaluation of Educational Achievement (IEA), TIMSS is used to measure the mathematics and science knowledge and skills of fourth- and eighth-graders over time. About 40 percent of TIMSS assessment focuses on the cognitive domain of knowledge, with 40 percent on application, and 20 percent on reasoning.

Given the nature of the questions posed, this study focused on descriptive statistics and a qualitative case study approach.

B. REVIEW OF INTERNATIONAL ASSESSMENTS

One of the main ways to identify high-performing education systems is through international assessments. The research team analyzed the results from two international assessments for this study effort. The assessments selected were the Programme for International Student Assessment (PISA) and Trends in International Mathematics and Science Study (TIMSS):

- PISA – The Program for International Student Assessment is given every 3 years to 15-year-olds worldwide. The Organisation for Economic Cooperation and Development (OECD), a group funded by 30 countries, coordinates the testing. The first PISA test was given in 2000. Every test specializes in one particular subject, but includes other subject areas. In 2006, the focus was science. In 2009, the focus was reading.
- TIMSS – The Trends in International Mathematics and Science Study is an assessment given to 4th and 8th grade students around the world. TIMSS is conducted by the International Association for the Evaluation of Educational Achievement (IEA). The first TIMSS was given was in 1995. The test is administered every 4 years. In 2007, approximately 60 countries participated.

Another international assessment, the Progress in International Reading Literacy Study (PIRLS), assesses reading achievement in 4th graders in 50 different countries. For purposes of this study, only TIMSS and PISA data were utilized.

The research team also reviewed national-level data on student achievement. In the United States, this information comes from the National Assessment of Educational Progress (NAEP), which is also known as the "Nation's Report Card." The NAEP is a nationally representative assessment of the United States students and is administered periodically to students in grades 4, 8, and 12 in math, science, and other subjects.

C. SELECTION OF HIGH-PERFORMING COUNTRIES

The successes of other countries can provide potential guidance for decision-making in Virginia. Interestingly, other countries have commenced benchmarking their educational policies and practices with the world's top performing countries. Likewise, a compilation of successful attributes of leading countries' educational systems would be useful to gather knowledge of best practices to ensure Virginia maintains and enhances its economic competitiveness. Consistent high-performers on the PISA and TIMSS assessments include countries such as Singapore, Finland, South Korea, Canada, and Japan.[9]

[9] In order to ensure the comparability of results across countries, PISA devoted attention to including representative samples of comparable target populations in the assessments. Differences among countries related to the nature and extent of pre-primary education and care, the age of entry for formal schooling, and the structure of the education system do not allow school grade levels to be defined in a way that is internationally comparable. Therefore, PISA defined their populations with reference to a target age. PISA covers students who are between 15 years 3 months and 16 years 2 months at the time of the assessment and who have completed at least six years of formal schooling, irrespective of the type of institution in which they are enrolled, whether they are in full-time or part-time education, whether they attend academic or vocational programs, and whether they attend public or private schools or foreign schools within the country. As a result, PISA data can make comparisons about the knowledge and skills of 15-year-old students, despite their having had different educational experiences, both in and outside school. (Source: PISA 2009 Technical Report).

Countries with identified high-performing educational systems were included for the initial data review. The countries selected possessed a variety of educational attributes appropriate for benchmarking. The selection of countries for this study involved reviewing a range of sources, including:

- Governmental, intergovernmental, and non-governmental publications;
- Existing surveys;
- International and national professional and academic journal articles;
- Websites and web-based networking facilities; and
- Extant literature.

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. The process of country selection encompassed a range of sources (governmental, intergovernmental, and non-governmental publications, surveys, international and national professional and academic journal articles, and websites) to identify the countries. Selection was made based on geographic diversity and availability of sufficient data.

- **Canada** was selected due to its proximity to the United States, its similar diverse student population, and its decentralized educational system. Although not among the top five according to the TIMSS and PISA, Canada performs at the same level as Japan and New Zealand, and outscores the United States significantly.
- **Finland** is consistently ranked among the top five on international assessments and its inclusion provided representation of a European nation. Finland provides outstanding education with less emphasis on standardized testing and with fewer school system resources. This ability to do more with less may provide valuable information for improving the Virginia educational system.
- **Shanghai** is new to international assessment but significantly outperformed even the previously top performing countries, according to PISA 2009, in all three categories. In addition, three researchers on this research team have had the opportunity to participate in site-visits to Shanghai, providing first-hand observations and interactions with their system.
- **Singapore** consistently ranks among the top countries across years, grades, and subjects, based on both TIMSS and PISA.
- **South Korea** only has secondary-school level data available on international assessments of PISA and TIMSS; however, the available data ranks South Korea among the top two in PISA Reading Grade 10 assessment and TIMSS Math Grade 8 assessment, as well as the top four in PISA Math Grade 10 and TIMSS Science Grade 8, and top six in PISA Science Grade 10.

A sixth country, The Netherlands, was added upon the request of the Virginia Commission on Youth during the preliminary presentation made in December 2011. An education profile for The Netherlands is provided as Appendix A.

VII. Education Profiles of Virginia and Selected Countries/Regions

This section provides educational profiles of the selected countries for comparison with the Commonwealth of Virginia. In addition to general information related to population and gross domestic product, the educational organization, a brief history of the educational system, financing of

schools, and recent efforts to improve student achievement are provided to add context to the quantitative data. The next section includes analyses across the profiles.

Virginia

Table 1

General Information of the Commonwealth of Virginia

Population	8 million
GDP per capita[10]	$47,430
Number of divisions[11]	132
Number of local schools[11]	
Pre-K	26
Elementary	1186
Middle	311
High	313
Local alternative, career, technical, and special education centers	119
Number of regional schools	
Alternative centers	45
Career and technical centers	10
Governor's schools	18
Special education centers	19
Total students[11]	1,258,521
Total teachers[12]	71,415

Brief History of Educational System[13]

The Underwood Constitution of 1869 called for the initial establishment of a state education system in Virginia, providing for a state superintendent of public instruction and a Board of Education consisting of the Governor, Attorney General, and chief state school officer. Previous to the Underwood Constitution, Virginia's educational system consisted of apprenticeships for youth, especially for orphaned youth, or private tutoring among more affluent citizens. The first state superintendent, Dr. William H. Ruffner, established policies that set precedents for current educational policy. He stipulated that the costs of public education would be subsidized by the state and local governments, and that all individuals ages 5 to 21 would be offered a free and public education.

In the early 20th century, citizens of Virginia worked to improve public education by establishing school divisions, increasing local and state funding, improving teacher salaries, and establishing policies regarding teacher certification. The 1920s marked the spark for growth in the field of education in Virginia. The Virginia Board of Education expanded to 13 members and supervisory roles were created to ensure quality education was offered to students. High schools, scarce prior to the

[10] Bureau of Economic Analysis. (2011). [Graph illustration GDP by state]. *Gross domestic product by state (GDP by State) Interactive Map.* Retrieved from http://www.bea.gov/regional/gdpmap/GDPMap.aspx.
[11] Virginia Department of Education. (2011). *Local and regional schools and centers.* Retrieved from http://www.doe.virginia.gov/statistics_reports/school_report_card/index.shtml.
[12] Local School Directory. (2012). State information for public schools. Retrieved from http://www.localschooldirectory.com/state-schools/VA.
[13] Virginia Department of Education. (2003). *A history of public education in Virginia.* Retrieved from http://www.cteresource.org/TFTfinalWebFiles/OtherDocuments/history_public_ed.pdf.

1920s, became more standard and offered a four-year college preparatory program that included agricultural courses and vocational options. Following World War II, the Virginia education system lacked teachers, as those returning from war did not return to classrooms. Scholarship programs attempted to bring in more teachers.

The Sputnik Era once again fueled Virginia's desire for a well-educated society. However, at the same time, desegregation of schools resulted in the closing of high schools until integrated. The Civil Rights Act of 1964 provided that all individuals have the right to a public education, free of discrimination.

The Commonwealth's new Constitution, adopted in 1970, required for the first time a high-quality education program (Article VIII, Section 1 – Virginia Constitution). In 1971, the Board of Education adopted the Standards of Quality. By the early 1980s, the basic Standards of Learning had been established. In 1995, the Board of Education revised Virginia's Standards of Learning to include expectations for teachers and students and to provide for greater accountability in public schools. The following year, the Board of Education developed a new state testing program to measure skills and competencies. Currently, Standards of Learning assessments are being offered to all students in specific subjects. The Standards of Accreditation set forth graduation requirements and use results from assessments in core subjects to determine if schools are providing the quality education expected. The Board of Education upholds the quality of public education in Virginia through the Standards of Quality.

Education Finance

The following information is taken from the Superintendent's 2010-2011 Annual Report for Virginia.[14] In Fiscal Year 2011, the Commonwealth of Virginia spent approximately $13 billion on education expenses, allocating approximately $10,793 per student. In general, Virginia's public schools are funded by a combination of federal, state, and local funding. State funding is determined using the composite index formula, which attempts to measure a locality's ability to pay for public education, and then subsidizes an estimated cost that the state will pick up. Federal funds contributed $1,119 per pupil while state funds contributed $4,303 per pupil.

School Turnaround Strategy

Recently, the Commonwealth of Virginia has made some significant changes emphasizing improvements in pre-kindergarten (Pre-K) education, teacher evaluation, and electronically-supported learning and teaching (e-learning). In 2005, Governor Warner initiated support and funding for the Virginia Early Childhood Foundation/Smart Beginning partnership, designed to provide all at-risk students with a Pre-K opportunity. Governor Kaine continued this trend through increased funding for Pre-K and the development of the Start Strong Council in 2006, tasked with the challenge of expanding Pre-K programs to even more four-year-olds.[15] In 2007-2008, the Commonwealth of Virginia spent approximately $47 million to provide Pre-K services to 13,125 students, or approximately 13 percent of four year olds in the Commonwealth.[16]

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[14] Virginia Department of Education. (2011). Table 15 of the *Superintendent's Annual Report for Virgini*a. Retrieved from http://www.doe.virginia.gov/administrators/superintendents_memos/2012/069-12a.pdf .

[15] Pre-K Now. (2008). *State Profile: Virginia.* Retrieved from http://67.199.18.33/resource/profiles/virginia.cfm?&print=1.

[16] Barnette, W., Epstein, D., Friedman, A., Boyd, J., & Hustedt, J. (2008). *The state of preschool 2008: State preschool yearbook.* The National Institute for Early Education Research, New Brunswick, NJ.

In 2010 Governor McDonnell introduced his Opportunity to Learn Initiative. This initiative included revisions to Virginia's charter school statute and the establishment of virtual schools and college partnership laboratory schools.

Another significant initiative in Virginia education is the newly released revised Teacher Performance Standards and Evaluation Criteria, a performance-based evaluation tool in which 40 percent of teacher performance is based on student academic progress. Furthermore, the Virginia Performance Pay Incentives Initiative, which is based on the recently revised and released Teacher Performance Standards and Evaluation Criteria, is in its pilot phase in 2011-2012.[17]

The Commonwealth of Virginia has also been recognized as a leader in e-learning. The Virtual Virginia Initiative currently offers "40 different online courses, including 24 Advanced Placement (AP) courses, other core courses, foreign languages and electives," and "enrolls approximately 2,500 students from 238 Virginia middle and high schools."[18] The reach of the program extends to 5,700 students, who receive remedial instruction through online tutorials hosted by Virtual Virginia. These steps towards e-learning have begun to provide more college-level opportunities for students, as well as an increase in graduation rates.

Canada

Table 2

General Information on Canada[19]

Population	33.7 million
GDP per capita	$46,000
Number of provinces/territories	10 provinces, 3 territories
Number of schools[20]	15,500 (2005)
Total students [22]	5.3 million (2005)
Total teachers[21]	310,000

The number of students enrolled in schools, as well as the number of educators, had decreased slightly from the previous year. In 2004-2005, 515,000 students in Canada were enrolled as either full-time or part-time students in undergraduate programs at universities, colleges, or institutes.[22]

[17] Virginia Department of Education. (2012). *Teaching in Virginia: Performance & evaluation.* Retrieved from http://www.doe.virginia.gov/teaching/performance_evaluation/index.shtml.
[18] Virginia Department of Education. (March 26, 2009). Virginia recognized by *Education Week* as an E-Learning leader. *Virginia Department of Education News.* Retrieved from http://www.doe.virginia.gov/news/news_releases/2009/mar26_print.pdf.
[19] U.S. Department of the State. (2011). *Background Note: Canada.* Retrieved from http://www.state.gov/r/pa/ei/bgn/2089.htm.
[20] The Council of Education Ministers Canada. (n.d.). *Education in Canada: An Overview*. Retrieved from http://www.cmec.ca/299/Education-in-Canada-An-Overview/index.html.
[21] Blouin, P. & Courchesne, M. (2007). Summary Public School Indicators for the Provinces and Territories, 1998/1999 to 2004/2005. Statistics Canada. Retrieved from http://www.statcan.gc.ca/pub/81-595-m/81-595-m2007050-eng.pdf.
[22] The Council of Education Ministers Canada. (n.d.).

Education Finance

In Canada in 2004-2005, total expenditures on education amounted to $9,040 per student. Costs were highest in the Northwest Territories and the Yukon, at over $13,000 per student, and lowest in the Atlantic Provinces, where average cost per student ranged from a high of $6,253 in Newfoundland to a low of $5,344 in Nova Scotia.[23] Figure 1 depicts the structure of the current education system in Canada.

In 2005-2006, total public funding of Canada's public education system amounted to a total of $75.7 billion, representing 16.1 percent of Canada's total public expenditures. Private expenditures on education amounted to approximately 17.7 percent of total expenditures on education.[24]

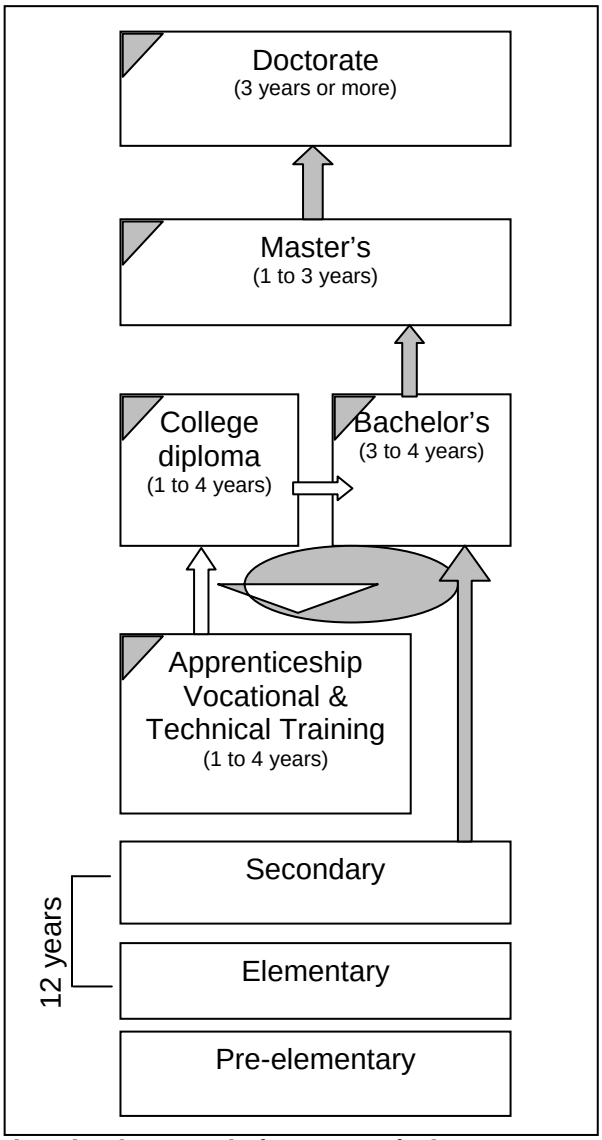
Brief History of Educational System

The family was the primary source of education during the 18th and early 19th centuries. By the mid 19th century, the clear establishment of a school system was developed and primarily intended to instill positive behaviors and thinking amongst children. School systems were thought to be the prime point of dissemination of behavior and values. By the late 19th century, compulsory education laws were put into effect (except in Quebec), although most parents were already sending their children to schools. French Canadians in Quebec and other provinces did not assimilate as well to the new education movement, resulting in significant differences in literacy rates and economic status. By the 1960s, during the Quiet Revolution period, Quebec revamped the public education system in an effort to significantly increase the quality of the labor force. A new mindset was promoted that stressed the impact of education on socio-cultural and economic opportunities.

Education policy in Canada has been guided by the goal of ensuring that organizations, such as schools, have a positive impact on society. Canadians strongly believe in peace, order, and good government and this expression is used in law. Because schools are such a powerful venue to communicate this message to children, state funding for education in Canada is among the highest in the world.

Figure 1

Current Education System in Alberta, British Columbia, Manitoba, New Brunswick, Ontario, Newfoundland and Labrador, Yukon



[23] Retrieved from Canadian Information Centre for International Credentials, The Council of Ministers of Education, Canada, 2010.

[24] The Council of Ministers of Education, Canada. (n.d.).

School Turnaround Strategy

Learn Canada 2020 is an initiative intended to guide public education in the provinces and territories. It entails a framework with four foci, or pillars, which include:

1) Ensuring access to early childhood education;
2) Ensuring equal opportunity to attend quality elementary, middle, and high schools;
3) Increasing the number of post-secondary degree pursued; and
4) Developing an adult learning and skills development system.[25]

The Prime Minister has advocated *Learn Canada 2020* as a national goal in order to promote the Canadian workforce and economy. The declaration does not provide specific plans, but instead leaves the provinces and territories to determine which strategies will be implemented to reach these goals. Ministers are to report progress annually.

Shanghai

Table 3

General Information on Shanghai[26]

Population	20,555,100
GDP per capita	$11,361 (2009)
Number of schools	
Preschool	1,057
Primary	626
Secondary	794
Total Preschool and Compulsory	2,477
Total students	
Preschool	299,800
Primary	535,700
Secondary	440,000

Number of Schools and Enrollment

In 2007, Shanghai had 1,057 preschools, 626 elementary schools, and 794 secondary schools. There are about 535,700 elementary students and 440,000 secondary students. The enrollment rate for the nine-year compulsory education (Grade 1 through Grade 9, i.e., elementary and middle school level) has been consistently at 99.99 percent.

There were 60 institutions of higher learning which offered three-year diploma programs to 171,500 students and four-year undergraduate programs to 292,800 students. Among these 60 higher education institutions, 51 provided post-graduate programs. There were 65,800 students seeking a master's degree and 21,100 seeking a doctorate. Figure 2 depicts the structure of China's educational system.

[25] The Council of Ministers of Education, Canada. (2008). *Learn Canada 2020.* Retrieved from http://www.cmec.ca/Publications/Lists/Publications/Attachments/187/CMEC-2020-DECLARATION.en.pdf.
[26] Shanghai Ministry of Education. (2007). *Education in Shanghai: An overview.* Retrieved from http://www.shmec.gov.cn/web/concept/show_article.php?article_id=252.

Figure 2

Structure of China's Education System[27]

Tertiary	
Senior Secondary (3 years) (General)	Vocational Secondary Schools
Junior Secondary (3 years) (Shanghai: 4years)	
Primary (6 years) (Shanghai: 5 years)	
Pre-School (3-4 years)	

Education Finance

In 2006, the budgeted finance of education was RMB 23 billion Yuan,[28] an increase of 9.52 percent from the prior year. The total educational expenditure was RMB 37 billion Yuan, an increase of 8.19 percent from 2005. In order to diversify the funding of education, sources of unbudgeted income have merged in recent years, such as students' fees, university-run enterprises, donations, and private schooling. In 2006, an income of RMB 4.6 billion Yuan was generated from students' fees (12.44 percent), RMB 350 million Yuan from university-run enterprises (0.94 percent), RMB 45 million from donations (0.12 percent) and RMB 3.5 billion Yuan from some other channels to fund the education (9.52 percent).[29]

Brief History of the Educational System

The educational system in Shanghai, and in China at large, has undergone several stages of development: the rigid Russian model during the 1950s, the period of "renaissance" in the early 1960s, disastrous damage during the Cultural Revolution (1966-1976), rapid expansion of basic education during the 1980s and 1990s, and the move towards massive higher education in the 21st century.[30] The Cultural Revolution in China from 1966 to 1976 essentially halted the education system by:

1) Eliminating all "bourgeois" cultural symbols or representations, including art, music, drama, and novels; and
2) Fully implementing the egalitarian ideal that all should be equal and wealth be redistributed.

Professors and educators were sent to factories and farms, while factory workers and farmers were sent to schools to teach. With the 1976 death of Mao Zedong in 1976, the Cultural Revolution came to an end, but China's education system was in disrepair and needed to be restructured and rebuilt. Through the late 1970s, schools reopened and higher education institutions began accepting students once again. In the early 1980s, in order to tap into community resources, China allowed schools to be supported by additional non-governmental funds from communities. This sparked the development of primary schools. In 1986, China enacted the *Law of Compulsory Education* that required all children take at least nine years of compulsory education. By the 1990s, China's primary enrollment rate was nearly 100 percent, with post-secondary rates around 79.2 percent, including both academic and vocational programs. The 1990s was the era of higher education. The enrollment rates for higher education institutions increased by 25 percent in 2000 and 22 percent in 2001.

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[27] OECD. (2010). *Strong Performers and Successful Reformers in Education: Lessons from PISA for the United States.* Retrieved from http://dx.doi.org/10.1787/9789264096660-en.
[28] One U.S. States dollar is equivalent to approximately RMB 6 Yuan.
[29] Shanghai Ministry of Education. (2007). *Education in Shanghai: An overview.* Retrieved from http://www.shmec.gov.cn/web/concept/show_article.php?article_id=252.
[30] OECD. (2010). *Strong Performers and Successful Reformers in Education.*

As one of the most internationalized cities in China, Shanghai has been at the forefront of educational reform. It was among the first to achieve universal nine-year compulsory education and to achieve almost universal senior secondary education. Moving away from its traditional examination-driven system, Shanghai has invested tremendous effort to reform its curriculum and assessment over the last two decades in order to better equip its children and youth with 21st Century skills.

School Turnaround Strategy

One interesting strategy employed by Shanghai to improve weak schools is the commissioned education program. Under this scheme, 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. Efforts for this strategy included:

- Systematically upgrading the infrastructure of all schools to similar levels;
- Transferring financial resources to schools serving disadvantaged student bodies and transferring high-performing teachers from socio-economically advantaged schools to disadvantaged ones;
- Pairing high-performing districts and schools with low-performing districts and schools to collaborate on educational development planning and share resources such as curricula, teaching materials, and best practices; and
- Having strong schools take over the administration of weak ones, by appointing new school leaders and sending a team of experienced teachers to lead in teaching.[31]

South Korea

General information on South Korea which is essential to understanding the country's student achievement, is provided as Table 3.

Education Finance[32]

Compared to other OECD countries, South Korea has outspent all other countries on education, except Iceland, in respective GDP. The Ministry of Education was budgeted approximately 7.6 percent of the GDP. According to the OECD, 22 percent of education costs in South Korea are paid by parents or private organizations and companies. This means far less government spending than other OECD countries, which averages 91 percent.

[31] OECD. (2010). *Strong Performers and Successful Reformers in Education.*
[32] OECD. (2011). *Education at a Glance 2011: Country Note-Korea.* Retrieved from http://www.oecd.org/dataoecd/31/0/48670430.pdf.

Table 4

General Information on South Korea[33]
2008

Population[34]	48,754,657 (2011)		
GDP per capita	$20,757		
Number of schools	20,261		
Public schools	14,133		
Private schools	6,030		
Total students	11,443,741		
Total public school teachers	533,649		
Numbers by Grade Level	Students	Teachers	Schools
K-12			
Kindergarten	538,587	7,212	8,388
Elementary	3,299,133	25,519	5,855
Middle	1,979,656	12,110	3,144
High	1,982,207	13,598	2,313
Post-Secondary			
Junior College	772,509	5,742	149
Undergraduate	2,555,016	28,441	222
Graduate	316,633	723	40

Although preschool programs are not part of the compulsory program, they have become more popular. The government helps subsidize the cost of pre-school education kindergarten enrollment has steadily increased over the past 40 years, with a 36.2 percent enrollment rate in 2007. Elementary school enrollment has been fairly consistent, hovering in the mid- to upper-90s. In 2007, it was at 99.3 percent. Approximately one-fifth of college students are on the junior college track, while the remainder pursue an undergraduate course track.

Brief History of the Educational System[35]

Pre-modern Korean education dates to prehistoric times and ended with the advent of the first formal education systems around Year 372. Curriculum in that period focused on ethics based on Confucianism and Buddhism. The first modern schools were introduced by Christian missionaries in the 19th century. Following the end of the Korean War, South Korea's education system underwent rapid and continuous transformations, beginning with policies addressing compulsory and curricular education, adult literacy education, and higher education. In an attempt to promote an educated democracy, the government initially used the education system to provide basic education, which has evolved into one of the highest-achieving educational systems in the world.

[33] Ministry of Education, Science and Technology. (2011). *Education for the future: Science and technology towards the future overview.* Retrieved from http://english.mest.go.kr/web/1722/site/contents/en/en_0219.jsp.
[34] U.S. Department of State. (2011). *Background Note: South Korea.* Retrieved from http://www.state.gov/r/pa/ei/bgn/2800.htm.
[35] Ministry of Education, Science and Technology. (2008). *Education System: Overview*. Retrieved from http://english.mest.go.kr/web/1692/site/contents/en/en_0203.jsp.

By the 1960s and 1970s, rapid economic growth resulted in drastic increases in student population, but shortages in facilities and qualified teaching staff. Teacher/education reform helped South Korea increase the numbers of qualified educators and normalize education at all school levels. Standardized preliminary college screening assessments were instituted. By the 1980s, South Korea had developed tax systems to finance education, college graduation quotas, and reforms aimed at improving early education, the college entrance system, curriculum, instruction, school facilities, and teacher quality. For the first time, South Korean education policy promoted the idea of life-long education.

To help students prepare for the challenges of the 21st century, the national curriculum was updated in 1998, moving away from a didactic educational approach to an increased focus on student-oriented curriculum emphasizing individualism and creativity.

School Turnaround Strategy

South Korea proposed six major tasks for 2011, which included the following goals:[36]

- Expanding creative and character building education.
  - Encourage creative classes by revising curriculum and reducing student loads by providing more tailored education.
  - Introduce more art, sports, and science programs and connect to real world companies/industries.
  - Facilitate a more democratic education and incorporate more experience-based education.
  - Improve support for students with special needs or students with challenges at home.
  - Improve safety of students at school.
- Establishing an advanced vocational education system that links education and work.
  - Provide more career guidance.
  - Link education curriculum and job qualification.
  - Strengthen vocational education in college.
- Offering quality teaching at universities.
  - Advance college admission process by establishing an admission officer system and revising the college ability test.
  - Advancement of university education by strengthening educational capacity of universities and by attracting more foreign students.
  - Introduce an education accreditation system, by restructuring private universities.
- Promoting science and engineering talents.
  - Create a national strategic research and development (R&D) system with a focus on science and technology that includes a basic science research institute-hub for creating knowledge.
  - Globalization of education, science, and technology with the goal of continuously enhancing national image.

[36] Ministry of Education and Culture. (2011). *6 Major Tasks for 2011*. Retrieved from http://english.mest.go.kr/web/1717/site/contents/en/en_0275.jsp.

Singapore

Table 5

General Information on Singapore[37]

Population (2011)	5.8 million
GDP per capita (2010)	$43,867
Number of government/government-aided schools (2010)[38]	342
Elementary	173
Secondary	148
Mixed level	8
Junior Colleges	13
Total students (2010)[42]	510,714
Total public school teachers (2010)[42]	29,862

Number of Schools and Enrollment[42]

Although the majority of schools in Singapore are public institutions, about a fourth are either government-aided or independent of government funding. Of the 342 government-funded schools, 173 are primary schools; 148 are secondary; 8 are mixed level schools; and 13 are junior colleges. Singapore houses a grand total of 356 schools, including the independent and specialized schools. 13,318 teachers instruct 256,801 students at the primary level, while 12,183 teachers instruct 196,220 secondary students, 2,572 teachers instruct 37,225 students in mixed level schools, and 1,789 teachers instruct 20,468 junior college level students. Figure 3 depicts the structure of Singapore's current educational system.

Singapore Education System Structure

A graphic depiction of the education system structure is provided as Figure 3.

Education Finance

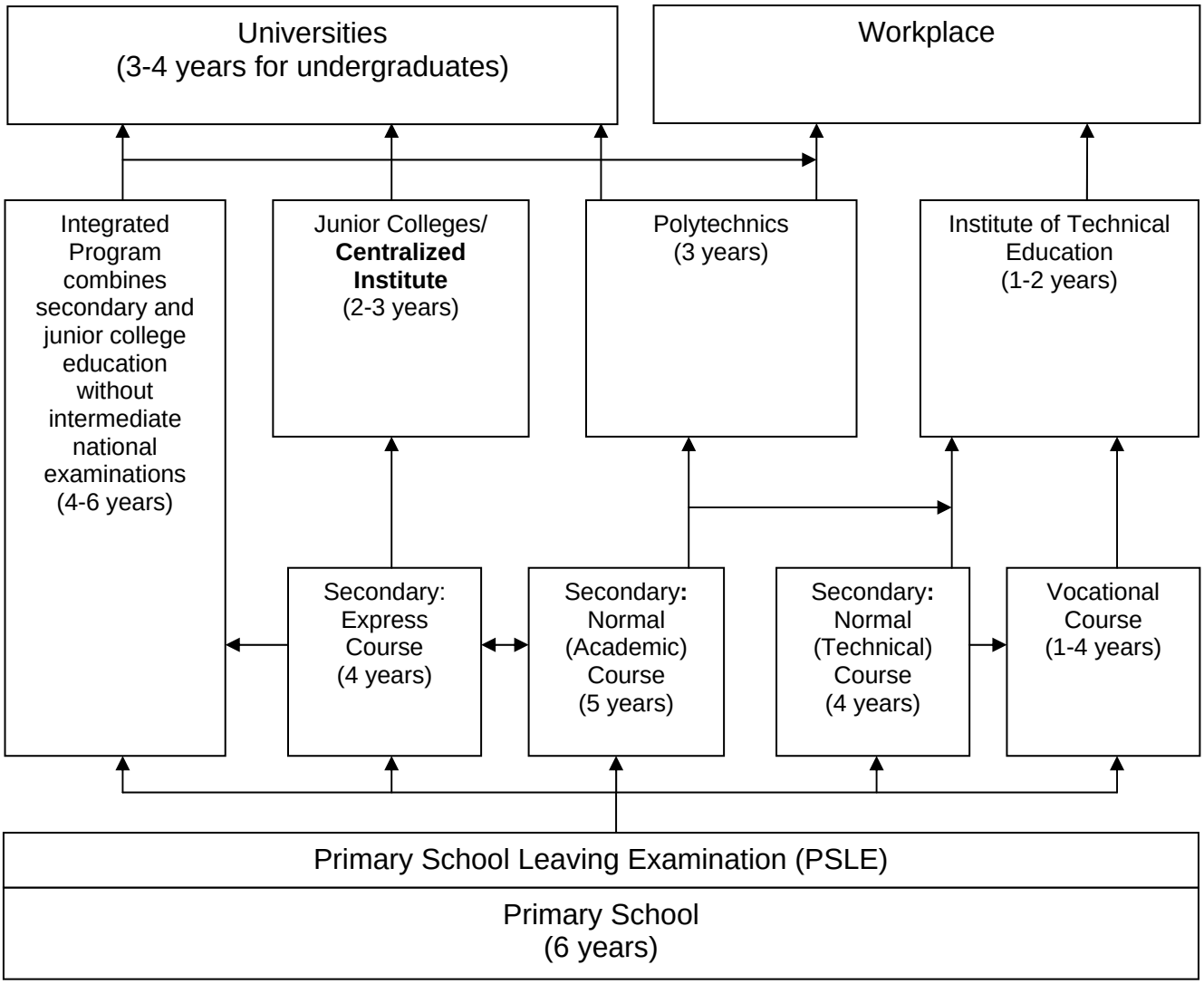
Singapore spends 2.8 percent of its GDP and 15.3 percent of total public expenditures on education.[39] The Ministry of Education has full administrative responsibility over all government-funded schools, and advisory and supervisory roles over all private schools.

Public schools in Singapore are not completely funded by the national and local governments. Although the government subsidizes much of the funding for school, there is still a fee associated with attending school. However, even this fee can be further subsidized under specific circumstances. Primary school fees are almost completely subsidized for all students. On average, school fees after subsidies are approximately $5 a month, with an additional standard miscellaneous fee of $8. Autonomous schools collect their own school fees, ranging from $3 to $18 per month in addition to the miscellaneous fees. Furthermore, independent schools charge their own separate fees, ranging from $200 to $300 per month.[40]

[37] Ministry of Education, Science and Technology. (2011). *Education for the future: Science and technology towards the future overview.* Retrieved from http://english.mest.go.kr/web/1722/site/contents/en/en_0219.jsp.
[38] Ministry of Education, Singapore. (2011). *Education statistics digest 2011: Molding the future of our nation.* Retrieved from http://www.moe.gov.sg/education/education-statistics-digest/files/esd-2011.pdf.
[39] OECD. (2010). *Strong Performers and Successful Reformers in Education.*
[40] Ministry of Education, Singapore. (2011).

Figure 3

Singapore Education System Structure



The educational system in Singapore used to allow students to learn at their own pace from Grade 5 on, but there has been a shift to more subject-based tracking. Some of the early school years' curriculum focuses on English, mother language, mathematics, science, civics and moral education, social studies, health, physical education, art, and music. At the end of Grade 6, all students take the primary school leaving examination in English, math, mother language, and science. The results determine the students' future track. Sixty percent are admitted to the express track; 25 percent to the normal academic track; and 15 percent to the normal technical track.[41]

[41] OECD. (2010). *Strong Performers and Successful Reformers in Education*.

Primary school is followed by four to five years of tracked secondary education. Depending on primary leaving examination scores, students follow one of the following three tracks:

1) A special/express course resulting in a General Certificate of Education (GCE 'O' level) upon completion;
2) The normal academic course resulting in GCE 'N' level upon completion; or
3) The normal technical course, which is a four-year course leading to the GCE 'N' upon completion.

Depending on the program completion in secondary school, students either attend a two-to-three year junior college, a three-year polytechnics school, or a two year institute of technical education. Students who complete junior college or polytechnical school may apply for admission to three-to-four year undergraduate universities. Students identified as clearly on the university track can be admitted into the Integrated Programme track, which is a combined secondary and junior college track.[42]

Brief History of the Educational System

The following information is taken from the OECD.[43] In 1965, Singapore had declared its independence from Malaysia. The first prime minister, Yew began promoting goals "to build a modern economy" and "to create a sense of Singaporean national identity," which led to the successful education system currently in place. Singapore's population consists of various religious and ethnic groups (74 percent Chinese, 13 percent Malay, 9 percent Indian, and 3 percent other). Upon the creation of Singapore as a nation, there was no common language and no common school system or curriculum. Although English is the national language, Singapore recognizes and teaches four different languages (Chinese, Malay, Tamil, and English, the language of government and all schools). With fears that the segregation of diversity would result in problems, leaders created the Singapore pledge: "One united people, regardless of race, language or religion." The government influenced the mixture of different groups with action such as assigning housing to diversify communities. Schools became the venues responsible for instilling values such as "honesty, commitment to excellence, teamwork, discipline, loyalty, humility, national pride, and emphasis on common good."

Education is highly valued in the city-state of Singapore. Additionally, human resource has become the most valuable resource due to the lack of other resources in Singapore. In the early 1970s, shortly after Singapore's independence, the quality of education was poor. In 1979, Goh published a report highlighting high dropout rates and low standards in the public education system. In response, Singapore did not attempt a "one size fits all" approach. Instead, Singapore began tracking students and creating multiple pathways for students in an effort to decrease dropout rates, improve quality of education, and produce a more technically skilled labor force. Tracking begins in elementary schools and the various pathways were framed around three distinct paths:

1) Academic high schools;
2) Polytechnic high schools, with advanced occupational and technical training that could lead to college; or
3) Technical institutes focusing on occupational and technical training for the lowest academically-performing students.

[42] Ministry of Education, Singapore. (2011).
[43] OECD. (2010). *Strong Performers and Successful Reformers in Education.*

A new motto was adopted by the public school system: "Thinking Schools, Learning Nation." Policy leaders agreed that "No single accountability model could fit all schools." Therefore, emphasis is placed upon clusters managing themselves autonomously and selecting their own teaching methods.

School Turnaround Strategy

Singapore's Ministry of Education (MOE) posits five strengths of Singapore's educational system to explain its strong student performance on international assessments:[44]

- In an effort to give students a global advantage in the future, all students are required to learn one of the official *Mother Tongue* languages, as well as English, the official language of schools.
- While Singapore's students focus on core competencies, they receive a variety of curricular experiences, including music, arts, and sports. The holistic framework of the curriculum allows students to develop a variety of skills.
- Providing incentives in order to hire the best teachers and leaders is a focus of the MOE. Singapore's National Institute of Education (NIE) provides a comprehensive teacher preparation program, as well as opportunities for ongoing professional development.
- Information Communication Technology (ICT) is incorporated into school curriculum to provide students with new skills and learning experiences.
- Singapore's education system stresses parents and community involvement.

Finland

Table 6

General Information and Background of Finland[45]

Population (2012)	5.4 million
GDP per capita (2011)	$47,386
Number of schools	
Comprehensive	2,719
Comprehensive school level special education schools	118
Upper secondary general schools	388
Vocational institutes	129
Total students	
Comprehensive	522,400
Comprehensive school level special education schools	6,200
Upper secondary general schools	118,500
Vocational institutes	179,700

[44] Ministry of Education, Singapore. (2010). Education in Singapore. Retrieved from http://www.moe.gov.sg/about/files/moe-corporate-brochure.pdf.

[45] U.S. Department of State. (2011). Background Note--Finland. Retrieved from http://www.state.gov/r/pa/ei/bgn/3238.htm.

Number of Schools and Enrollment

In 2011, Finland's public and private comprehensive schools consisted of 2,719 schools serving 522,400 students. Pre-primary school, which is free, is attended by 99 percent of six-year-olds. A compulsory nine-year basic education is mandatory for all Finnish students. Following the nine-year compulsory curriculum, 2.5 percent of students opt to remain in voluntary basic education for an additional year, 55 percent choose general upper secondary education, and 38.5 percent enroll in vocational education and training.[46] The 129 vocational study programs provide opportunities to earn 53 different vocational qualifications.[47]

Finland offers 16 universities which have academic autonomy and independence from the government and are treated as independent corporations or foundations. The 25 polytechnic schools are run either by local governments or by private institutions and are funded by both the local government and national government. Figure 4 depicts the structure of Finland's educational system.[48]

Education Finance[48]

Education in Finland is co-financed by the national government and localities. Student populations of schools determine the funding each school receives, based upon a unit cost per student. Approximately 54.7 percent of educational costs are financed by the localities, while the remainder is subsidized by the government. Additional funding in the form of grants is offered by the government.

Finland spends approximately $7,711 on students across all levels of education (slightly above the corresponding OECD average of $7,527); however, only $5,557 is spent per primary student (below the corresponding OECD average, $6,252) and an average of $7,324 is spent on secondary students (lower than the corresponding OECD average $7,804). Spending on post-secondary levels is $12,285, higher than the OECD average of $11,512. Between the years of 1995 and 2005, spending on primary and secondary education increased far more rapidly (38 percent increase) than enrollment (13 percent increase). There is no charge for basic education, which includes additional services such as school meals, health care, and dental care. There is also no charge or fee for those students pursuing post-secondary degrees.[50]

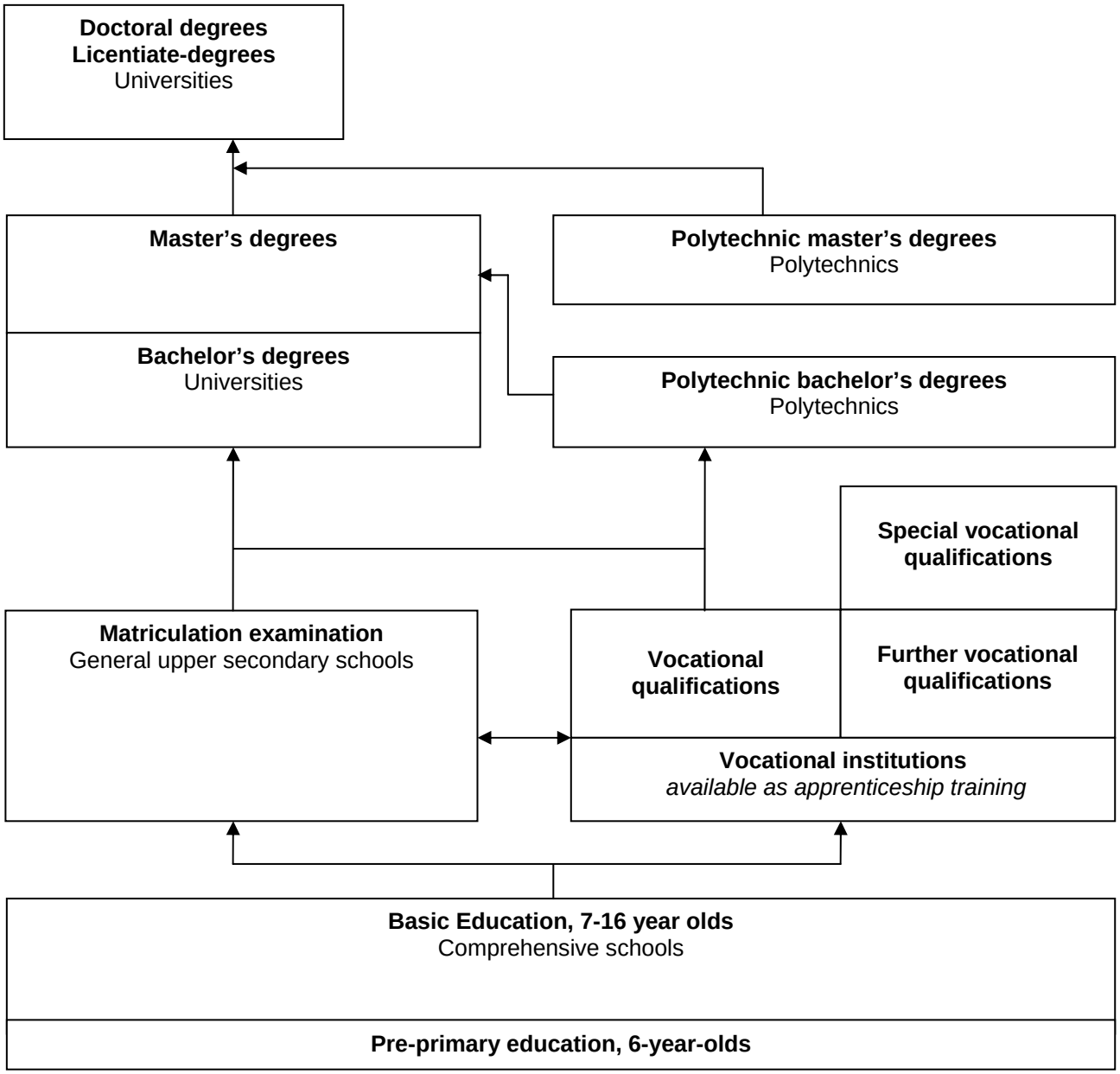
Brief History of the Educational System[49]

In the 1950s and 1960s, Finland's population increase resulted in a relatively quick change from a rural society to a developing modern industrial society. By the 1960s, political leadership and public education advocates guided Finland to adopt a nine-year compulsory education system for all children ages 7 to 16. This shift to a standardized education system resulted in the development of detailed and standardized curriculum framework, and the training of teachers to help support implementation of the new system. Finland's performance on the PISA 2000 has been attributed to the radical change in the public school system during the 1970s.

[46] Finnish National Board of Education. (2011). *Education.* Retrieved from http://www.oph.fi/english.
[47] Ministry of Education and Culture. (2011). *Vocational education and training in Finland.* Retrieved from http://www.minedu.fi/OPM/Koulutus/ammatillinen_koulutus/?lang=en.
[48] OECD. (2008). *Education at a Glance 2008, OECD Briefing Note for Finland.* Retrieved from http://www.oecd.org/dataoecd/31/46/41277828.pdf.
[49] Kupiainen, S., Hautamaki, J., & Karjalainen, T. (2009). The Finnish Education System and PISA. *Helsinki University Print.* Retrieved from http://www.pisa2006.helsinki.fi/files/The_Finnish_education_system_and_PISA.pdf.

Figure 4

Finland's Education System[50]



[50] Retrieved directly from The Finnish National Board of Education. (n.d.). *Educational structure.* Retrieved from http://www.oph.fi/english/education/overview_of_the_education_system.

School Turnaround Strategy[50]

Finland ensures that all teachers are highly qualified, especially those teaching in secondary subject areas. Finland has localized school control, giving far more autonomy to individual schools than in the past. Finnish schools have implemented a pre-school program that almost all students participate in before entering compulsory basic school. These programs focus on self-reflection and social behavior. Finland's Constitution provides all children with the right to education and culture. The Constitution requires that pre-primary and basic education be free for all students, and even most post-secondary schools are free of charge.

VIII. Comparisons between Virginia and High-performing Education Systems

Section VII consists of four major components: general information about countries/regions, student demographics, educational system attributes, and education outcomes. The comparison of these factors indicates wide differences across countries/regions. However, a comparative analysis of these high-performing educational systems also reveals certain commonalities that transcend their differences in their history, politics, culture, and economic structure.

Information about Countries

Table 7 and 8, which follow, provide a side-by-side comparison of the countries/regions explored in Section VII.[51]

[51] The cites below are for Table 7 found on the following page:

i. U.S. Census Bureau. (2010). *U.S. Census Bureau announces 2010 Census population counts.* Retrieved from http://2010.census.gov/news/releases/operations/cb10-cn93.html.
ii. U.S. Census Bureau. (2010). Retrieved from http://quickfacts.census.gov/qfd/states/51000.html.
iii. World Atlas. (2010). Retrieved from http://www.worldatlas.com/aatlas/populations/ctypopls.htm.
iv. Central Intelligence Agency. (2012a). *The World Factbook.* Retrieved from https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html.
v. Central Intelligence Agency. (2012a).
vi. Note that this counts individuals ages 16 years and older. National Center for Education Statistics. (2003). *National assessment of adult literacy: State and county estimates of low literacy*. Retrieved from http://nces.ed.gov/naal/estimates/StateEstimates.aspx
vii. U.S. Census Bureau. (2010).
viii. Central Intelligence Agency. (2012a).
ix. Central Intelligence Agency World Factbook. (2000).
x. U.S. Census Bureau. (2006).
xi. Pearson Education. (2007). Information please database. Retrieved from http://www.infoplease.com/ipa/A0855613.html.
xii. The Pew Forum on Religion and Public Life. (2010). *U.S. religious landscape survey.* Retrieved from http://religions.pewforum.org/maps.
xiii. U.S. Department of State. (2011). *Background Notes: Canada*. Retrieved from http://www.state.gov/r/pa/ei/bgn/2089.htm.
xiv. U.S. Department of State. (2012). *Background note: South Korea.* Retrieved from http://www.state.gov/r/pa/ei/bgn/2800.htm.
xv. Singapore Department of Statistics. (2011). *Census of population 2010: Statistical release on demographic characteristics, education, language, and religion.* Retrieved from http://www.singstat.gov.sg/pubn/popn/C2010sr1/cop2010sr1.pdf.
xvi. Statistics Finland. (2012). *Population.* Retrieved from http://tilastokeskus.fi/tup/suoluk/suoluk_vaesto_en.html.
xvii. World Bank. (2010).
xviii. U.S. Department of Commerce. (2010).
xix.

Table 7

Background Economic, Demographic and Geographic Information - I

United States, Virginia, Canada, Shanghai, South Korea, Singapore, Finland

	UNITED STATES	VIRGINIA	CANADA	SHANGHAI	SOUTH KOREA	SINGAPORE	FINLAND
Population	308.75 million[i]	8 million[ii]	33.7 million	20.5 million	48.8 million	5.8 million	5.4 million
Density[iii]	83.38 people/sq. mi	202.6 people/sq. mi	8.88 people/sq. mi	1,401 people/sq. mi	1309.2 people/sq. mi	2,751 people/sq. mi	42.24 people/sq. mi
Poverty [iv]	15.1% (2010)	10.3%[54] (2010)	9.4% (2008)	N/A	15% (2006)	N/A	N/A
Government Structure[v]	Constitution-based federal democratic republic	Constitution-based democratic republic	Parliamentary democracy, federation, and constitutional monarchy	Communist (China)	Republic	Parliamentary Republic	Republic
Literacy Rate (15 and older)[55]	99% (2003)	88%[vi]	99% (2003)	97.3% (2010)	97.9% (2002)	92.5% (2000)	100% (2000)
Population by race	White: 80.0% Black: 12.9% Asian: 4.4% Hispanic 15.1%	White: 68.6% Black: 19.4% Asian: 5.5% Hispanic 7.9% (2010)[vii]	British Isles origin: 28% French origin: 23% Other European: 15% American Indian: 2% Other: 6% Mixed background: 26%[viii]	Han: 99.4% Minorities: 0.6%	~100% Korean 20,000 Chinese	Chinese: 76.8% Malay: 13.9% Indian: 7.9% Other: 1.4%[ix]	Finn: 93.4% Swede: 5.6% Russian: 0.5% Estonian: 0.3% Roma and Sami: 0.1%
Languages [x]	English: 82.1% Spanish: 10.7% Indo-European: 3.8% Asian Pacific Island: 2.7%	English: 86.7% Spanish:5.9% Asian Pacific Island: 3.2%	English (official): 58.8% French (official): 21.6% Other: 19.6% (2006)	Mandarin English taught widely in elementary and secondary school.	Korean English taught widely in junior high and high school. (2011)	Mandarin (official): 35% English (official): 23% Malay (official): 14.1% Hakkinen: 11.4% Cantónese: 5.7% Teochew: 4.9% Tamil (official): 3.2% Other: 2% (2000)	Finnish (official): 91.2% Swedish (official): 5.5% Other (Sami/Russian): 3.3% (2007)
Population by religion[xi]	Protestant: 52% Roman Catholic: 24% Mormon: 2% Muslim: 1% Jewish: 1% None: 10% (2002)	Baptist: 27% Roman Catholic: 11% Methodist: 8% Lutheran: 2% Other Christian: 28% Jewish: 1% Buddhism: 1% Hinduism: 1% Unaffiliated: 18% (2008)[xii]	Roman Catholic: 43.6% Protestant: 29.2% Other Christian: 4.3% Muslim: 2% Jewish: 1.1% Buddhism: 1% Hinduism: 1% None: 16.5% (2011)[xiii]	Christian: 1.07% Muslim: 0.28%	Nonreligious: 46.5% Christianity: 29.2% Buddhism: 22.8% Confucianism: 0.2% (2012)[xiv]	Buddhism: 33.3% Christianity: 18.3% Islam: 14.7% Taoism: 10.9% Hinduism: 5.1% Other: 0.7% None: 17% (2010)[xv]	Lutheran: 77.3% Orthodox: 1.1% Other Christian: 1.5% None: 20.1% (2011)[xvi]
GDP[xvii]	$14.5 trillion	$424 billion[xviii]	$1.6 trillion	$256.3 billion	$1.0 trillion	$223 billion	$238.8 billion

Table 8

Background Economic, Demographic and Geographic Information II

	UNITED STATES	VIRGINIA	CANADA	CHINA	SOUTH KOREA	SINGAPORE	FINLAND
Life Expectancy in Years (2012)[52]	78.49	78.5 (2007)[53]	81.48	74.84	79.3	83.75	79.41
Unemployment[54]	9.6% (2010) 9.3% (2009)	6.9% (2009) 6.9% (2010)[55]	8.0% (2010) 8.3% (2009)	4.3% (2009)	3.7% (2010) 3.7% (2009)	2.2% (2010) 3.0% (2009)	8.4% (2010) 8.2% (2009)
Average Household Size	2.59 (2010)[56]	2.54 (2010)[57]	3.0 (2006)[58]	2.49 (2011)[59]	3.4 (2005)[60]	3.5 (2011)[61]	2.8 (2009)[62]
Home Ownership Rate	66% (2011)[63]	68.9% (2010)[64]	68.4% (2006)[65]	N/A	N/A	88.6% (2011)[66]	64.6% (2000)[67]
Cost to Raise One Child to Age 18	$226,920 (2010)[68]	N/A	Girl: $166,549 Boy: $166,972[69]	N/A	N/A	N/A	N/A
Marital Dissolution per 1000[70]	4.95 (2012)[71]	3.7 (2009)[74]	2.24 (2003)	1.28 (2004)	2.90 (2004)	0.78 (2004)	2.53 (2004)

[52] Central Intelligence Agency. (2012b). *The World Factbook.* Retrieved from https://www.cia.gov/library/publications/the-world-factbook/rankorder/2102rank.html.
[53] Virginia Department of Health. (2010). *Complete Virginia Life Tables – 2007*. Retrieved from http://www.vdh.state.va.us/healthstats/documents/2010/pdfs/LifeTables07.pdf.
[54] U.S. National Center for Health Statistics. (2009). Births, marriages, divorces, and deaths: Provisional data for 2009. *National Vital Statistics Reports, 58*(25). Retrieved from http://www.cdc.gov/nchs/data/nvsr/nvsr58/nvsr58_25.htm.
[55] U.S. Bureau of Labor Statistics. (2012). *Unemployment rates for states.* Retrieved from http://www.bls.gov/lau/lastrk10.htm.
[56] U.S. Census Bureau. (2010). *America's Families and Living Arrangements: 2010.* Retrieved from http://www.census.gov/population/www/socdemo/hh-fam/cps2010.html.
[57] U.S. Census Bureau. (2010). *Profile of general population and housing characteristics: 2010.* Retrieved from http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml.
[58] Statistics Canada. (2007). Retrieved from http://www.statcan.gc.ca/tables-tableaux/sum-som/l01/cst01/famil40-eng.htm.
[59] Shanghai Department of Statistics. (2011). *The Sixth Census of Shanghai: An overview.* Retrieved from http://www.stats-sh.gov.cn.
[60] Scandinavian Tourist Board. (2006). *South Korea white paper.* Retrieved from http://www.visitscandinavia.org/PageFiles/6450/south%20korea.pdf.
[61] Department of Statistics Singapore. (2012). *Key annual indicators.* Retrieved from http://www.singstat.gov.sg/stats/keyind.html.
[62] Statistics Finland. (2010). *Population and cause of death statistics.* Retrieved from http://www.stat.fi/til/perh/2009/perh_2009_2010-05-28_tau_002_en.html.
[63] U.S. Census Bureau. (2011). *Housing vacancies and homeownership.* Retrieved from http://www.census.gov/hhes/www/housing/hvs/qtr411/q411ind.html.
[64] U.S. Census Bureau. (2012).
[65] Statistics Canada. (2009). *Homeownership rates for one-person householders.* Retrieved from http://www12.statcan.ca/census-recensement/2006/as-sa/97-554/table/t2-eng.cfm.
[66] Department of Statistics Singapore. (2012). *Statistics: Key Annual Indicators*. Retrieved from http://www.singstat.gov.sg/stats/keyind.html#note5.
[67] Atterhög, M. (2005). Importance of Government Policies for Home Ownership Rates: An International Survey and Analysis (Working Paper No. 54). Retrieved from http://www.infra.kth.se/se/byfa/publikationer/engelskaUppsatserOchRapporter/54.pdf.
[68] U.S. Department of Agriculture. (2010). *A child born in 2010 will cost $226,920 to raise according to USDA report.* Retrieved from http://www.usda.gov/wps/portal/usda/usdahome?contentid=2011/06/0241.xml&contentidonly=true.
[69] Canadian Council on Social Development. (2004).

STUDENT DEMOGRAPHICS

This section provides demographic information about the countries/regions, but focusing on student-related characteristics. Specifically, the following characteristics are explored: ages of attendance, enrollment rates, pre-primary system, student with disabilities, and immigrant students.

Ages of Attendance

Table 9 sets forth each country's compulsory attendance practices.

Table 9

Average Years of Primary and Secondary Schooling and Ages of Compulsory Attendance

	SINGAPORE[72]	CANADA[73]	SOUTH KOREA[74]	FINLAND[75]	SHANGHAI	UNITED STATES[76]	VIRGINIA
Average years of schooling	7	12	11.6	10	10.55	12	12
Ages of compulsory attendance	6-12	6/7-15/18	5/6-14-15	7-16[b]	6-15	5/7- 16/18	5-18[77]
Compulsory							
- Primary	6	6-8	6	6	5	6	6
- Secondary	0[a]	4-6	3	3	4	6	6
- Total	6	10-13	9	10	9	12	12

Notes:
Canadian data is in respect to most provinces. New Brunswick and Ontario require education until age 18.[94]
[a] Additional 4 years is not required, but universal.
[b] Compulsory education is considered "satisfied" when a student completes comprehensive school or at least 10 years of education. (Finnish National Board of Education, 2012)
U.S. data also varies among states. Virginia compulsory education typically ranges from ages 6-18, but with parental consent and student stipulations, students can graduate at age 16.

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 being compared; however, most students attend the four years of secondary school that is available.

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[70] England, J. L., & Kunz, P. R. (1975). The Application of Age-Specific Rates to Divorce. *Journal of Marriage and the Family*. *37(1)* 40–46. doi:10.2307/351029.
[71] U.S. Census Bureau. (2012).
[72] Ministry of Education, Singapore. (2012). *Our education system.* Retrieved from http://www.moe.gov.sg/education.
[73] The Council of Ministers of Education, Canada (n.d.). Education in Canada. Retrieved from http://www.cmec.ca/en.
[74] Ministry of Education, Science and Technology. (2008). Retrieved from http://english.mest.go.kr/web/1692/site/contents/en/en_0203.jsp.
[75] Ministry of Education and Culture. (2012). Retrieved from http://www.minedu.fi/OPM/?lang=en.
[76] National Center for Education Statistics. (2011). *Age range for compulsory school attendance and special education services, and policies on year-round schools and kindergarten programs, by state: Selected years, 2000 through 2011.* Retrieved from http://nces.ed.gov/programs/digest/d11/tables/dt11_175.asp.
[77] Education Commission of the States. (2010). *State Notes: Attendance: Compulsory School Age Requirements.* Retrieved from http://www.ncsl.org/documents/educ/ECSCompulsoryAge.pdf.

Enrollment Rates

Tables 10 and 11 outlines the enrollment rates of each country.

Table 10

Gross Enrollment Rates by Percent[78]

	Pre-primary	**Primary**	**Secondary**	**Tertiary**[79]
Canada (2004)	68.2	99.6	117.3	N/A
Finland (2005)	59.4	99.8	111.2	92
Shanghai (2009)[80]	98	99.9	97	80
Singapore (2005)	50.5 (2001)	77.9	63.2	N/A
South Korea (2006)	95.5	104.5	95.6	104
Netherlands (2005)	89.8	106.5	118.0	63
United States (2005)	61.4	98.4	94.1	89

Note: Enrollment rates are calculated by dividing the number of students of a specific age range enrolled by the total number of students in the population within that specific age range. Gross enrollment rates can exceed 100 percent if students are entering the grades at younger ages or if students are repeating grades.

Table 11

Net Enrollment Rates[97]

	Pre-primary	**Primary**	**Secondary**
Canada	66.3 (2002)	99.5 (2000)	88.8 (1991)
Finland (2005)	59.0	98.5	95.3
Shanghai (1997)			
Singapore (2002)	N/A	76.9	64.4
South Korea (2006)	50.6	97.6	93.9
Netherlands (2005)	89.7	97.9	86.6
United States (2005)	56.3	91.6	88.4

Note: *Net enrollment rate* is defined as the number of pupils in the theoretical age group for a given level of education enrolled in that level, expressed as a percentage of the total population in that age group.

Gross enrollment rate and net enrollment rate can provide insight into the accessibility and efficiency of school systems. Greater differences between gross and net enrollment rates can either mean that students are entering into primary school at a later or earlier age, or that students are not successfully following the track of the educational system. The gross enrollment rate of pre-primary

[78] Childinfo. (2008). *Statistics by area/education.* Retrieved from http://www.childinfo.org/education_496.htm.
[79] The World Bank. (2012). *School Enrollment.* Retrieved from http://data.worldbank.org/indicator/SE.TER.ENRR.
[80] Shanghai Municipal Government. (2010). *Shanghai Yearbook 2009*. Shanghai.

programs is higher in Canada (68.2%), South Korea (95.5%), and the Netherlands (89.8%), compared to the United States (61.4%). Aside from South Korea, this trend is also evident in the pre-primary net enrollment rates. By primary school, the difference between the gross and net enrollment rates of all countries, except the United States, are fairly similar. The net enrollment rates show that the United States out-enrolls only Singapore during the primary years, and then Singapore and the Netherlands in the secondary years.

The declining United States performance on international assessments has been explained by the assumption that the United States teaches all students while many other countries only teach the elite. Unfortunately, conflicting data continues to make it difficult to compare enrollment rates accurately. Differing expectations of the education systems result in a comparison of education systems serving differing populations. For example, South Korea and Singapore do not have compulsory education expectations for students with disabilities and therefore, these students cannot be accounted for by the data. Furthermore, the PISA assessment is only given to students who attend school, so those students receiving alternative education or being homeschooled would also be missed.

Pre-primary System

Approximately 40 percent of all four-year-olds in Virginia were not enrolled in any type of school in 2005 and a third of four-year-olds were enrolled in private school.[81] More recently in 2010, 39 percent of children ages three and four in Virginia still were not enrolled in some type of pre-primary program and approximately 24 percent of four-year-olds were enrolled in state or federally funded preschool programs.[82] 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. The latest PISA data suggests that school systems with a higher proportion of students who had attended pre-primary education tended to perform better.[83]

Tables 12-14 provide an overview of the pre-primary education system in each country.

[81] Walters, A., & Cai, Q. (2007). *Preschool enrollment: Identifying Virginia's underserved population.* Weldon Cooper Center, University of Virginia. Retrieved from http://www.coopercenter.org/demographics/publications/preschool-enrollment-identifying-virginias-underserved-population.

[82] The National Institute for Early Education Research. (2010). *State preschool yearbook.* Retrieved from http://nieer.org/sites/nieer/files/2011yearbook.pdf.

[83] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

Table 12

Comparison of Pre-primary Education Systems

Canada[84]	Official pre-primary programs are available only in Ontario. In 2002-2003, non-parental childcare increased to 53% from 42% in 1994-1995.
Finland[85]	Early Childhood Education and Care (ECEC) grants free access to universal daycare for children ages 8 months to five years (since 1990). It is not mandatory, but widely used. Approximately 96% of six-year-olds attend pre-primary school. Books are also provided to parents of newborns. Approximately 0.4% of GDP was invested in pre-primary programs in 2008.
Shanghai[86]	0.23% of GDP was invested in pre-primary education in 2010, with a 10% increase for the next three years.
Singapore[87]	Three years of kindergarten are offered from ages 3-6 (nursery, K1, K2) and run by private organizations. Approximately 99% of children attend at least one year of pre-primary.
South Korea[88]	Most pre-primary and kindergarten programs offered in South Korea are private. Only 0.13% of GDP was invested into pre-primary programs in 2008.
United States[89]	Fewer than 1 million children enroll in the first year of pre-primary programs and approximately 3.4 million enroll in the second year of pre-primary school. 27% of four-year-olds and 4% of three-year-olds were enrolled in pre-primary programs in 2010. When kindergarten is included, 63.5% of all 3-5 year olds were enrolled in some type of pre-primary education in 2009.
Virginia	The Commonwealth of Virginia has shown support for pre-primary education with the creation of the *Virginia Preschool Initiative* in 1995 and the expansion of the program from 2002-2006. The initiative targets at-risk four-year-olds not already enrolled in a preschool program.[90] 39 percent of three- and four-year-olds are not enrolled in a government sponsored preschool primary program.[91]

[84] Bushnik, T. (2006). Child care in Canada. *Children and youth research paper series.* Retrieved from http://www.statcan.gc.ca/pub/89-599-m/89-599-m2006003-eng.pdf.
[85] Ministry of Education and Culture. (2012). Retrieved from http://www.minedu.fi/OPM/Koulutus/yleissivistaevae_koulutus/esiopetus/?lang=en.
[86] Research Academy of Shanghai Pre-school Education. (2010). *A blueprint for curriculum and instruction reform in Pre-school education in Shanghai.* Retrieved from www.yajiuhui.age06.com.
[87] Ministry of Education, Singapore. (2012). *Pre-school education.* Retrieved from http://www.moe.gov.sg/education/preschool.
[88] OECD. (2004). *OECD Country Note: Early Childhood Education and Care Policy in the Republic of Korea.* Retrieved from http://www.oecd.org/dataoecd/42/43/33689774.pdf.
[89] Barnett, W. S., Epstein, D. J., Carolan, M. E., Fitzgerald, J., Ackerman, D. J., & Friedman, A. H. (2010). The State of Preschool 2010. Retrieved from http://nieer.org/yearbook/contents.
National Center for Education Statistics. (2011). *Fast Facts: Preprimary education enrollment.* Retrieved from http://nces.ed.gov/fastfacts/display.asp?id=516.
[90] Pre-primary Now. (2010). *Overview*. Retrieved from http://www.preknow.org/privacypolicy.cfm.
[91] The Annie E. Casey Foundation. (2012). *KIDS COUNT Data Center*. Retrieved from datacenter.kidscount.org. Note: Annie E. Casey defines children enrolled in programs sponsored by federal, state, or local agencies to provide preschool education to young children, including Head Start programs, as enrolled in preschool.

Table 13

Percentage of Students Attending Pre-primary Education (based on self-reports) [92]

Pre-primary Education	Canada	Finland	Shanghai	Singapore	South Korea	United States
No Attendance	9.5	5.0	2.5	2.3	5.9	1.8
One year or less	42.3	28.9	10.7	6.6	15.9	27.7
More than one year	48.2	66.1	86.8	91.1	78.1	70.6

Table 14

Participation Rates in Formal Care and Pre-school for Children under Six[93]

	Canada	Finland	Shanghai	Singapore	South Korea	United States
Under 3 years	24.0	28.6	N/A	N/A	37.7	31.4
3 years	15.7	68.5	N/A	N/A	73.3	36.3
4 years	41.7	75.4	N/A	N/A	79.3	57.5
5 years	99.2	78.9	N/A	N/A	86.3	73.3
3-5 years	56.8	74.2	N/A	N/A	79.8	55.7

Students with Disabilities

In the 2008-2009 school year, 13.2 percent of Pre-K-12 students in the United States were identified as receiving services due to disabilities.[94] The United States, Finland, and Canada prepare individualized plans for students with disabilities. Pursuant to federal law, U.S. students with disabilities are to have an Individualized Education Program (IEP). Moreover, schools are expected to ensure achievement of special education students, as measured by state-determined standards.[95]

Finland provides specialized plans for students with disabilities and also advocates for vocations for these students. There is a strong movement for full inclusion during the early grades, until students are tracked in different directions. Approximately eight percent of Finnish students have been identified as special needs students; however, half are mainstreamed into inclusive schools. The remaining four percent attend special schools. "Special Teachers" serve as support for classroom teachers and provide additional supports to students with special needs. Supports range from identifying students to pulling out and supporting students in smaller groups.[96]

[92] OECD. (2010). *PISA 2009 results: What makes a school successful? Resources, policies and practices* (Volume IV). Retrieved from http://dx.doi.org/10.1787/9789264091559-en.
[93] OECD. (2008). *OECD – Social Policy Division – Directorate of Employment, Labour and Social Affairs.* Retrieved from http://www.oecd.org/dataoecd/46/13/37864698.pdf.
[94] National Center for Education Statistics. (2010). *Digest of educational statistics.* Retrieved from http://nces.ed.gov/programs/digest/d10/tables/dt10_047.asp.
[95] U.S. Department of Education. (2004). *IDEA.* Retrieved from http://idea.ed.gov.
[96] OECD. (2010). *Strong performers and successful reformers in education*.

South Korea did not provide an appropriate education to all students with disabilities until the Special Education Promotion Act, which was initiated in 1977 and amended in 1994. Currently, the Ministry of Education requires there be at least one special school to serve the South Korean students with disabilities, estimated to make up approximately 2.4 percent of the population. Just under half of these students are mildly handicapped and therefore attend special programs at general mainstream schools. The Ministry of Education instituted a program in 2007 that works towards including students with disabilities into the mainstream classroom as much as possible.[97]

Singapore has made efforts to improve special education services to students with mild disabilities by:

1) Providing "Allied Educators" who serve as Special Needs Officers supporting special needs students in mainstream classrooms;
2) Providing additional funding to support the needs of special needs students in mainstream classrooms; and
3) Providing additional training to educators teaching students with disabilities in the mainstream classroom settings.[98]

Singapore currently does not require that all students with disabilities attend school. Singapore's special education services are operated by voluntary welfare organizations funded by the Ministry of Education. However, because compulsory education requirements do not apply to students with special needs, many students with disabilities do not attend school. This is particularly true for students with more severe disabilities. The educational ministry funds voluntarily run schools for students with disabilities but, because of a scarcity of these schools, there is a waiting list for students with more severe disabilities.[99]

Childhood Poverty Rates

The role of poverty in educational achievement has been an ongoing topic of research.[100] Table 15 depicts the poverty rates in the selected countries/regions.

Although the United States is one of the wealthiest countries in the world, the poverty rate for children is at least twice the rate of most other developed countries, recognizing that countries define poverty rates differently. However, these relatively high poverty rates in the United States may have implications on the success of students in the schools.

[97] National Center on Education and the Economy. (2011). *Education for all.* Retrieved from http://www.ncee.org/programs-affiliates/center-on-international-education-benchmarking/top-performing-countries/south-korea-overview/south-korea-education-for-all.

[98] Ministry of Education. (2012). *Support for children with special needs.* Retrieved from http://www.moe.gov.sg/education/programmes/support-for-children-special-needs.

[99] Singapore Ministry of Education. (2011). *Special education in Singapore.* Retrieved from http://www.moe.gov.sg/education/special-education.

[100] Duncan, G. J., Brooks-Gunn, J., & Klebanov, P. K. (1994). Economic deprivation and early childhood development. *Child Development, 65*, 296-318; Keegan-Eamon, M. (2002). Effects of poverty on mathematics and reading achievement of young adolescents. *The Journal of Early Adolescence, 22*(1), 49-73; McLoyd, V. C. (1998). Socioeconomic disadvantage and child development. *American Psychologist, 53*, 185-204.

Table 15

Poverty Rates for Children and Households with Children[101]
2008

Country	Poverty among Children	Poverty in Households with Children					
		All	Single Parent		Couple Family		
			Not Working	Working	Neither Working	One Working	Two/more Working
Canada	15.1	11.6	74.7	16.8	68.0	13.5	1.0
Finland	5.4	4.7	49.0	8.6	49.2	13.4	1.4
South Korea	10.3	8.6	23.1	19.7	37.5	9.5	5.3
Shanghai	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Singapore	N/A	N/A	N/A	N/A	N/A	N/A	N/A
United States	21.6	18.7	91.5	35.8	84.1	30.6	6.6
Virginia[102]	13.8	N/A	60	18	10	2	N/A

Immigrant Students

The effects of immigration on education provide another lens for exploring the challenges of mobility and cultural and linguistic diversity in schools. Table 16 summarizes immigration and mobility rates for the selected countries/regions.

Table 16

Comparison of Migration Rates Between Countries[103]
2005

	Canada	Finland	South Korea	Shanghai[104]	Singapore	United States	Virginia[105]
Annual mobility rates per thousand immigrants	6.7	1.6	-0.3	N/A	9.6	4.0	4.3
Percentage of population that is immigrants	18.9	3.0	1.2	39	42.6	12.9	10.2
Note: Migration rates are determined by dividing the net number of immigrants by the average population of the receiving country. Migration rates can be negative if more migrants move out of the country than into the country.							

[101] OECD. (2008). *Family Database: Children poverty.* Retrieved from http://www.oecd.org/dataoecd/52/43/41929552.pdf.
[102] Virginia's Poverty Reduction Task Force. (2010). *Rethinking poverty.* Retrieved from http://www.dss.virginia.gov/geninfo/reports/agency_wide/poverty_long.pdf.
[103] United Nations. (2006). *International Migration 2006.* Retrieved from http://www.un.org/esa/population/publications/2006Migration_Chart/Migration2006.pdf.
[104] Shanghai Department of Statistics. (2011). *The Sixth Census of Shanghai: An overview.* Retrieved from http://www.stats-sh.gov.cn.
[105] Council on Virginia's Future. (n.d.). *Virginia demographic profile 2009.* Retrieved from http://www.future.virginia.gov/docs/VirginiaProfile2009.pdf.

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 countries are still able to outperform the United States on international comparison tests.[106]

EDUCATIONAL SYSTEM ATTRIBUTES

This section will compare educational system attributes such as average class size, the ratio of students to teachers, time spent learning, funding and school choice, teacher preparation and selection, and the role of educational leadership.

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. Table 17 summarizes the average student-teacher ratio for the selected countries/regions.

Table 17

Average Student-Teacher Ratio by Primary and Secondary School[107]
2008

	Primary	**Secondary**
Canada	N/A	7
Finland	14	10
Singapore	19	16
Shanghai	N/A	N/A
South Korea	24	18
United States	20	12.4
Virginia (2011)[108]	26.7	10.3

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.[109] Various studies have found that reducing class size in primary grades from about 23 or 24 to 15 can yield an effect size in the range of .15 to .26.[110] This translates,

[106] OECD. (2010). *Strong Performers and Successful Reformers in Education*. p. 232.
[107] The World Bank. (2012). Retrieved from http://data.worldbank.org.
[108] National Center for Education Statistics. (2011). *Common Core of Data (CCD), State Nonfiscal Survey of Public Elementary/Secondary Education, Version 1a*. Retrieved from http://nces.ed.gov/pubs2012/snf201011/tables/table_04.asp?referrer=report.
[109] Ehrenberg, R., Brewer, D. J., Gamoran, A., & Wiliam, J. D. (2001). Class size and student achievement. *Psychological Science in the Public Interest, 2*(1), 1-30.
[110] U.S. Department of Education. (1998, April). *Research on the academic effects of small class size.* Retrieved April 25, 2009, from http://www.ed.gov/pubs/ClassSize/academic.html.

at best, to a 7 to 8 percentile point rise in achievement over the course of a year.[111] Class size appears more important in younger students than for older students.[112] PISA data indicated that average class sizes ranged from fewer than 20 students per classroom in Finland, to more than 30 students per classroom in South Korea, Singapore, and Shanghai. While class size is largely consistent across Finland, there is more variation in the United States. In addition, class size varies within schools in the United States. Over 65 percent of class size variation occurs within schools, indicating that students attending the same school may attend classes of different sizes.[113] Table 18 provides the average class size for the studied countries/regions.

Table 18

Average Class Size of Public Schools[114]

	Primary Schools	**Secondary Schools**
Canada	N/A	N/A
Finland	19.8	20.4
Singapore[115]	34.3	36.6
Shanghai	N/A	N/A
South Korea	31	35.8
United States[116]	20.1 (Self-contained classes) 23.3 (Departmentalized instruction)	18.6 (Self-contained classes) 23.0 (Departmentalized instruction)
Virginia[117]	18.2 (Self-contained classes) 20.0 (Departmentalized instruction)	15.5 (Self-contained classes) 20.5 (Departmentalized instruction)

Time-Per-Week Teacher is Engaged in Instruction

Teachers in the United States spend more time per week engaged in instruction than teachers in any of the compared countries, all of which outperform the United States on international comparative assessments. 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

[111] Barber, M., & Mourshed, M. (2007). How the world's best-performing school systems come out on top. Retrieved from http://www.mckinsey.com/locations/ukireland/publications/pdf/Education_report.pdf.
[112] Finn, J. D. (2002). Class-size reduction in grades K-3. In A. Molnar (Ed.). *School reform proposals: The research evidence* (pp. 15-24). Tempe, AZ: Education Policy Research Unit, Arizona State University.
[113] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).
[114] OECD. (2009). *Education at a Glance 2009: OECD Indicators.* Retrieved from http://www.oecd.org/dataoecd/41/25/43636332.pdf.
[115] Ministry of Education, Singapore. (2011). *Education statistics digest 2011: Molding the future of our nation.* Retrieved from http://www.moe.gov.sg/education/education-statistics-digest/files/esd-2011.pdf.
[116] Institute of Education Sciences. (2009). *Characteristics of public, private, and Bureau of Indian Education elementary and secondary school teachers in the United States.* Washington, D.C.: National Center for Education Statistics. Retrieved from http://nces.ed.gov/pubs2009/2009324.pdf.
[117] Institute of Education Sciences. (2009). *Schools and staffing survey.* Retrieved from http://nces.ed.gov/surveys/sass/tables/sass0708_2009324_t1s_08.asp.

total of 840 hours on instruction and Finnish teachers provided instruction for an average of 677 hours a year (or about four daily lessons of 45 minutes).[118] Table 19 summarizes the weekly instructional time for the selected countries/regions.

Table 19

Weekly Intended and Implemented Instruction Time
By Country (in Hours) [119]
2007

	Canada	Finland[120]	Singapore	Shanghai[121]	South Korea	United States
Hours	25-26	15	23	10-14	26	29

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 percent of students in South Korea and Shanghai spend up to four hours per week on supplemental after-school lessons; an additional 20 percent 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.[122]

One of the most striking features of Finnish schools is that their students have fewer hours of instruction than students in other countries, yet they score near the very top on international tests. Finnish students do not follow the Asian model of study: study and more study. Instead, they start school a year later than most countries, emphasize creative work, and shun tests for most of the academic year. However, the difference may be explained by Finland's great outstanding teachers, who are paid well and treated with the same professional respect accorded to doctors and lawyers. They are selected and developed through an extremely competitive and rigorous process. All teachers are required to have master's degrees, and only one in ten applicants is accepted to the country's teacher-training programs. The contrast with the United States is stark; 47 percent of America's teachers graduated in the bottom third of their college class, 30 percent in the middle third, and only 23 percent in the top third.[123] The tables which follow look at varying units of time and student instruction.

[118] OECD. (2010). *Education at a glance 2010: OECD indicators.*
[119] International Association for the Evaluation of Educational Achievement (IEA). (2007). *Trends in International Mathematics and Science Study (TIMSS).* Retrieved from http://nces.ed.gov/surveys/international/tables/C_3_03b.asp.
[120] Lavy, V. (2010). *Do differences in school's instruction time explain international achievement gaps in math, science, and reading? Evidence from developed and developing countries.* Cambridge, MA: National Bureau of Economic Research.
[121] Ibid.
[122] Zakaria, F. (2011, November 6). When will we learn? *Time*, p. 43.
[123] Auguste, B., Kihn, P., & Miller, M. (2010). Closing the talent gap: Attracting and retaining top-third graduates to careers in teaching: An international and market research-based perspective. Retrieved from http://mckinseyonsociety.com/downloads/reports/Education/Closing_the_talent_gap.pdf.

Table 20

Length of School Year (in Days)[124]

	Primary	Secondary	Upper Secondary	Notes
Canada	Average: 188			Province-based policies, but typically a September to June school year.
Finland	187	187	187	N/A
Singapore	200	200	200	Two-semester school year beginning in January and ending in June, and from July to December.
Shanghai	About 180			N/A
South Korea	204	204	204	N/A
United States	About 180			N/A

Table 21

Length of School Day (in Minutes)[125]

	Canada	Finland	Shanghai	Singapore	South Korea	United States[126]
Length of School Day	304	240	390	330	264	402

Table 22

Students' Learning Time at School (Minutes per Week) [127]

(Based on Students' Self-Reports)

Regular Lessons at School in Subject Area	Canada	Finland	Shanghai	Singapore	South Korea	United States
Language	326.4	150.3	256.1	283.2	212.0	257.7
Mathematics	322.6	171.7	274.1	343.5	217.4	258.5
Science	317.5	194.4	201.9	345.1	179.7	258.3
Mathematics and Science	632.9	364.5	375.6	660.2	397.1	509.1

[124] OECD. (2010). *PISA 2009 results: What makes a school successful? (Volume IV).*
[125] Ibid.
[126] National Center for Education Statistics. (2002). *Private school universe survey.* Retrieved from http://nces.ed.gov/surveys/pss/TableDisplay.asp?TablePath=tables/table_15.asp.
[127] OECD. (2010).

Table 23

Students' Learning Time at School (2009) By Lower or Upper Secondary Level of Education (Minutes per Week) [128]

(Based on Students' Self-Reports)

		Canada	Finland	Shanghai	Singapore	South Korea	United States
Regular lessons at school in language	Lower secondary	340.8	150.2	324.6	284.3	186.1	235.1
	Upper secondary	324.5	N/A	206.2	282.2	213.1	260.5
	Difference between lower and upper secondary	16.3	N/A	118.4	2.2	-27.0	-25.4
Regular lessons at school in mathematics	Lower secondary	301.4	171.5	345.9	262.7	169.3	249.2
	Upper secondary	326.3	N/A	222.7	346.3	219.5	259.4
	Difference between lower and upper secondary	-24.9	N/A	123.2	-83.6	-50.2	-10.2
Regular lessons at school in science	Lower secondary	267.1	194.4	218.8	253.1	181.4	228.6
	Upper secondary	326.1	N/A	190.6	347.0	179.6	261.4
	Difference between lower and upper secondary	-59.0	N/A	28.2	-93.9	1.8	-32.8

Table 24

Percentage of Students Attending After-school Lessons, 2009 (Enrichment or Remedial Lessons) [129]

(Based on Students' Self-reports)

By Subject Area and Type Lesson		Canada	Finland	Shanghai	Singapore	South Korea	United States
Language	Enrichment	5.9	1.3	13.0	27.1	27.0	9.8
	Remedial	4.5	2.2	17.9	30.3	54.4	6.6
Mathematics	Enrichment	11.9	2.5	28.1	48.5	37.9	14.8
	Remedial	8.4	9.2	37.7	49.1	61.2	8.7
Science	Enrichment	6.4	1.8	9.3	34.2	17.2	11.1
	Remedial	4.3	2.0	6.6	41.7	44.8	7.2
Attend after-school lessons for at least one of the three subjects	Enrichment	18.6	5.4	46.7	60.5	47.6	24.8
	Remedial	11.8	12.6	51.4	60.7	69.3	14.3

[128] U.S. Department of the State. (2011). *Background Note: Canada.* Retrieved from http://www.state.gov/r/pa/ei/bgn/2089.htm.
[129] Ibid.

Table 25

Percentage of Students Attending After-school Lessons (By Hours per Week)[130] 2009
(Based on Students' Self-reports)

		Canada	Finland	Shanghai	Singapore	South Korea	United States
Language	No attendance	90.8	92.1	45.8	56.6	32.4	85.7
	< 4 hours/wk	6.9	6.6	39.5	35.7	51.8	10.3
	4 hours/wk or more	2.3	1.3	14.7	7.7	15.8	4.0
Mathematics	No attendance	81.5	89.8	29.0	29.8	23.4	78.6
	< 4 hours/wk	14.9	7.6	47.4	48.6	47.0	16.3
	4 hours/wk or more	3.5	2.6	23.6	21.6	29.7	5.1
Science	No attendance	89.4	92.2	71.2	43.1	43.3	83.3
	< 4 hours/wk	8.0	5.9	22.3	41.5	47.1	12.3
	4 hours/wk or more	2.6	1.9	6.5	15.3	9.6	4.5
Other subjects	No attendance	87.0	87.6	38.1	56.7	33.0	79.6
	< 4 hours/wk	9.4	9.1	43.0	34.2	46.7	13.1
	4 hours/wk or more	3.6	3.3	18.9	9.1	20.2	7.4

Funding

This section explores differences in how the comparison countries fund education. Data such as total expenditures and percentage of GDP, cost per pupil over the course of a K-12 education, and the sources for such funding (local, state/regional, of national) are compared in the following tables.[131]

[130] U.S. Department of the State. (2011). *Background Note: Canada.* Retrieved from http://www.state.gov/r/pa/ei/bgn/2089.htm.
[131] OECD. (2010). The World Bank. (2012).

Table 26

Educational Expenditures[132] 2006

Country	Expenditure per student from K-12 (in USD)	GDP per capita (2010)[133]	% of GDP			Total public expenditures as % of GDP	Total private expenditure as % of GDP
			Primary and Secondary	Tertiary	Total		
Canada	96,541	46,212	3.5	2.6	6.1	4.6	1.5
Finland	87,013	44,378	3.6	1.6	5.6	5.5	0.1
Shanghai	42,064	11,361	4.0[134]			N/A	N/A
Singapore	N/A	41,120	2.6[135]			3.3	N/A
South Korea	80,345	20,757	4.0	2.4	7.0	4.2	2.8
Netherlands	90,964	46,904	3.7	1.5	5.6	4.7	0.8
United States	129,327	47,153	4.0	3.1	7.6	5.0	2.6

Table 27

Annual Expenditure per Pupil[136] 2006

Canada	$8,045
Finland	$7,216
Shanghai	N/A
Singapore	N/A
South Korea	$6,663
Netherlands	$8,571
United States (2008)[137]	$10,259
Virginia (2010)[138]	$10,793

Note: The range of expenditure per pupil between districts in Virginia is $8,366 (King George County) and 18,452 (Arlington County).[139]

[132] OECD. (2009). *Education at a glance 2009.*
[133] The World Bank. (2012). Retrieved from http://data.worldbank.org.
[134] The central government in China decided the spending on education would account for four percent of the country's GDP in 2010. Chen, X. (2012). Government to raise education spending to 4% of GDP. *China Daily.* Retrieved from http://usa.chinadaily.com.cn/china/2012-03/06/content_14762659.htm.
[135] The World Bank (2012). Retrieved from http://data.worldbank.org.
[136] OECD. (2009). *Education at a glance 2009.*
[137] U.S. Census Bureau. (2010). Public Education Finances 2008. Retrieved from http://www2.census.gov/govs/school/08f33pub.pdf.
[138] Virginia Department of Education. (2011). Table 15 of the *Superintendent's Annual Report for Virgini*a. Retrieved from http://www.doe.virginia.gov/administrators/superintendents_memos/2012/069-12a.pdf .
[139] New America Foundation. (n.d.). *Federal Education Budget Project.* Retrieved from http://febp.newamerica.net/

Table 28

How Education is Funded[140]

Percentage of funding from:	Canada	Finland	Shanghai	Singapore	South Korea	United States
Public	76	97.4	N/A	N/A	59.6	71
Private	24	2.6	N/A	N/A	40.4	29

PISA data indicates that expenditures per student account for an estimated nine percent of the variation in a country's mean performance. However, an increase in spending does not guarantee an increase in mean scores; the United States spent significantly more per student and a higher percentage of the GDP, as compared to the leading countries reviewed in this study.

The United States, which ranks third after Luxembourg and Norway in terms of GDP per capita, has a substantial economic advantage over other countries because of the potential resources available to spend on education. A comparison of countries' expenditure per student puts the United States at the top. Among 34 OECD countries, only Luxembourg spends more than the United States on education per student. However, across OECD countries, expenditures per student explain only nine percent of the variation in PISA mean performance between countries. PISA data indicates that moderate spending per student cannot automatically be equated with poor performance by education systems. For example, Estonia and Poland, whose expenditure per student is less than half of that of the United States, perform at the same level as the United States. It is not just the volume of resources that matters, but how countries invest these resources and how well they succeed in directing the money to where it can make the most difference.[141]

School Choice[142]

According to the responses of school principals participating in PISA, 67 percent of students in Canada, 69 percent in Shanghai, 90 percent in Singapore, 72 percent in South Korea, and 70 percent in the United States attend schools competing with at least two other schools for enrollment. 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. In Finland, only 44 percent of students attend schools that compete with two other schools for enrollment.[143] There are varying forms of school choice, such as independently managed schools with public funding. These schools receive funding based on student enrollments or student credit-hours. Another typical model is giving money to students and their families to spend in public or private schools of their choice through vouchers.

The enrollment policies in Finland, South Korea, Shanghai, and some states within the United States require that students be enrolled in geographical area schools, while parents in Singapore are

140 OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).
141 Ibid.
142 Musset, P. (2012). School Choice and Equity: Current Policies in OECD Countries and a Literature Review. *OECD Education Working Papers*, No. 66, OECD Publishing. Retrieved from http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=EDU/WKP(2012)3&docLanguage=En
143 Ibid.

given the right to enroll their child(ren) in any public school they wish.[144] Singapore and South Korea incorporate vouchers or tax credits into their school-choice arrangements. Some states within the United States choose this option as well. Finland and Shanghai provide more freedom in public school choice in the area of residence, but do not offer vouchers or tax credits. Competition among schools correlates with the school-choice arrangements in their educational systems. The competition is greatest in school systems that grant students and parents the authority to choose public schools, and offer subsidies in the form of vouchers or tax credits to attend other schools, which is the model in Singapore.

PISA data indicates that the extent of competition is positively associated with student performance. However, once the socio-economic background of the students and schools is 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.[145] Singapore, which is characterized by high level of school competition, has a lower educational equity (as indicated in Table 48) and increasing widening class divide.[146] PISA data also reveals that the existence of private schools does not make a difference in overall performance when student socio-economic profiles are taken into consideration. Private schools are defined as those that are independently managed, regardless of whether they are publicly or privately funded. In fact, only one percent of the variation in student achievement is attributable to differences in how schools are governed.[124]

Teacher Preparation and Selection

A number of studies have found teacher education and preparation are significantly related to increases in student achievement.[147] For instance, one study found teacher education in mathematics (as measured by a major in math or math education, or having a regular teaching certificate in math) to be significantly related to math proficiency in eighth-grade students.[148] Studies exploring other subjects have found less significant relationships between teachers' degrees and student achievement. Table 29 summarizes teacher preparation standards, using data sources from 2003 to 2006 (based on availability of comparable information).

[144] Musset, P. (2012). School Choice and Equity: Current Policies in OECD Countries and a Literature Review. *OECD Education Working Papers*, No. 66, OECD Publishing. Retrieved from http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=EDU/WKP(2012)3&docLanguage=En.
[145] OECD. (2010). *Strong performers and successful reformers in education.*
[146] Ng, I. Y. H. (2011, February 16). Singapore's education system: Growing worry of social immobility. *The Strait Times*, p. 25. Retrieved from http://newshub.nus.edu.sg/news/1102/PDF/IMMOBILITY-st-16feb-pA25.pdf.
[147] Greenwald, R., Hedges, L., & Laine, R. (1996). The effect of school resources on student achievement. *Review of Educational Research, 66*, 361-396.
[148] Greenberg, E., Rhodes, D., Ye, X., & Stancavage, F. (2004). *Prepared to teach: Teacher preparation and student achievement in 8th grade mathematics.* Paper presented at the American Educational Research Association Annual Meeting, San Diego.

Table 29

Teacher Preparation Requirements and Standards[149]

	Educational Qualifications				Professional Qualifications			
	High School Diploma	Associate or Sub-Degree	Bachelor's Degree	Minimum Years Post-Secondary Education	Subject-Area and Pedagogy	Certification and/or License	Test or Exam	Training During or After Degree
Canada[150]			X	4	X	X		
China (2004-05)								
Elementary	X			0	X	X	X	Both
Lower Secondary		X		2	X	X	X	Both
Upper Secondary			X	4	X	X	X	Both
Finland[151]								
Elementary			X	4+1	X			
Secondary			X	4+1	X			
Singapore (2006)								
Elementary		X		2	X	X		Both
Secondary			X	4+1	X	X		Both
South Korea (2005)								
Elementary			X	4	X	X	X*	During
Secondary			X	4	X	X	X*	Both
United States (2003-04)								
Elementary			X	4	X	X	X	Both
Secondary			X	4	X	X	X	Both

*Test or exam not required for license, but upon employment.

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—expertise in knowing what and how to teach.

The top-performing countries do two things to maintain their high quality teacher workforce. First, they maintain a high level of selectivity for people interested in entering the teaching profession. Second, top-performing countries start teachers off with good pay. The decision to hire a teacher is viewed as extremely important, considering that the hiring of a specific individual could result in 30 years of good teaching or bad teaching. Singapore has developed a single-statewide-selection process overseen by the Ministry of Education and the National Institute for Education. Only candidates in the top 30 percent in high school are considered for admission. Finland had implemented the use of

[149] Ingersoll, R. M. (Ed.). (2007). A comparative study of teacher preparation and qualifications in six nations. Retrieved from http://www.cpre.org/images/stories/cpre_pdfs/sixnations_final.pdf.
[150] Canadian Teacher's Federation. (2012). *Teaching in Canada: Make a difference-be the change.* Retrieved from http://www.ctf-fce.ca/TIC/Default.aspx?sid=626067.
[151] Finnish National Board of Education. (2010). *Teachers in General Education.* Retrieved from http://www.oph.fi/english/education/teachers/teachers_in_general_education.

assessments to determine teacher quality. In Singapore, only one in six applicants is accepted to be a teacher, while only one in ten applicants is hired in Finland.[152] Table 30 summarizes selectivity in the preparation and hiring of teachers.

Table 30

Overview Descriptions of Teacher Selection by Country[130]

Country	Descriptions
Canada	Most schools require an undergraduate degree and an additional degree in education (additional 1 to 2 years). Secondary certification often requires a specific number of credits in the subject area. Requirements differ from province to province.
Finland	Only 10 percent of undergraduates are accepted into teacher-training programs. Since 1979, all teachers in Finland must have a master's degree. Candidates enter teaching programs at the graduate level.
Singapore	Only the top third of each graduating high school class is recruited for initial screening. Final candidates enter a fully paid, four-year teacher education program and are paid by the government during their education.
Shanghai	High societal regard and competitive income for teaching remain reasons the teaching profession is preferred. Stable incomes, as well as the recent improvements in teacher salaries, help draw and retain qualified teachers. Furthermore, in 1997, when universities in China began to charge tuition, China initiated a priority admission policy to normal (teacher training) universities to recruit better students and attract more competitive students.
South Korea	Anyone can apply and participate in a teacher preparation program, but following the program and testing, only the top 30 percent will obtain teaching jobs.
United 9tates	Just as in Korea, anyone can apply to teacher preparation programs, however two-thirds of teacher preparation programs accept more than half of their applicants, and a fourth of teacher preparation programs accepted nearly all of their applicants.[153] Only 40 percent of teacher preparatory programs were found to implement some type of minimum grade point average.[154] It has been asserted that the United States teacher preparatory programs pull college bound students from the bottom third of their high school class.[155]

In the United States, the teaching profession is not as selective as the comparison countries and has the perception of being a non-competitive, easy-entry occupation. Most of those who desire to enter the occupation are free to do so—as individuals choose the occupation, unlike the reverse in law, medicine, engineering, architecture, and academia.[156] While increases in licensure requirements create a more selective environment, the difficulty in recruiting teachers in high teacher-shortage areas (e.g., special education, math, and science) and for high need areas results in the use of waivers for requirements and teachers teaching out-of-field. Furthermore, teaching is portrayed as a "revolving door" occupation in the United States, referring to the phenomenon that large numbers of teachers flow

[152] Barber, M., & Mourshed, M. (2007).
[153] Walsh, K., & Jacobs, S. (2007). *Alternative Certification Isn't Alternative.* Washington, DC: Thomas B. Fordham Institute and National Council on Teacher Quality. Retrieved from http://www.hunt-institute.org/elements/media/files/reVISION-Number-1-November-2011.pdf.
[154] National Governors Association. (2009). Building a High-Quality Education Workforce: A Governor's Guide to Human Capital Development. Washington, DC. Retrieved from http://www.hunt-institute.org/elements/media/files/reVISION-Number-1-November-2011.pdf.
[155] Barber, M., & Mourshed, M. (2007).
[156] Ingersoll, R. M. (Ed.). (2007).

in and out of schools each year. About 40 to 50 percent of teachers leave teaching in the first five years. The amount of turnover accounted for by retirement is relatively minor in comparison with other reasons, such as teacher job dissatisfaction and seeking better careers.[157]

In Shanghai, the past 20 years have brought drastic increases in teacher threshold qualifications. Primary teachers were often taught at the level of senior secondary schools in teacher-training programs, and junior secondary teachers obtained sub-degree diplomas. Now, all primary teachers are required to hold sub-degree diplomas while all secondary teachers are required to hold degrees and teaching certifications. Master's degrees are concentrated on subject matter; in the last decade, however, there have been closer links between schools and normal (teacher training) universities. There are opportunities for prospective teachers to apply their educational theory and skills through student teaching.[158]

Leaders in Finland attribute their student success in learning to their intensive investments in teacher education (all teachers receive three years of high-quality graduate level preparation completely at state expense), and the major overhaul of the curriculum and assessment system. Most teachers now hold master's degrees in both their content area and in education, and 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.[159]

In 2010, over 6,600 applicants competed for 660 available slots in Finland's primary school preparation programs in the eight universities that prepare teachers. The admissions process occurs in two stages. The initial paper screen is based on the applicant's nationwide matriculation exam score, upper secondary school record, and out-of-school accomplishments. Those who pass that screening must then take a written exam, be observed in a teaching-like activity in which their interaction and communication skills can be assessed, and finally be interviewed to assess, among other things, the strength of their motivation to teach.[160]

In Singapore, prospective teachers are carefully selected from the top one-third of the secondary school graduating class by panels which include current principals. Strong academic ability is essential, as is the commitment to teaching, an ability to communicate, and creativity, confidence, and leadership qualities. Prospective teachers receive a monthly stipend that is competitive with the monthly salary of new graduates in other fields. They must commit to teaching for at least three years. Interest in teaching is seeded early through teaching internships for high school students. There is a system for mid-career entry, which is a way of bringing real-world experience to students.[161]

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[157] Ingersoll, R. M. (2001). Teacher turnover and teacher shortages: An organizational analysis. *American Educational Research Journal, 38*(3), 499-534.
Ingersoll, R. M. (2003). *Is there really a teacher shortage?* Philadelphia: Consortium for Policy Research in Education, University of Pennsylvania, and the Center for the Study of Teaching and Policy, University of Washington.
[158] Preus, B. (2007). Educational trends in China and the United States: Proverbial pendulum or potential for balance? *Phi Delta Kappan, 89*(2), 115-118.
[159] Laukkanen, R. (2008). Finnish strategy for high-level education for all. In N. C. Soguel and P. Jaccard (Eds.). *Governance and Performance of Education Systems* (pp. 305-324). Dordrecht, Netherlands: Springer Verlad.
Buchberger, F., & Buchberger, I. (2003). Problem solving capacity of a teacher education system as a condition of success? An analysis of the "Finnish case," In F. Buchberger and S. Berghammer (Eds.): *Education Policy Analysis in a Comparative Perspective* (pp. 222-237). Linz: Trauner.
[160] OECD. (2010). *Strong performers and successful reformers in education.*
[161] Ingersoll, R. M. (Ed.). (2007).
OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

Teacher Compensation

Most of the high-achieving countries have policies that align teacher compensation to other professions that are traditionally deemed as attractive careers, such as engineering. Table 31 offers some comparisons using 2009 data.

Table 31

Teacher Salaries by Country[162]
2009

	Canada	Finland	Shanghai	Singapore	South Korea	United States
Average starting salary of primary education	N/A	32,692	N/A	N/A	30,522	36,502
Average starting salary of lower secondary		34,707			30,401	36,416
Average starting salary of upper secondary		35,743			36,907	36,907
Ratio of salary of primary education after 15 years' experience to GDP per capita	N/A	1.07	1.39	1.67	2.01	0.97
Ratio of salary of lower sec after 15 years' experience to GDP per capita		1.15	1.71	1.67	2.01	0.94
Ratio of salary of upper sec after 15 years' experience to GDP per capita		1.26	1.75	1.67	2.01	1.01
Starting Salary/ minimum training (Purchasing power parity)[163]	An average of 2,238 (net monthly)[164]	27.023	N/A	N/A	27,214	30,339
Salary after 15 years of experience/ minimum training (Purchasing power parity)[165]		31,785			46,640	43,999

Although teachers in Shanghai do not receive very high salaries, they often have substantial supplemental income. This additional income may come from school bonuses or assignments beyond normal instructional responsibilities, such as private tutoring. Bonuses may be generated from sponsoring fees collected from students who come from other residency areas, or those whose test scores are below the official cut-off score for admission.[166] Salaries for Finland's teachers appear low when compared with South Korea; however, salaries are relatively flat throughout Finland, and the social status of the teaching profession is high. In the United States, teachers earn an average starting

[162] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).
[163] National Center on Education and Economy. (2003). *Teachers' salaries.* Retrieved from http://www.ncee.org/programs-affiliates/center-on-international-education-benchmarking.
[164] Worldsalaries.org. (2007). *Teacher salaries – International Comparison.* Retrieved from http://www.worldsalaries.org/teacher.shtml.
[165] National Center on Education and Economy. (2003).
[166] OECD. (2010). *Strong performers and successful reformers in education.*

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 been falling farther and farther behind for 60 years.[167]

School systems differ in the amount of time, human, material, and financial resources dedicated to education and in how these resources are invested. PISA data show that higher teacher salaries, not smaller class sizes, are associated with better student performance. 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. The findings from PISA suggest that systems prioritizing higher salaries over smaller classes tend to perform better, which corresponds with research showing that raising teacher quality, rather than creating smaller classes, is a more effective route to improving student outcomes.[168]

To illustrate the power of teacher quality on a reform such as class size reduction, consider the relative impact of class reduction as compared to teacher performance improvement on student achievement. Various studies have found that reducing class size in primary grades from about 23 or 24 to 15 can yield an effect size in the range of .15 to .26,[169] meaning an increase of 7 to 8 percentile points in achievement over the course of a year.[170] When juxtaposed with improving teacher quality, the effect of class size reduction pales in comparison. For instance, in a large scale study of students in Texas, Rivkin, Hanushek, and Kain found that the effects of a costly ten student reduction in class size are smaller than the benefits of improving teacher quality by one standard deviation.[171] Table 32 illustrates the relative impact of class size reduction with the student achievement gains associated with improvement in teacher performance.

Table 32

Comparative Impact of Class Size Reduction and Teacher Quality On Student Achievement

Reform Description	Annual Student Achievement Gains
Class size reduction Reducing primary grade classes from larger sizes (22 to 26 students) to smaller sizes (13 to 17 students)[172]	+ 2-6 percentile points
Teacher quality improvement Improvement from 25th percentile to 75th percentile in teacher effectiveness[173]	+30 percentile points

[167] Tucker, M. S. (2011). *Standing on the shoulders of giants: An American agenda for education reform.* Washington, DC: National Center on Education and the Economy.
[168] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).
[169] U.S. Department of Education. (1998, April). *Research on the academic effects of small class size.* Retrieved April 25, 2009, from http://www.ed.gov/pubs/ClassSize/academic.html.
[170] Barber, M., & Mourshed, M. (2007).
[171] Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417-458.
[172] Nye, B., Konstantopoulos, S., & Hedges, L. V. (2004). How large are teacher effects? *Educational Evaluation and Policy Analysis, 26*(3), 237-257.
[173] Stronge, J. H., Ward, T. J., & Grant, L.W. (2011). What makes good teachers good? A cross-case analysis of the connection between teacher effectiveness and student achievement. *Journal of Teacher Education, 62*(4), 339-355.

Teacher Evaluation

All countries, 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. Table 33 summarizes key elements of teacher evaluation for the selected countries/regions.

Table 33

Schools' Methods for Monitoring Teachers' Practices
(Percentage of Students in Schools where the Principal Reported the Following Methods Were Used to Monitor Teachers' Instructional Practice)[174]

	Canada	Finland	Shanghai	Singapore	South Korea	United States
Tests or assessments of student achievement	N/A	18.2	82.6	98.7	76.7	80.8
Teacher peer review (of lesson plans assessment instruments, lessons)	N/A	19.1	89.0	76.8	88.2	55.9
Principal or senior staff observation of lessons	81.6	23.2	99.4	97.6	89.5	98.0
Observation of classes by inspectors or other persons external to the school	13.2	2.0	87.9	18.0	62.5	53.2

Finland and Canada have rejected merit pay due to the lack of an empirical research base supporting the value of such an approach. These two countries encourage extensive dialogues between principals and teachers about student progress.[175] On the other hand, teachers in Shanghai and Singapore receive extra pay and promotions for high student achievement. In Singapore, like every other profession, teachers' performance is appraised annually, by a number of people, against 16 different competencies, including 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.[176]

Professional Development

Over the last several decades, high quality staff development has evolved from a remedial support system primarily focused on individual improvement into a dynamic, reflective, and continuous

[174] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).
[175] Stewart, V. (2010). Raising teacher quality around the world. *Educational Leadership, 68*(4), 16-20.
[176] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

improvement process essential to meeting the critical demands of today's public schools. Virginia has recognized rich knowledge of content coupled with a wide variety of research-based teaching strategies and sound assessment techniques as the essential ingredients for contemporary teachers to meet the individualized learning needs of today's students.[177] Table 34 outlines the amount of professional development teachers in the comparison countries undergo.

Table 34

Amount of Professional Development by Country[178]

Nation	Amount of Professional Development
Canada	N/A
Finland	200 hours per year
Shanghai	240 hours of professional development within five years
Singapore	100 hours per year
South Korea	90 hours every three years
United States	Determined by each state

Extensive research has contributed to a rich understanding of how professional development practices impact teacher learning and foster change.[179] Researchers agree that professional development unrelated to teacher content and pedagogy often produces minimal results because follow-up is lacking and classroom implementation is rare.[180] Hendrickson and others outlined some contextual and structural aspects of ineffective professional development:[181]

1) Insensitivity to individual differences among participants;
2) Lack of specificity and intensity;
3) Insufficient hands-on practice and feedback;
4) Little or no follow-up; and
5) Conflicting agendas.

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[177] Virginia Department of Education. (2004). *High-quality professional development criteria*. Richmond, VA: Author.
[178] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).
[179] Cohen, D., & Hill, H. (2000). Instructional policy and classroom performance: The mathematics reform in California. *Teacher College Record, 102*(2), 294-343.
Desimone, L. M., Porter, A. C., Garet, M. S., Yoon, K. W., & Birman, B. F. (2002). Effects of professional development on teachers' instruction: results from a three-year longitudinal study. *Educational Evaluation and Policy Analysis, 24* (2), 81-112.
Garet, M., Porter, A., Desimone, L., Birman, B., & Yoon, K. (2001). What makes professional development effective? Results from a national sample of teachers. *American Educational Research Journal, 38*(3), 915-945.
Guskey, T. R. (1985). Staff development and the process of teacher changes. *Educational Researcher, 15*(5), 5-12.
Guskey, T. R. (2000). *Evaluating professional development.* Thousand Oaks, CA: Corwin Press.
Hawley, D., & Valli, L. (1999). The essentials of effective professional development: A new consensus. In L. Darling-Hammond & G. Sykes. (Eds.) *Teaching as the learning profession: Handbook of policy and practice*, pp.127-150. San Francisco: Jossey-Bass Publishers.
Richardson, V., & Placier, P. (2001). Teacher change. In V. Richardson (Ed.), *Handbook of research on teaching* (4th ed.). New York: Macmillan.
[180] Abdal-Haqq, I. (1996). *Making time for teacher professional development*. ERIC Document Reproduction Service No. ED 400 259. Retrieved from http://ericae.net/edo/ed400259.htm.
Hendrickson, J., O'Shea, D., Gable, R., Heitman, S., & Sealander, K. (1993). Putting a new face on an old strategy: In-service preparation for the year 2000. *Preventing School Failure, 37*(2), 31-35.
[181] Hendrickson, J., O'Shea, D., Gable, R., Heitman, S., & Sealander, K. (1993).

Barriers that effect the successful implementation of staff development initiatives may occur at the individual or systemic level, making transfer of learning exceedingly complex.[182]

Frequently, professional development in the United States is not tightly linked to the instructional agenda of the school.[183] However, China has developed a rather rigorous 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.[184] Classrooms are routinely open for observation. 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. The classroom observation is conducted for multiple purposes:

- Lesson observations by peers are usually related to a new subject content area or instructional strategy resulting from curriculum change or other initiatives;
- Observation by new induction stage teachers allows them to learn from more experienced teachers; and
- Observation by senior teachers provides mentoring, and an observation by the school principal is used for monitoring or constructive development.

Outsiders may see this structure as a means of quality assurance; however, it serves the major platform for professional development and pedagogical advancement. The steps are built into teachers' career ladders. Teachers in China are classified into four grades as an indication of their professional status. Promotion from one grade to the next often requires the capacity to give demonstration lessons, contribute to induction of new teachers, and publish in journals or magazines about education or teaching.[185]

Teachers in Singapore typically accrue 100 hours of professional development per year. The professional development is undertaken in many forms, including:

1) Courses at the National Institute of Education focusing on subject matter and pedagogical knowledge that lead towards higher degrees or advanced diplomas;
2) School-based professional development opportunities led by staff developers, which focus on identifying teaching-based problems in the school and introducing new practices; and
3) Teacher networks and professional learning communities which encourage peer-to-peer learning.[186]

It is worth noting that 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, and to engage in professional development.

According the Virginia Department of Education, adult participants involved in professional development activities need to actively participate in meaningful learning experiences.[187] The active engagement of adult learners in professional learning increases when they are in communities where they participate in collaborative learning activities.[188] Guskey posited that, "When viewed

[182] Thomas, E. (2008). Thoughtful planning fosters learning transfer. *Adult Learning,* 18(3), 4-8.
[183] Stewart, V. (2010).
[184] OECD. (2010). *Strong performers and successful reformers in education.*
[185] Ibid.
[186] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).
[187] Virginia Department of Education. (2004).
[188] National Staff Development Council. (2001). Standards for staff development-revised. Oxford, OH: Author.

systemically, professional development is not just in terms of individual improvement, but in terms of improvements in the capacity of the organization to solve problems and renew itself."[189] Additionally, research suggests that contemporary educators want to be actively engaged in self-directed, collaborative professional learning environments with colleagues.[190] Research indicates that when adults are actively engaged in self-directed learning based on a set of established goals and in a learning community with like professionals, they tend to become more self-directed and take responsibility for their own learning.[191] In doing so, teachers may become more satisfied, self-reliant, and goal-oriented.[192]Accordingly, adult learning theories propose that in order for professional development to be effective, teachers need to be actively engaged in planning, implementing, analyzing, and reflecting upon their own current practice in collaboration with other professionals.[193] These research findings support what the highest-performing educational systems are doing with their teacher professional development.

Teacher-student Relationships

Effective teachers use care and respect to build relationships with students that are conducive to academic learning. Caring can make an immediate impact on the lives of the students and their perceptions of self and others. In classroom learning, when students are supported by caring teachers, they are more likely to ask questions, take chances, and share their inner thoughts in creative writing and other forms of expression.[194] Effective teachers believe in their students and expect all to learn, regardless of their skill levels and starting points. Moreover, effective teachers believe that students can learn; therefore, the students do learn. This self-fulfilling prophecy, unfortunately, works both ways. For example, if a teacher believes that these students are low-performing, unreachable, and unable to learn, the students perform poorly, seem unreachable, and do not learn.[195] The PISA data reveal that learning is best accomplished when students have good relationships with their teachers and when teachers have high expectations for their students, especially when those students are from disadvantaged backgrounds.[196]

To determine the extent to which teacher-related behaviors influence student learning, the 2009 PISA study asked school principals to report the extent to which they perceived learning in their schools to be hindered by such factors as teachers' low expectations of students, poor student-teacher relations, absenteeism among teachers, staff resistance to change, teachers not meeting individual

[189] Guskey, T.R. (2000). p. 21.

[190] Cercone, K. (2008). Characteristics of adult learners with implications for online learning design. *AACE Journal, 16* (2), 137-159; Desimone, L. M., Porter, A. C., Garet, M. S., Yoon, K. W., & Birman, B. F. (2002); Guskey, T.R. (2000); Orlich, D.C. (1989). *Staff development: enhancing human potential*. Massachusetts: Allyn and Bacon.

[191] Ibid.

[192] Ibid.

[193] Desimone, L. M., Porter, A. C., Garet, M. S., Yoon, K. W., & Birman, B. F. (2002); Virginia Department of Education. (2004); Willis, S. (2002). Creating a knowledge base for teaching: conversation with James Stigler. *Educational Leadership,* 59(6), 6-11.

[194] Jennings, P., & Greenberg, M. (2009). The prosocial classroom: Teacher social and emotional competence in relation to student and classroom outcomes. *Review of Educational Research, 79*, 491-525.

[195] Jussim, L, & K. Harber. (2005). Teacher expectations and self-fulfilling prophecies: Knowns and unknowns, resolved and unresolved controversies. *Personality and Social Psychology Review, 9*(2), 131-155.
McKnown, C. & Weinstein, R.S. (2008). Teacher expectations, classroom context, and the achievement gap. *Journal of School Psychology*, *46*, 235-261.Miller-Cribbs, C. S., Davis, L., & Johnson, S. (2002). An exploratory analysis of factors that foster school engagement and completion among African-American students. *Children & Schools, 24*(3), 159-174.
Rubie-Davies, C. M. (2006). Teacher expectations and student self-perceptions: Exploring relationships. *Psychology in the School, 43*(5), 537-552.

[196] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

students' needs, teachers being too strict with students, and students not being encouraged to achieve their full potential. The majority of students across the countries attended schools whose principals agree that teacher-related factors in their schools hinder learning either "not at all" or only "very little." Table 35 outlines school principals' perceptions of how teacher behavior influences student learning.

Table 35

School Principals' View of How Teacher Behavior Affects Students' Learning [197]
(Percentage of students in schools whose principals reported that the following phenomena hindered learning "not at all" or "very little")

	Canada	Finland	Shanghai	Singapore	South Korea	United States
Teachers' low expectations of students	86	94	58	64	66	77
Poor student-teacher relations	89	88	59	83	90	90
Teachers not meeting individual students' needs	75	67	45	59	67	72
Teacher absenteeism	88	80	71	84	99	91
Staff resisting change	62	84	60	83	66	68
Teachers being too strict with students	94	97	73	90	84	96
Students not being encouraged to achieve their full potential	86	86	47	90	83	84

Research supports a student-teacher relationship characterized by fairness, warmth, genuineness, and nondirectiveness. These characteristics have been positively associated with student cognitive (e.g., academic achievement in math, science, social science, and verbal achievement), affective (e.g., positive motivation, self-esteem/mental health, social connections), and behavioral (e.g., student participation/initiation, outcomes, attendance/absences, disruptive behavior) outcomes.[198] Positive teacher-student relationships help establish an environment conducive to learning. PISA used surveys to ask students to express their perceptions on several statements regarding their relationships with their teacher. Table 36 sets forth the findings from the 2009 survey.

[197] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

[198] Baker, J. A., Grant, S., & Morlock, L. (2008). The teacher-student relationships as a developmental context for children with internalizing or externalizing behavior problems. *School Psychology Quarterly, 23*(1), 3-15.
Buyse, E., Verschueren, K., Verachtert, P., & Van Damme, J. (2009). Predicting school adjustment in early elementary school: Impact of teacher-child relationship quality and relational classroom climate. *The Elementary School Journal, 110*(2), 119-141.
Cornelius-White, J. (2007). Leaner-centered teacher-student relationships are effective: A meta-analysis. *Review of Educational Research, 77*(1), 113-143.

Table 36

Students' Views of Teacher-Student Relations[199]
(Percentage of students who agreed or strongly agreed with each statement)

	I get along with most of my teachers.	*Most of my teachers are interested in my well-being.*	*Most of my teachers really listen to what I have to say.*	*If I need extra help, I will receive it from my teachers.*	*Most of my teachers treat me fairly.*
Canada	89	80	74	89	88
Finland	87	49	63	84	80
Shanghai	89	81	79	90	85
Singapore	91	81	74	88	87
South Korea	79	60	57	83	75
United States	90	81	74	88	89

Learning Environment

A positive learning environment that is conducive to student success is defined by attributes such as caring, supportive, safe, challenging, and academically robust.[200] The most prevalent criteria used to define "learning environment" includes the physical arrangement of the classroom, discipline, rules and procedures, organization of learning activities, and the engagement of students with tasks.[201] Students need an engaging, stimulating, and enriching learning environment to grow and thrive. Effective teachers establish and communicate guidelines for expected behavior, monitor student behavior, keep students on tasks, and infuse humor, care, and respect into classroom interactions in order to develop a climate that contributes to student learning.[202]

Research indicates that a positive learning environment can shape student outcomes in cognitive, motivational, emotional, and behavioral domains.[203] Classroom management includes actions taken by

[199] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

[200] Hamre, B.K. & Pianta, R.C. (2005). Can instruction and emotional support in the first-grade classroom make a difference for children at risk of school failure? *Child Development, 76*(5), 949-967.
Hattie, J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to student achievement.* New York: Routledge.
Pressley, M., Rapael, L. Gallagher, J.D., & DiBella, J. (2004). Providence-St. Mel School: How a school that works for African Americans works. *Journal of Educational Psychology, 96*(2), 216-235.

[201] Cameron, C. E., Connor, C. M., Morrison, F. J., Jewkes, A. M. (2008). Effects of classroom organization on letter-word reading in first grade. *Journal of School Psychology, 46,* 173-192.
Zahorik, J., Halbach, A., Ehrle, K., & Molnar, A. (2003). Teaching practices for smaller classes. E*ducational Leadership, 61*(1), 75-77.

[202] Emmer, E. T., & Stough, L. M. (2001). Classroom management: A critical part of educational psychology, with implications for teacher education. *Educational Psychologist, 36*(2), 103-112.
Kunter, M., Baumert, J., & Koller, P. (2007). Effective classroom management and the development of subject-related interest. *Learning and Instruction, 17,* 494-509.

[203] Fraser, B. J., & Fisher, D. L. (1982). Predicting students' outcomes from their perceptions of classroom psycho-social environment. *American Educational Research Journal, 19,* 498-518.
Ludtke, O., Robitzsch, A., Trautwein, U., & Kunter, M. (2009). Assessing the impact of learning environments: How to use student ratings of classroom or school characteristics in multilevel modeling. *Contemporary Educational Psychology, 34,* 120-131.

teachers to establish order, engage students, and elicit student cooperation, with the ultimate purpose of establishing and maintaining an environment conducive to instruction and learning.[204] The 2009 PISA examined student responses regarding the disciplinary climate they experienced in the classroom. Table 37 reports the percentages of students who rarely observed the disruptive behaviors listed. Figure 5 reverses the data and indicates the percentage of students reporting *more than* "in some lessons" for the cited disruptions.

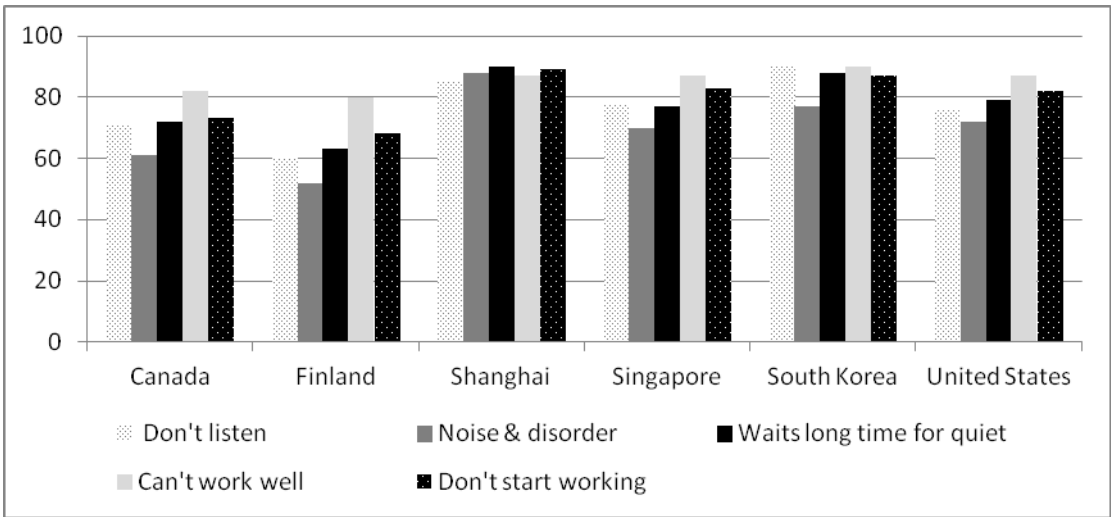
Table 37

Students' Views of How Conducive Classrooms Are to Learning[205]
(Percentage age of students reporting the five phenomena happen "never or hardly ever" or "in some lessons")

	Students don't listen to what the teacher says.	*There is noise and disorder.*	*The teacher has to wait a long time for the students to quiet down.*	*Students cannot work well.*	*Students don't start working for a long time after the lesson begins.*
Canada	71	61	72	82	73
Finland	60	52	63	80	68
Shanghai	85	88	90	87	89
Singapore	78	70	77	87	83
South Korea	90	77	88	90	87
United States	76	72	79	87	82

Figure 5

Students' Views of Classrooms Disruptions to Learning



[204] Emmer, E. T., & Stough, L. M. (2001).
[205] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

Students in South Korea and Shanghai reported better learning environments when compared to other countries. However, overall, the differences across countries are not highly remarkable. The majority of students experience orderly classrooms. Results from PISA suggest that schools and countries where students work in a climate characterized by expectations of high performance and a readiness to invest effort, good teacher-student relations, high teacher morale, and a disciplinary climate tend to achieve better results. In fact, approximately 13 percent of variation in student performance is associated with differences in school climate between schools.[206]

Based on a review of Western studies during the past 20 years, Beaman, Wheldall, and Kemp found "talk out of turn" to be the top student behavior causing classroom disruption.[207] In Western countries, about 55 to 65 percent of teachers reported they spend too much time dealing with problems of classroom order. In China, the majority of teachers (65.6 percent) do not think that classroom management is a great concern. Chinese teachers perceive the most frequent and most troublesome student behavior is "daydreaming."[208] Ding et al. posited that teaching for testing is the major reason for Chinese students' low mental engagement.[209]

Principal Leadership

PISA asked principals to report their level of involvement in several school issues. The survey[210] statements included:

A. I make sure that the professional development activities of teachers are in accordance with the teaching goals of the school;
B. I ensure that teachers work according to the school's educational goals;
C. I observe instruction in classrooms;
D. I use student performance results to develop the school's educational goals;
E. I give teachers suggestions as to how they can improve their teaching;
F. I monitor students' work;
G. When a teacher has problems in his/her classrooms, I take the initiatives to discuss matters;
H. I inform teachers about possibilities for updating their knowledge and skills;
I. I check to see whether classroom activities are in keeping with our educational goals;
J. I take exam results into account in decisions regarding curriculum development;
K. I ensure that there is clarity concerning the responsibility for coordinating the curriculum;
L. When a teacher brings up a classroom problem, we solve the problem together;
M. I pay attention to disruptive behavior in classrooms; and
N. I take over lessons from teachers who are unexpectedly absent.

Table 38 indicates the percentage of principals who reported the activities listed under "Principal Leadership" occurred "quite often" or "very often. For further comparison, Figures 6, 7, and 8 present the same information graphically. The reported activities are separated into graphs for easier comparisons.

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[206] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).
[207] Beaman, R., Wheldall, K., & Kemp, C. (2007). Recent research on troublesome classroom behavior: A review. *Australasian Journal of Special Education, 3*1, 45-60.
[208] Ding, M., Li, Y., Li, X., & Kulm, G. (2008). Chinese teachers' perceptions of students' classroom misbehavior. *Educational Psychology, 28*(3), 305-324.
Shen, J., Zhang, N., Zhang, C., Caldarella, P., Richardson, M. J., & Shatzer, R. H. (2009). Chinese elementary school teachers' perceptions of students' classroom behavior problems. *Educational Psychology, 29*(2), 187-201.
[209] Ding, M., Li, Y., Li, X., & Kulm, G. (2008).
[210] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

Table 38

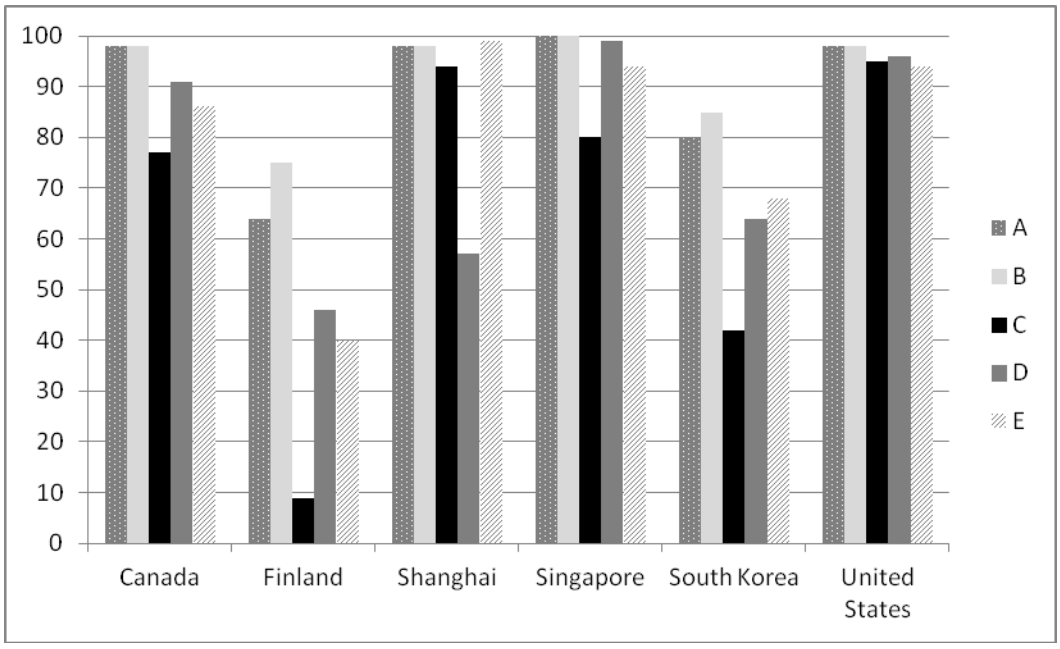
School Principals' Views of their Involvement in School Matters[211]
(Percentage of students in schools whose principals reported that the above-mentioned activities and behaviors occurred "quite often" or "very often" during the last year)

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Canada	98	98	77	91	86	60	95	95	86	63	87	99	98	19
Finland	64	75	9	46	40	61	77	95	59	13	77	98	94	39
Shanghai	98	98	94	57	99	69	91	93	96	70	98	99	89	14
Singapore	100	100	80	99	94	66	93	93	93	98	98	97	96	8
South Korea	80	85	42	64	68	56	75	69	60	46	63	79	68	7
United States	98	98	95	96	94	72	95	97	94	88	90	97	96	16

Note: Statements corresponding to each letter (A-N) are found on the previous page.

Figure 6

School Principals' Views of their Involvement in School Matters[162]
(Statements A-E)



[211] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

Figure 7

School Principals' Views of their Involvement in School Matters[162]
(Statements F-J)

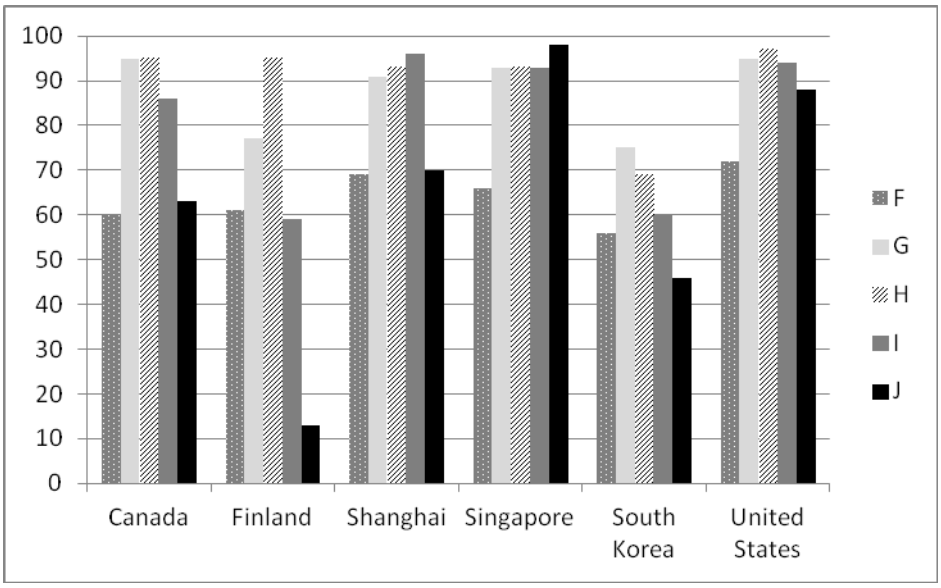
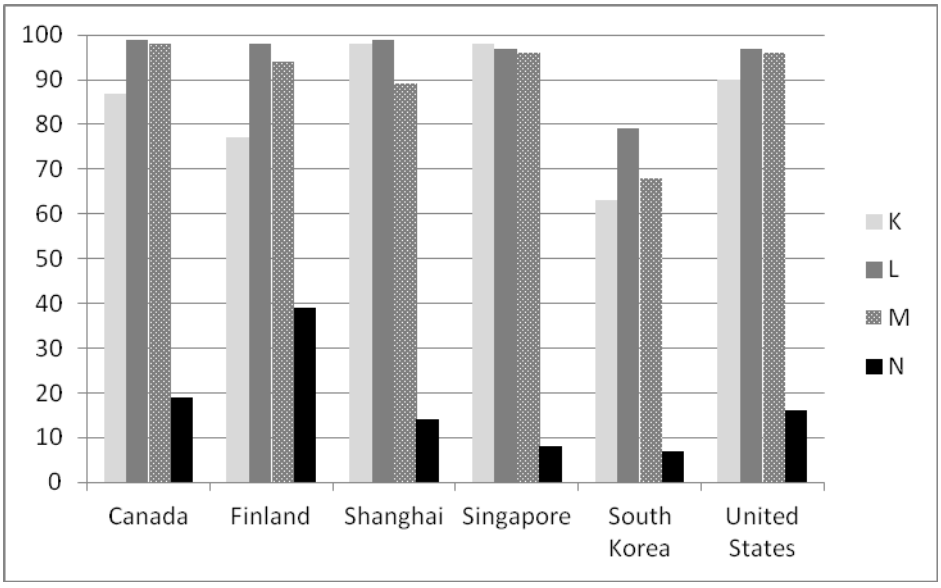


Figure 8

School Principals' Views of their Involvement in School Matters[162]
(Statements K-N)



Principals in the United States and Singapore assume more leadership roles across various domains, while principal leadership is relatively low in Finland and South Korea. For example, in Finland, very few students attend schools whose principals monitor teacher practices in the classroom or use examination results to make decisions about the curriculum. The principals in Finland are often

head teachers — they continue to teach while they manage and are still viewed as teachers, but with additional responsibilities. In China, the principals are appointed because of their superior teaching ability.[212]

School Autonomy

PISA data indicates that high-performing educational systems are often featured with high autonomy at the school level. Schools are held accountable for their results and given decision-making responsibilities.[213] Table 39 indicates responses from principals to questions about school autonomy.

Table 39

School Autonomy over Resource Allocation[214]
(Percentage of students in schools whose principals reported which agency has a considerable responsibility in making decision)

		Canada	Finland	Shanghai	Singapore	South Korea	United States
Selecting teachers for hiring	A	54	33	98	14	32	88
	B	39	43	2	38	6	12
	C	7	25	0	48	63	0
Dismissing teachers	A	17	18	99	14	23	75
	B	35	19	1	24	4	19
	C	48	63	0	62	74	6
Establishing teachers' starting salaries	A	3	8	36	4	8	17
	B	5	7	5	3	0	5
	C	92	84	59	93	92	78
Determining teachers' salary increases	A	4	5	43	7	6	18
	B	6	15	6	17	0	6
	C	91	80	51	75	94	75
Formulating the school budget	A	25	36	91	49	29	54
	B	30	41	2	22	12	29
	C	45	23	6	29	58	16
Deciding budget allocations within the school	A	76	92	98	91	86	83
	B	19	6	1	8	6	13
	C	5	1	1	1	8	4

Note: "A" represents only "principals and/or teachers" have considerable responsibility for the task; "B" means both "principal and/or teachers" and "regional and/or national education authority;" and "C" means only "regional and/or national education authority."

[212] Tucker, M. S. (2011). *Standing on the shoulders of giants: An American agenda for education reform.* Washington, DC: National Center on Education and the Economy.
[213] Fuchs, T., & Woessmann, L. (2007). What Accounts for International Differences in Student Performance? A Re-examination using PISA Data. *Empirical Economics, 32*(2-3), 433-464.
[214] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

Table 39 indicates that, with the exception of Shanghai, few schools in these countries have a major influence on establishing teachers' starting salaries and determining increases. More than three-quarters of students are in schools whose principals reported that only national and/or regional education authority have responsibility for these tasks. In comparison, school principals and/or teachers have more responsibility in selecting and hiring teachers, dismissing teachers, formulating the school budget, and deciding on budget allocations within the school.

Table 40 indicates responses from principals to questions about who has authority to make the instructional decisions listed.

Table 40

School Autonomy over Curriculum and Assessments[215]
(Percentage of students in schools whose principals reported which agency has a considerable responsibility in making decision)

		Canada	Finland	Shanghai	Singapore	South Korea	United States
Establishing student assessment policies	A	28	50	86	57	92	46
	B	62	43	9	41	6	40
	C	10	7	5	2	2	13
Choosing which textbooks are used	A	40	98	49	77	96	62
	B	49	2	17	24	4	28
	C	11	0	34	3	0	10
Determining course content	A	12	32	45	44	89	36
	B	51	52	22	38	8	46
	C	38	16	33	18	2	18
Deciding which courses are offered	A	44	55	52	66	79	58
	B	54	39	28	31	17	37
	C	3	6	20	4	4	4

Note: "A" represents only "principals and/or teachers" have considerable responsibility for the task; "B" means both "principal and/or teachers" and "regional and/or national education authority;" and "C" means only "regional and/or national education authority."

A majority of students in Shanghai and South Korea are in schools whose principals reported that only principals and/or teachers have a considerable responsibility for establishing student assessment policies. Meanwhile, principals and/or teachers in Finland, Singapore, and South Korea have more influence over textbook selection.

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. Tables 41 to 44 summarize principals' reports on assessment practices.

[215] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

Table 41

Assessment Practices[216]
(Percentage of students in schools where principals reported the following assessment practices are used)

		Canada	Finland	Shanghai	Singapore	South Korea	United States
Standardized tests	Never	12.0	1.5	7.8	0.9	2.1	2.5
	1 to 5 times a year	85.3	96.3	90.9	87.3	96.5	95.3
	At least once a month	2.8	2.1	1.3	11.9	1.4	2.1
Teacher-developed tests	Never	0.0	0.0	0.8	0.0	34.5	0.2
	1 to 5 times a year	8.2	51.4	19.7	27.3	58.3	3.8
	At least once a month	91.8	48.6	79.5	72.7	7.2	96.0
Teachers' judgmental ratings	Never	14.5	0.0	8.5	22.0	14.5	17.1
	1 to 5 times a year	30.4	17.7	76.5	54.1	64.7	21.0
	At least once a month	55.1	82.3	14.9	23.9	20.8	61.9
Student portfolios	Never	15.0	16.9	2.7	16.1	17.0	31.1
	1 to 5 times a year	64.8	79.6	82.1	81.2	69.8	56.4
	At least once a month	20.3	3.5	15.3	2.7	13.2	12.4
Student assignments/ projects/ homework	Never	0.7	0.0	1.3	0.0	2.6	0.0
	1 to 5 times a year	2.9	25.2	5.2	21.7	56.1	3.4
	At least once a month	96.4	74.8	93.5	78.3	41.3	96.6

[216] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

Table 42

Assessment Purposes[217]
(Percentage of students in schools where the principals reported assessments are used for the following purposes)

Purpose of Assessment:	**Canada**	**Finland**	**Shanghai**	**Singapore**	**South Korea**	**United States**
Inform parents about their child's progress	99.8	98.2	91.8	100.0	95.3	96.9
Make retention or promotion decisions	93.9	94.4	45.7	88.2	36.9	70.4
Group students for instructional purposes	76.5	16.3	42.8	95.1	78.1	69.1
Compare the school to district or national performance	73.4	49.7	60.2	93.4	75.2	95.3
Monitor students' progress across years	86.2	52.5	85.7	98.8	83.4	97.7
Make judgments about teachers' effectiveness	34.7	23.7	83.4	85.2	66.4	58.0
Identify aspects of instruction or curriculum that could be improved	86.7	56.3	96.7	97.4	88.3	98.1
Compare the school with other schools	57.0	27.2	63.7	81.7	62.3	90.3
Compare the school with other schools or national/ regional performance	76.4	53.4	69.4	95.1	77.8	96.8

[217] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

Table 43

Use of Achievement Data for Accountability Purposes[218]
(Percentage of students in school where the principals reported the following uses of achievement data)

	Canada	Finland	Shanghai	Singapore	South Korea	United States
Posted publicly	55.2	2.5	0.6	61.2	33.0	89.3
Used in evaluation of the principal's performance	17.1	5.2	44.8	72.8	27.6	62.5
Used in evaluation of teachers' performance	4.7	10.9	80.2	84.6	45.3	41.0
Used in decisions about instructional resource allocation to the school	58.5	5.2	34.3	84.8	39.2	72.0
Tracked over time by an administrative authority	89.0	43.4	68.3	98.0	75.8	95.5

Table 44

School Accountability to Parents[219]
(Percentage of students in schools where the principals reported that the school provides the following information to parents on student performance)

	Canada	Finland	Shanghai	Singapore	South Korea	United States
Relative to other students in the same school	65.3	12.6	69.8	87.6	71.1	53.0
Relative to national or regional benchmarks	51.0	29.3	39.5	68.0	82.2	85.0
As a group, relative to students in the same grade in other schools	23.6	17.8	28.1	31.4	38.7	57.9
Relative to national or regional benchmarks or as a group relative to students in same grade in other schools	53.5	38.9	46.5	72.4	83.6	87.8

It is important to note 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 them 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'

[218] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).
[219] Ibid.

learning on a regular basis as an integrated part of quality instruction. Furthermore, other countries use gateway assessments for accountability purposes to a lesser extent than the United States. For example, in Finland, the only external assessment is given on a sampling basis and is designed to provide information on the functioning of the school as a whole. Assessment is a classroom responsibility. Teachers monitor student progress by assessing them on an ongoing basis, using the assessment guidelines in the national core curriculum and textbooks. While the Finns do not assess for school accountability purposes, they do an enormous amount of diagnostic or formative assessment at the classroom level.[220] Another major focus in Finnish classrooms is promoting students' self-assessment skills.

The practice of assessing student learning is essential for effective instruction and learning. High quality assessments provide teachers with information regarding the extent to which students have attained the intended learning outcomes, and it informs teachers' instructional decision-making. The goals of assessments are to provide teachers with evidence of student learning, and to facilitate teachers in making informed decisions on revising instruction and advancing student learning.

Assessments can facilitate instruction and learning in many ways, including:[221]

- Providing diagnostic information regarding students' mental readiness for learning new content;
- Providing formative and summative information needed to monitor student progress and adjust instruction;
- Keeping students motivated;
- Holding students accountable for their own learning;
- Providing opportunities to re-expose students to content; and
- Helping students to retain and transfer what they have learned.

Assessments are more likely to have a positive influence on student learning when they are:[222]

- Aligned with the framework of learning targets and instruction;
- Sufficiently valid and reliability to produce an accurate representation of student learning;
- Accompanied by frequent informative feedback, rather than infrequent judgmental feedback;
- Structured to involve students deeply in classroom review and monitoring; and
- Documented through proper record keeping of learning results.

[220] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).
[221] Gronlund, N. E. (2006). *Assessment of student achievement* (8th ed.). Boston: Pearson.
[222] Black, P. J. & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice, 5*(1), 7–73.
Stiggins, R., & DuFour, R. (2009). Maximizing the power of formative assessments. *Phi Delta Kappan, 90*(9), 640-644.

Extant literature has documented both positive and negative impacts of standardized assessments widely adopted in the United States on teachers' instruction and assessment at the classroom level. The positive evidence indicates that standardized tests motivate teachers to:[223]

- Align their instruction to standards;
- Maximize instructional time;
- Work harder to cover more material in a given amount of instructional time; and
- Adopt a better curriculum or more effective pedagogical methods.

However, other research reveals that high-stakes assessments force teachers to:[224]

- Narrow the curriculum;
- Focus on memorization, drills, and worksheets;
- Allocate less time to higher-order skills; and
- Restrict their teaching to formulated approaches of instruction.

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, most high-achieving countries use open-ended, performance-based items that require students to analyze, apply knowledge, and write extensively. Furthermore, a growing emphasis on higher-order thinking in the curriculum and project-based, inquiry-oriented learning activities in classroom instruction have led to increasing prominence of school-based tasks. Such school-based tasks include research projects, science investigations, development of products, and reports or presentations. These influence the day-to-day work of teaching, learning, and assessment practices.[225]

EDUCATION OUTCOMES

Much of the comparison in this report has focused in inputs. This section shifts the discussion back to outcomes and looking at student achievement.

Scores on Standardized Assessments

China and Singapore show mean mathematics scores that are much higher than those of any other country or economy that participated in PISA 2009. As summarized in Table 45, Shanghai, China is furthest ahead with students more than half a proficiency level, on average, above those in any other

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[223] Borko, H., & Elliott, R. (1999). Hands-on pedagogy versus hands-off accountability. *Phi Delta Kappan, 80*(5), 394-400.
Shepard, L. A., & Dougherty, K. C. (1991). *Effects of high-stakes testing on instruction.* Paper presented at the annual meeting of the American Educational Research Association and National Council on Measurement in Education, Chicago.
Thayer, Y. (2000). Virginia's Standards make all students stars. *Phi Delta Kappan, 57*(7), 70-72.
Vogler, K. E. (2002). The impact of high-stakes, state-mandated student performance assessment on teachers' instructional practices. *Education, 123*(1), 39-56.

[224] Hamilton, L., & Stecher, B. (2004).Responding effectively to test-based accountability. *Phi Delta Kappan, 85*(8), 578-583.
Jones, B. D., & Egley, R. J. (2004).Voice from the frontlines: Teachers' perceptions of high-stakes testing. *Educational Policy Analysis Archives, 12*(39). Retrieved from http://epaa.asu.edu/epaa/va12n39.
Jones, G., Jones, B. D., Hardin, B., Chapman, L., Yardrough, T, & Davis, M. (1999). The impact of high-stakes testing on teachers and students in North Carolina. *Phi Delta Kappan, 81*(3), 199-203.
Stecher, B. M., & Mitchell, K. J. (1995). *Portfolio driven reform: Vermont teachers' understanding of mathematical problem solving. CSE Technical Report 400.* Los Angeles: National Center for Research on Evaluation, Standards, and Student Testing.

[225] Darling-Hammond, L., & McCloskey, L. (2008). Assessment for learning around the world: What would it mean to be "international competitive?" *Phi Delta Kappan, 90*(4), 263-272.

country or economy. Canada, Finland, and South Korea all perform at between one-half and one proficiency level above the OECD average in mathematics. For example, PISA shows that Canadian 15-year-olds, on average, are over one school year ahead of the 15-year-olds in the United States in mathematics and more than half a school year ahead in reading and science.[226]

Table 45

PISA 2009 Assessment
Performance of 15-Year-Olds, Mean Scores

	Reading	Math	Science
Canada	524	527	529
Finland	536	541	554
Shanghai	556	600	575
Singapore	526	562	542
South Korea	539	546	538
United States	500	487	502

Tables 46 and 47 reveal that the United States had a larger share of at-risk students and a smaller share of top-performing students than other countries.

Table 46

PISA Data
Share of At-risk Students
(not reaching PISA baselines Level 2) [227]

	Canada	Finland	Shanghai	Singapore	South Korea	United States
Reading	10%	8%	4%	12%	6%	18%
Mathematics	11%	8%	5%	10%	8%	21%
Science	10%	6%	3%	11%	6%	18%

Students who did not surpass the most basic performance level were not a random group; the PISA data indicated that socio-economic disadvantage has a particularly strong impact on student performance in the United States. In fact, 17 percent of the variation in student-learning outcomes in the United States was explained by students' socio-economic background. In other words, in the United States, two students from different socio-economic backgrounds vary much more in their academic achievement than in other countries.

[226] OECD. (2010). *PISA 2009 at a Glance.*
[227] OECD. (2010). *PISA 2009 results: What students know and can do—Student performance in reading, mathematics and science (Volume I).* Retrieved from http://dx.doi.org/10.1787/9789264091450-en.
Note: PISA assessment on reading, mathematics, and science would scale student outcomes on six levels. Level 6 and Level 5 are considered as high-performing, and Level 2 is the baseline level for proficiency.

Table 47

PISA Data
Share of Top-performing Students
(reaching PISA Level 6 and Level 5) [228]

	Canada	Finland	Shanghai	Singapore	South Korea	United States
Reading	13%	15%	19%	16%	13%	10%
Mathematics	18%	21%	50%	36%	26%	10%
Science	12%	19%	24%	20%	12%	9%

Table 47 indicates the United States is behind other leading countries in producing advanced-achieving students. The other industrialized countries in the comparison have proportionally more students reaching advanced achievement levels in reading, mathematics, and science than the United States. Researchers have noted that "the percentages of high-achieving students in the United States—and in most of its individual states—are below those of many of the world's leading industrialized countries."[229] Researchers also noted that recent educational initiatives within the United States focused on bridging the gap of low-performing students, but lacked a similar focus on enhancing the education of talented students.[230]

Table 48 compares countries on equity in the distribution of learning opportunities, spending on education and the economic context of the country. Once again, here is proof of a global achievement gap. The data show that socio-economically disadvantaged students in Canada and Finland are much less at risk for poor educational performance than their counterparts in the United States. The relationship between student socio-economic background and learning outcomes is stronger in the United States than in other high-performing countries. To illustrate, only 20 percent of American 15-year-olds enrolled in socio-economically disadvantaged schools reached the average performance standards of Finland in PISA.

Comparison also found these countries/regions have different levels of educational attainment. Table 49 shows the percentage of a population that has reached a certain level of education. Canada and the United States have higher levels of tertiary attainment than Shanghai, Singapore, and South Korea.

[228] OECD. (2010). *PISA 2009 results: What students know and can do*.
[229] Hanushek, E. A., Peterson, P. E., & Woessmann, L. (2010). Teaching math to the talented. Which countries and states are producing high-achieving students? *Education Next*, *11*(1). Retrieved from http://educationnext.org/teaching-math-to-the-talented.
[230] Konstantopoulos, S., Modi, M., & Hedges, L. V. (2001). Who are America's gifted? *American Journal of Education, 109*(3), 344-382.

Table 48

Equity in Learning Outcomes[231]

	Equity	Coherence	Efficiency	Income	Equality
	Percentage of the variance in student performance	Total variance between schools expressed as a percentage of the total variance within the country	Annual expenditure per student on educational core services (below tertiary)	GDP per capita	Gini index*
Canada	8.6	22	7,609	36,397	0.30
Finland	7.8	9	6,430	35,322	0.26
Shanghai	12.3	38	42,062	11,361	0.42
Singapore	15.3	35	23,699	51,462	0.42
South Korea	N/A	N/A	61,104	26,574	N/A
United States	16.8	36	9,932	46,434	0.36

*Gini index is a standard economic measure of income distribution. The Gini coefficient is rated on a scale ranging between 0 and 1. A score of 0 on the Gini scale means perfect equality in income distribution – everyone has the same income, while 1 corresponds with perfect inequality – one person has all the income while others have nothing. Higher the number above 0 denotes higher inequality.

Table 49

Educational Achievement of Population 25-64-Year-Olds[232] 2009

	Canada	Finland	Shanghai[233]	Singapore	South Korea	United States
Below upper secondary	22	32	65	67	38	14
Upper secondary and post-secondary non-tertiary	40	39	24	15	42	52
Tertiary education	37	29	11	18	20	34

Research has established that students' socio-economic background is an influential predictor of their academic achievement.[234] Student who have a low socio-economic status (SES) tend to have

[231] OECD. (2010). *Strong Performers and Successful Reformers in Education.*
[232] OECD. (2010). *Education at a glance, 2009.*
[233] Shanghai Department of Statistics. (2011). *The Sixth Census of Shanghai: An overview.* Retrieved from http://www.stats-sh.gov.cn.
[234] Jeynes, W. H. (2002). Examining the effects of parental absence on the academic achievement of adolescents: The challenge of controlling for family income. *Journal of Family and Economic Issues, 23*(2), 189-210. Majoribanks, K. (1996). Family learning environments and students' outcomes: A review. *Journal of Comparative Family Studies, 27*(2), 373-394.

lower test scores and to drop out of school.[235] The PISA data also found students who are low-performing are more likely for low SES backgrounds; however, a large number of disadvantaged students excel in PISA.[236] Table 50 summarizes the percentage of resilient students and disadvantaged low-achievers across the countries/regions. Resilient students are those who come from the bottom quarter of the distribution of SES background in their country and score in the top quarter among students from all countries with similar SES background. Disadvantaged low-achievers are those who come from the bottom quarter of SES distribution and perform in the bottom quarter. Table 50 indicated that disadvantaged students have a bigger opportunity to overcome their SES barriers in Shanghai and Korea than they do in Canada and United States.

Table 50

Percentage of Resilient Students and Disadvantaged Low Achievers Among All Students[237]

	Canada	**Finland**	**Singapore**	**Shanghai**	**South Korea**	**United States**
Resilient students	9.8	11.4	N/A	18.9	14.0	7.2
Disadvantaged low achievers	2.9	2.2	N/A	0.3	1.3	4.6

Time spent reading for enjoyment (summarized in Table 51) is strongly related to reading performance. Better readers tend to read more because they are more motivated to read, which, in turn, leads to improved vocabulary and comprehension skills. In 16 OECD countries, at least 20 percent of the variation in reading performance is explained by enjoyment of reading. In OECD countries, there is an average difference of 103 points between the average scores of the top and bottom quarters of students ranked by reading enjoyment.

International comparisons of United States students' performance in science and mathematics place the United States in the middle of the pack or lower. The World Economic Forum ranks the United States educational system 26th in the world, well behind those of countries like Germany, Finland, the Netherlands, Denmark, Canada and Singapore.[238] In TIMSS, United States fourth graders and eighth graders scored about average among industrialized and rapidly industrializing countries.[239] However, as their grade level increases, United States students in fourth, eighth, and twelfth grades drop progressively lower on international comparisons of science and mathematics ability. On the National Assessment of Educational Progress (NAEP), less than one-third of United States eighth graders show proficiency in mathematics and science, and science test scores have improved very little over the past few decades.

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[235] Eamon, M. K. (2005). Social-demographic, school, neighborhood, and parenting influences on academic achievement of Latino young adolescents. *Journal of Youth and Adolescence, 34*(2), 163-175; Hochschild, J. L. (2003). Social class in public schools. *Journal of Social Issues, 59*(4), 821-840.

[236] OECD. (2010). *PISA 2009 results: Overcoming social background.* (Volume II). Paris: Author.

[237] Ibid.

[238] Zakaria, F. (2011, November 6).

[239] Gonzales, P., Williams, T., Jocelyn, L., Roey, S., Kastberg, D., & Brenwald, S. (2009). *Highlights from TIMSS 2007: Mathematics and science achievement of U.S. fourth- and eighth-graders in an international context.* Washington, DC: U.S. Department of Education.

Table 51

Percentage of Students who Spent Time on Reading for Enjoyment[240]

	I do not read for enjoyment.	I read for enjoyment				
		30 minutes or less a day	More than 30 minutes to less than 60 minutes a day	1 to 2 hours a day	More than 2 hours a day	Total
United States	42.0	29.3	15.1	8.7	4.9	58.0
Singapore	N/A	N/A	N/A	N/A	N/A	N/A
Canada	31.1	30.5	19.0	13.3	6.0	68.8
South Korea	38.5	29.8	19.1	8.4	4.2	61.5
Finland	33.0	32.4	18.6	12.7	3.2	68.8
Shanghai	8.0	35.9	36.5	13.2	6.4	92.0

In the 2009 PISA study, 15-year-olds in the United States performed about average in reading and science, and below average in math. Of the 34 countries that took the test, the United States ranked 14th in reading, 17th in science, and 25th in math. The United States' standing dropped progressively in the last decade and is continuously losing ground in international comparison.[241] The TIMSS showed better results: eight of 35 countries scored better than the United States on the fourth-grade level tests, and only five of 47 countries scored better on the eighth grade level test in the area of mathematics.

The differences in the content and format of the tests can help account for the differences in results. The tests differ in their overarching purposes, the content assessed, and the format used.[242] For instance, in mathematics, the TIMSS seeks more to assess "curricular attainment," or how much the student knows. To that end, it is organized by topics in mathematics such as number, measurement, geometry, data, and algebra. The purpose of the PISA, on the other hand, is to measure students' ability to apply what they have learned in science and technology, and it has been designed to assess the kinds of skills needed in today's workplace. Therefore, PISA is arranged not by content areas but by large themes like "space and shape." The format of each belies its purpose: about two-thirds of the TIMSS is in multiple choice format, and one-third is constructed-response. The PISA, conversely, is about two-thirds constructed response and one-third multiple choice format, which is well-suited for emphasizing problem-solving and application.

[240] OECD. (2010). *PISA 2009 at a glance.*
[241] National Science Board. (2010). *Science and engineering indicators: 2010.* Arlington, VA: National Science Foundation.
[242] National Center for Educational Statistics. (2006). Comparing mathematics content in the National Assessment of Educational Progress (NAEP), Trends in International Mathematics and Science Study (TIMSS), and Program for International Student Assessment (PISA) 2003 assessments. Retrieved from http://nces.ed.gov/pubs2006/2006029.pdf.

Wagner has summarized a few some concerning facts:[243]

- The high school graduation rate in the United States — which is about 70 percent of the age cohort — is now well behind that of countries such as Denmark (96 percent), Japan (93 percent), Poland (92 percent), and Italy (79 percent).
- Only about one-third of United States high school students graduate ready for college today, and the rates are much lower for poor and minority students. Of all students who enter college, 40 percent must take remedial courses. While no hard data are readily available, it is estimated that one out of every two students who starts college never completes any kind of postsecondary degree.
- Sixty-five percent of college professors report that what is taught in high school does not prepare students for college. One major reason is that the tests high school students must take for state-accountability purposes usually measure 9th or 10th grade-level knowledge and skills. Primarily multiple-choice assessments are not designed to allow students to explain their reasoning or to apply knowledge to new situations (critical skills for success in college), so neither teachers nor students receive useful feedback about college-readiness.
- In order to earn a decent wage in today's economy, most students will need at least some postsecondary education. Indeed, an estimated 85 percent of current jobs and almost 90 percent of the fastest-growing and best-paying jobs now require postsecondary education. Even today's manufacturing jobs now largely require postsecondary training and skills.
- The United States now ranks tenth among industrial countries in the rate of college completion by 25- to 44-year-olds.
- Students are graduating from both high school and college unprepared for the world of work. Less than 25 percent of the more than 400 employers recently surveyed for a major study of work-readiness reported that new employees with four-year college degrees have "excellent" basic knowledge and applied skills. Among those who employ young people right out of high school, nearly 50 percent said that their overall preparation was "deficient."

Education is and always has been the fastest way to climb the socio-economic ladder. The unemployment rate for college graduates is just four percent, but for high school dropouts it is 14 percent; the United States has a 25 percent dropout rate.[244] There is a high correlation between the number of teenagers who are not in school or not working and lowered mobility. In Virginia, the percentage of teenagers between ages 16-19 who neither attended school nor worked was four percent compared to nine percent nationally.[245]

Underperformance of Students in Virginia

Under the *No Child Left Behind Act of 2001*,[246] states have considerable control in setting their own passing scores on state assessments such as Virginia's Standards of Learning (SOLs). That makes it challenging to compare Virginia's students to those in other states. However, there is growing agreement that the National Assessment of Educational Progress (NAEP) provides a common yardstick. It is the largest nationally representative and continuing assessment available, and its

[243] Wagner, T. (2008). *The global achievement gap: Why even out best schools don't teach the new survival skills out children need.*
[244] Zakaria, F. (2011, November 6).
[245] Federal Interagency Forum on Child and Family Statistics. (2011). *America's children: Key national indicators of well-being, 2011*. Washington, DC: U.S. Government Printing Office.
The Annie E. Casey Foundation. (2011). *State profiles of child well-being: 2011 Kids count data book.* Baltimore, MD: Author.
[246] U.S. Department of Education. (2001).

"proficient" level is as close to a national performance standard as has the United States.

When Virginia's students are measured against that standard, their performance is limited. While 89 percent of Virginia's fourth-graders passed the state reading test, just 38 percent met the NAEP proficient level. Similarly, only 43 percent of Virginia's students were at the NAEP proficient level in fourth-grade math, compared with 88 percent who passed the SOL test. 90 percent of eighth-graders passed the SOL reading test, while only 32 percent were at the NAEP proficient level; in math, 87 percent of eighth-graders passed the SOL, but only 36 percent were at the NAEP proficient level. Similarly, TIMSS found that just 44 percent Virginia's students could meet their standards.[247] Tables 52 and 53 outline these findings.

Table 52

Virginia Reading Achievement[248]

	4th Graders			8th Graders		
	% Proficient on State Test: 2009-10	% Basic on NAEP: 2008-09	% Proficient on NAEP: 2008-09	% Proficient on State Test: 2009-10	% Basic on NAEP: 2008-09	% Proficient on NAEP: 2008-09
All	88.1	74	38	89.7	78	32
White	91.7	82	47	92.9	85	40
Black	79.7	56	18	82.6	61	14
Hispanic	84.7	60	26	84.9	70	22
Low Income	80.3	56	18	81.5	63	15

Table 53

Virginia Math Achievement[249]

	4th Graders			8th Graders		
	% Proficient on State Test: 2009-10	% Basic on NAEP: 2008-09	% Proficient on NAEP: 2008-09	% Proficient on State Test: 2009-10	% Basic on NAEP: 2008-09	% Proficient on NAEP: 2008-09
All	88.1	85	43	86.9	76	36
White	92.0	93	54	90.8	84	44
Black	80.5	69	16	79.1	59	14
Hispanic	80.9	80	28	80.9	65	23
Low Income	80.8	74	23	78.4	60	15

[247] Anumdson, K. (2010). *National education standards: The right answer for Virginia.* Retrieved from http://www.educationsector.org/publications/national-education-standards-right-answer-virginia.
[248] ED Data Express. (n.d.). *Virginia State Snapshot.* Retrieved from http://www.eddataexpress.ed.gov/state-report.cfm/state/va.
[249] Ibid.

IX. First Year Findings

As the world becomes smaller through globalization and modernization, policymakers are seeking a broad and balanced perspective on the goals and purposes of education. There are lessons to be learned from top-performing countries on international assessments, such as:

- Recognizing the importance of nurturing students' knowledge base and their ability to conduct higher-level thinking;
- Recruiting the most talented young people to the profession of teaching;
- Preparing teachers in both subject matter and pedagogy;
- Establishing policies that provide both accountability and autonomy; and
- Fostering collaborative structures for professional development.

This section will elaborate on the education structure, policy, and practices of the top-performing countries from which Virginia may learn.

EDUCATIONAL REFORM: RIGHT DRIVERS AND COHERENT POLICIES

As part of the strategy to dramatically reduce the dropout rate, improve high school graduation rates, and increase the number of students who graduate prepared for success in college and the workplace, the United States is attempting to turn around the 5,000 lowest-performing schools over the next five years. During the 2010-2011 school year, 135 Virginia schools were in need of improvement. During a recent Virginia conference, it was noted that many educational reforms undertaken in the United States have been based on the wrong driver—a deliberate policy force that has little chance of achieving the desired results.[250]

Understanding school improvement means discovering how to implement high-leverage strategies for effective schools.[251] Leverage is about the relationship between educational inputs and outputs; it may be defined as the quality and quantity of student-learning outcomes as a function of the school's invested energy. High leverage is the desired relationship between inputs and outputs that leads to greater impact on school effectiveness and improvement, with relatively low levels of teacher effort. However, many teachers interpret recent educational reform initiatives as requiring more input of effort. Further, many teachers in the United States do not experience a culture of collaborative professional learning by which they might work more efficiently. School improvement in a climate of external accountability may actually compromise results. Data from process-product research indicate that there are no silver-bullet practices to ensure school success.[252] In fact, many high-leverage

[250] Fullan, M. (2011). *Choosing the wrong drivers.* Presentation at Virginia Association of Supervision and Curriculum Development. Williamsburg, VA, November 30-December 2.

[251] Hargreaves, D. H. (2001). A capital theory of school effectiveness and improvement. *British Educational Research Journal, 27*(4), 487-503.

[252] Process-product analysis is an approach to research on teaching which gained popularity initially in the 1970s (Good & Brophy, 1973; 2008). Research using this approach usually examines cause-and-effect relationships between process and product variables. Process variables refer to properties of education input which leads students and teachers to interact around academic content. Examples of process variables include student time-on-task, instructional strategies, and teacher characteristics. Product variables refer to possible outcomes of teaching, such as student learning (Rowan, Correnti, & Miller, 2002).

Rowan, B., Correnti, R., & Miller, R. J. (2002). What large-scale, survey research tells U.S. about teacher effects on student achievement: Insights from the *Prospects* study of elementary schools. *Teachers College Record*, *104*(8), 1525-1567.

Good, T. L., & Brophy, J. E. (1973). *Looking in classrooms* (1st ed.). New York: Harper & Row.

Good, T. L., & Brophy, J. E. (2008). *Looking in classrooms* (10th ed.). Boston: Allyn & Bacon.

processes are developed by teachers through their practice, rather than derived from research evidence. They are often collective innovations within school-based research and development.[253]

As evidenced by the highest-performing educational systems, two forms of capital are essential for school effectiveness: human capital and social capital. Human capital is the sum of knowledge and experience among school stakeholders that can be deployed to achieve school goals. (*Human capital* includes teacher experience, subject knowledge, and pedagogical skills.) Research indicates that, although enhancing human capital does matter, it should not be the sole focus of school reform. For measureable and sustainable improvement, schools must instead foster social capital and the patterns of interactions among teachers.[254]A school's *social capital* refers to the level of trust, and norms of reciprocity and collaboration, as well as to the networks in which the people are embedded by strong ties.[255] One highlight from Canada's success is its systemic educational reform.[256] The reform designers in Canada develop and implement systemic responses to problems and challenges, building shared understanding and a sense of common purpose among key stakeholder groups.

One emergent theme from this international study is the significance of coherent educational policies and implementation. Singapore's remarkable strength is that no policy is announced without a plan for building the capacity to meet it. To align curriculum, instruction, and assessment with the standards, Singapore does more than establish high standards and leave individual teachers to figure out how to achieve them. Serious attention to coherence and alignment has produced strong programs in mathematics, science, technical education, and languages, and has ensured teachers are well-trained to teach them. Many countries experience policy-to-implementation gaps in reform initiatives. Multitudes of new and sometimes conflicting policies are mandated without building the capacity to fulfill them. In Singapore, whenever a policy is developed or changed, significant attention is given to implementation details by the Ministry of Education, the National Institute of Education, and cluster superintendents, principals, and teachers. The concept of capacity-building is emphasized by academics and practitioners.[257] People at various levels, such as teachers, principals, support staff, and students, must be given opportunities to learn new behaviors, as well as to learn and apply new and more effective practices.[258] When reform policy and capacity-building are out of sync, practitioners can become resistant to change and wait passively for reform waves to pass.

TEACHER QUALITY

Teachers are the most powerful school-related factor and must be considered when looking at student-learning outcomes and school performance. The 2007 McKinsey report on leading PISA countries emphasized that one key factor in school and student success was teacher quality.[259] As noted in *How the World's Best-Performing School Systems Come Out on Top,* an international study comparing data from OECD's PISA, "the quality of an education system cannot exceed the quality of its teachers."[260] In order to improve the quality of schools and positively affect the lives of students,

[253] Hargreaves, D. H. (2001).
[254] Leana, C. (2011). *The missing link in school reform.* Palo Alto, CA: Stanford Social Innovation Review.
[255] Hargreaves, D. H. (2001).
[256] OECD. (2010). *Strong performers and successful reformers in education.*
[257] Elmore, R. (2004). *School reform from the inside out: Policy, practice, and performance.* Cambridge, MA: Harvard Education Press.; Fullan, M. (2008). *The six secrets of change.* San Francisco, CA: Jossey-Bass.
[258] Levin, B. (2008). *How to change 5000 schools: A practical and positive approach for leading change at every level.* Cambridge, MA: Harvard Education Press.
[259] Barber, M., & Mourshed, M. (2007).
[260] Barber, M., & Mourshed, M. (2007). p. iii.

the quality of teaching must be addressed. This is the best hope to systematically and dramatically improve education. Curriculum can be reformed but ultimately it is teachers who implement it. Professional development on new instructional strategies can be provided but ultimately, it is teachers who must incorporate them into their instruction. There can be an increasing focus on data analysis of student performance but ultimately, it is teachers who produce the results.[261]

The highest-achieving countries around the world have committed significant resources to teacher training and support over the last decade. They raised standards and created stronger pathways for teacher education, provided teachers more content and pedagogical knowledge, paid them well in relation to competing occupations, and provided them with meaningful time for professional learning.[262] However, the National Council on Teacher Quality (NCTQ) review of Virginia's education policies on teacher quality generated disconcerting results.[263] The NCTQ has tracked states' teacher policies, related to teacher preparation, licensure, evaluation, career advancement, tenure, and compensation for five years. It evaluates the states' laws and regulations against a set of 36 policy goals and gives rating scores based the states' progress toward these goals. The most recent 2011 report found Virginia ranking 41st on its progress rating. Virginia received C- on *Delivering Well Prepared Teachers*; C on *Expanding the Teaching Pool*; F on *Identifying Effective Teachers*; C on *Retaining Effective Teachers*; D+ on *Exiting Ineffective Teachers,* with an overall grade of D+.

Teacher Effectiveness and Student Achievement

The following list illustrates how teacher quality has a significant impact on student academic achievement:

- Teacher effectiveness is the dominant factor influencing student academic growth.[264]
- The influence of teacher quality is not correlated to initial student test scores. That means highly effective teachers were generally effective with all student achievement levels.[265] An effective teacher performs well among both low- and high-ability students.[266]
- Ineffective teachers were found to be ineffective with all students, regardless of their prior achievement level. Average teachers facilitated achievement gains with lower-achieving students, but not higher student achievers.[267]

Such serious findings are derived from analyses of teachers' measurable impact on student achievement using value-added methodologies. For the last several years, numerous researchers across the world have explored the "value-added effects" of particular schools or teachers using sophisticated statistical models involving longitudinal student achievement data. Value-added methods remove the

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[261] Stronge, J. H. (2011). *Teacher effectiveness = Student achievement: What research says*. Larchmont, NY: Eye on Education.

[262] Darling-Hammond, L. (2010). Teacher education and the American future. *Journal of Teacher Education, 61*(1-2), 35-47.

[263] National Council on Teacher Quality. (2011). *2011 state teacher policy yearbook.* Retrieved from http://www.nctq.org/stpy11Home.do.

[264] Sanders, W. L, & Rivers, J. C. (1996, November). *Cumulative and residual effects of teachers on future student academic achievement.* Knoxville, TN: University of Tennessee Value-Added Research and Assessment Center. Wright, S. P., Horn, S. P., & Sanders, W. L. (1997). Teacher and classroom context effects on student achievement: Implications for teacher evaluation. *Journal of Personnel Evaluation in Education, 11*, 57-67.

[265] Sanders, W. L, & Rivers, J. C. (1996, November). *Cumulative and residual effects of teachers on future student academic achievement.* Knoxville, TN: University of Tennessee Value-Added Research and Assessment Center.

[266] Aaronson, D., Barrow, L., & Sander, W. (2007). Teachers and student achievement in the Chicago public high schools. *Journal of Labor Economics, 25*(1), 95-135.

[267] Sanders, W. L, & Rivers, J. C. (1996, November).

effects of factors not under the control of the school, such as prior student achievement and socio-economic status, which provide more accurate estimates of school or teacher effectiveness. While the statistical modeling approach has taken a number of forms and generated differential statistical power of teacher effects, a final conclusion across studies is that teachers matter, and teacher quality is the most significant school factor affecting student learning. [268] This effect is not just of statistical significance; more importantly, it is of practical significance.[269] Table 54 lists in chronological order samples of studies exploring the outcomes of teacher effectiveness on student achievement.

Table 54

Summary Findings from Selected Studies of Teacher Effects on Student Achievement

Study	Key Findings
Sanders & Rivers [270]	• Teacher effect on student achievement is cumulative. Second graders who had similar achievement at the start of the year varied 52 to 54 percentile points as a result of two extreme teacher sequences after only three years (low-low-low sequence versus high-high-high sequence). • Teacher effects on student achievement are cumulative and residual. Subsequent assignment of effective teachers cannot offset the effects of prior ineffectiveness. • Residual effects of effective and ineffective teachers are measurable two years later, regardless of subsequent teachers' effectiveness.
Hanushek, Kain, & Rivkin [271]	• Lower bound estimates suggest variations in teacher quality account for at least 7.5% of the total variation in measured achievement gains; there are reasons to believe the true percentage is considerably larger.
Mendro, Jordan, Gomez, Anderson, & Bembry [272]	• Teachers have large effects on student achievement, and measures of effectiveness are stable over time. • 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 assigned effective teachers for all years.

[268] Palardy, G. J., & Rumberger, R. W. (2008). Teacher effectiveness in first grade: The importance of background qualifications, attitudes, and instructional practices for student learning. *Educational Evaluation and Policy Analysis, 30*(2), 111-140.
Rowan, B., Chiang, F. S. & Miller, R. J. (1997). Using research on employees' performance to study the effects of teachers on student achievement. *Sociology of Education, 70*, 256-284.

[269] In educational research, statistical significance is used to determine if certain observed differences exist beyond a chance occurrence. However, statistical significance does not determine the magnitude of differences or the likelihood of obtaining similar results in the future. On the other hand, practical significance indicates results are of a magnitude that would make a real-world difference and be valuable to teachers, school administrators, policymakers, and others who are involved in day-to-day educational practice (Gall, 2001).

[270] Sanders, W. L, & Rivers, J. C. (1996, November).

[271] Hanushek, E. A., Kain, J. F., & Rivkin, S. G. (1998). *Teachers, schools, and academic achievement.* Cambridge, MA: National Bureau of Economic Research. Retrieved from http://www.nber.org/papers/w6691.

[272] Mendro, R. L., Jordan, H. R., Gomez, E., Anderson, M. C., & Bembry, K. L. (1998a, April). *Longitudinal teacher effects on student achievement and their relation to school and project evaluation.* Paper presented at the 1998 Annual Meeting of the American Educational Research Association, San Diego, CA.

Nye, Konstantopoulos, & Hedges[273]	• If primary grade teacher effects are normally distributed, the difference in achievement gains between having a 25th percentile teacher (less effective teacher) and a 75th percentile teacher (more effective teacher) is over one third of a standard deviation in reading and almost half a standard deviation in mathematics. • The difference in achievement gains between having a 50th percentile teacher (an average teacher) and a 90th percentile teacher (a very effective teacher) is about one third of a standard deviation in reading and somewhat smaller than half a standard deviation in mathematics.
Rivkin, Hanushek, & Kain [274]	• Differences between teachers explained about 15% of the measured variance in student test scores. • One standard deviation increase in teacher quality for a grade raised student achievement in reading and mathematics by about one-tenth of standard deviation.
Aaronson, Barrow, & Sander [275]	• A standard deviation increase in teacher effectiveness over a full year raised student math test scores by 0.15 standard deviations. • Controlling for sampling error, a one standard deviation, one semester improvement in math teacher quality raised student math scores by 0.15 standard deviations. Thus, over two semesters, a one standard deviation improvement in math teacher quality translated into an increase in math achievement equal to 22% of the average annual gain. • Estimates of teacher effects are relatively stable over time, reasonably impervious to a variety of conditioning variables, and do not appear to be driven by classroom sorting (i.e., student/teacher assignment) or selective use of test scores.
Stronge, Ward, Tucker, & Hindman[276]	• Most students' actual achievement scores were within a close range of their predicted scores. However, teacher effectiveness scores ranged from more than a standard deviation above predicted performance to more than a standard deviation below, indicating a wide dispersion of teacher effectiveness. • Teachers who were highly effective in producing higher-than-expected student achievement gains (top quartile) in one end-of-course content test (reading, math, science, social studies) tended to produce top quartile residual gain scores in all four content areas. Teachers who were ineffective (bottom quartile) in one content area tended to be ineffective in all four content areas.
Leigh[277]	• Moving from a teacher at the 25th percentile to a teacher at the 75th percentile raises test scores by one-seventh of a standard deviation. Since a 0.5 standard deviation increase in test scores is equivalent to a full year's learning, this implies that a 75th percentile teacher can achieve in three-quarters of a year what a 25th percentile teacher can achieve in a full year. • Moving from a teacher at the 10th percentile to a teacher at the 90th percentile would have even more dramatic effects, raising test scores by one quarter of a

Mendro, R. L., Jordan, H. R., Gomez, E., Anderson, M. C., & Bembry, K. L. (1998b, April). *An application of multiple linear regression in determining longitudinal teacher effectiveness.* Paper presented at 1998 Annual Meeting of the American Educational Research Association, San Diego, CA.

[273] Nye, B., Konstantopoulos, S., & Hedges, L. V. (2004).

[274] Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417-458.

[275] Aaronson, D., Barrow, L., & Sander, W. (2007).

[276] Stronge, J. H., Ward, T. J., Tucker, P. D., & Hindman, J. L. (2008). What is the relationship between teacher quality and student achievement? An exploratory study. *Journal of Personnel Evaluation in Education, 20*(3-4), 165-184.

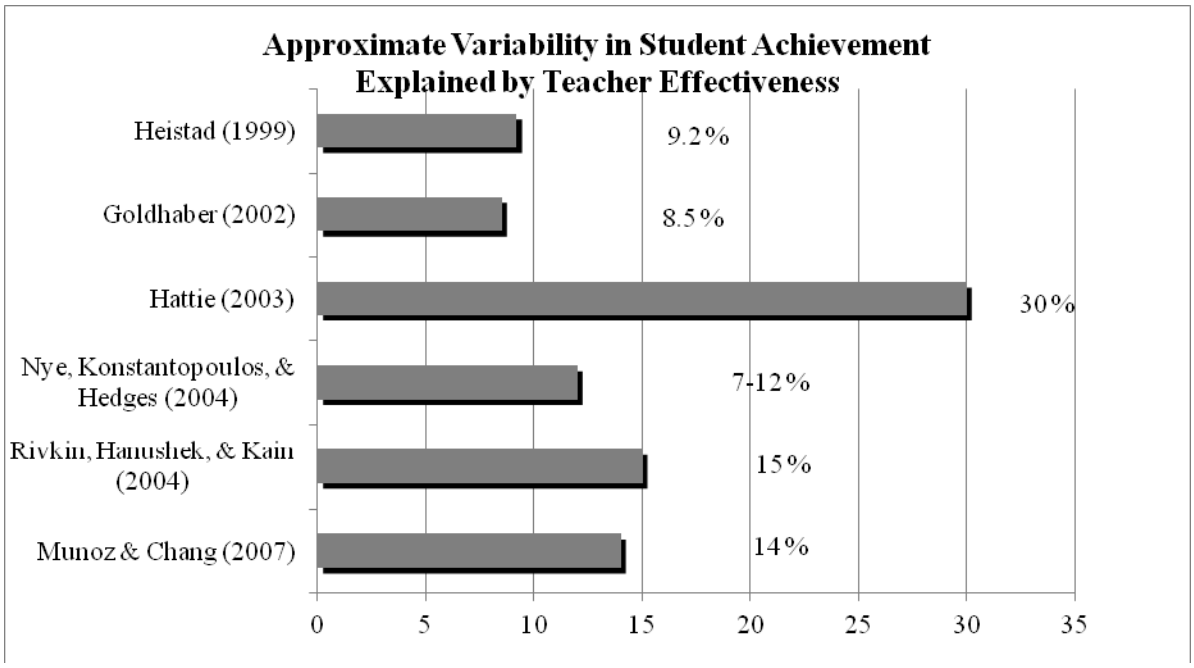
	standard deviation. This implies that a teacher at the 90th percentile can achieve in half a year what a teacher at the 10th percentile can achieve in a full year.
Stronge, Ward, & Grant [278]	• In reading, students taught by bottom quartile teachers could expect to score, on average, at the 21st percentile on the state's reading assessment, whereas students taught by top quartile teachers could expect to score at approximately the 54th percentile. The more than 30 percentile point difference was attributed to the quality of teaching occurring in classrooms during one academic year. Similar results were reached for mathematics.

Various studies have estimated how much of the variability in student achievement can be explained by the quality of the teacher. Understanding what factors account for variability in student academic performance plays a central role in educational research design.[279] Figure 9 summarizes selected studies regarding variability in student achievement attributed to teacher effectiveness.

Figure 9

Student Achievement Accounted for by Teacher Effects[280]

[277] Leigh, A. (2010). Estimating teacher effectiveness from two-year changes in students' test scores. *Economics of Education Review, 29,* 480-488.
[278] Stronge, J. H., Ward, T. J., & Grant, L.W. (2011).
[279] Gall, M. D., Gall, J. P., Borg, W. R. (2007). *Educational research: An introduction* (8th ed.). Boston: Pearson.
[280] Heistad, D. (1999). *Teachers who beat the odds: Value-added reading instruction in Minneapolis 2nd grade.* Paper presented at the Annual American Educational Research Association Conference, April, Montreal, Canada.
Goldhaber, D. (2002). The mystery of good teaching. *Education Next, 2*(1), 50-55. Retrieved from http://www.hoover.org/publications/ednext/3368021.html.
Hattie, J. (2003). *Teachers make a difference: What is the research evidence?* Retrieved from http://www.leadspace.govt.nz/leadership/pdf/john_hattie.pdf.
Nye, B., Konstantopoulos, S., & Hedges, L. V. (2004).
Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417-458.
Munoz, M. A., & Chang, F. C. (2007). The elusive relationship between teacher characteristics and student academic growth: A longitudinal multilevel model for change. *Journal of Personnel Evaluation in Education, 20,* 147-164.



Impact of Teacher Quality on School Improvement

In their report on the success of the world's top-performing systems, Sir Michael Barber and Dr. Mona Mourshed highlighted a paradox in the school systems:

> The federal government, state governments, school boards, principals, teachers, teacher unions, listed companies, non-profit organizations, and others launched tens of thousands of initiatives aimed at improving the quality of education in the nation's schools. Actual student outcomes, however, as measured by the Department of Education's own national assessment program, stayed almost the same. Though there was some improvement in mathematics, the reading scores of 9-year-olds, 13-year-olds and 17-year-olds remained the same in 2005 as they had been in 1980.[281]

Outcomes in the United States remain unchanged despite continuous education reform efforts. Elimination of the "Teflon-effect," in which all reform efforts simply slide off after a few months or a few years, is crucial to allow real and lasting reform to take deep root and then yield fruit.[282]

Clearly, reform effort does not equal reform results. The United States is not the only country with challenges to improve its schools. Almost all countries in the OECD substantially increased their spending on education over the past 25 years and implemented large-scale reform initiatives to improve schools. However, few school systems achieved significant improvements in student performance. In fact, results of national and international assessments show that many school systems' performance had either flat-lined or deteriorated.[283] The fact that many reform efforts appear well-conceived and far-reaching in their objectives makes their failure all the more perplexing. Even in countries like England that reformed "the funding of schools, the governance of schools, curriculum standards, assessment and testing, the inspection of quality, the role of local government, the role of

[281] Barber, M., & Mourshed, M. (2007). p. 10.
[282] Stronge, J. H. (2010). *Teacher effectiveness = Student achievement: What research says*. Larchmont, NY: Eye on Education.
[283] Barber, M., & Mourshed, M. (2007).

national government, the range and nature of national agencies, the relationships of schools to communities, school admissions…," results were paltry, at best.[284]

Around the globe, neither resources nor ambitious and well-intentioned reform efforts have answered the need for school improvement.[285] Teacher effects are of a magnitude that dwarf the effects associated with other educational programs or interventions, such as curriculum, staff development, restructuring, and other types of educational interventions.[286] In fact, effective teachers can make poor reform efforts look good, while ineffective teachers can make promising reform efforts look bad.[287]

In their international study, Barber and Mourshed argued that substantial increases in spending and popular reforms, most noticeably, class-size reduction and decentralization of decision-making, have failed to budge student achievement.[288] In contrast, high-performing school systems like those in Canada, Finland, Japan, and Singapore, maintained a strong focus on improving daily classroom instruction because of its direct impact upon student learning. As an example of supporting investment in classroom teachers, some high-performing East Asian countries found that mechanisms to encourage high levels of student achievement are policies which target classroom teachers, including ongoing professional development and the equalization of instructional resources.[289]

The research findings indicating that the magnitude of teacher effects are larger than schools effects shed light on the policy issue of educational resource allocation. Since the classroom teacher is a larger source of variance in student achievement than the school, policies focusing on teacher effects should be more promising than policies designed to impact other factors. [290]

It appears that few, if any, school-level reforms or improvement plans can bring forth the intended changes in student achievement unless those reforms or plans make a difference in teacher effectiveness. To illustrate, some expensive innovations, such as the United States $1.6 billion Comprehensive School Reform (CSR), were found to be not cost-effective in improving student outcomes.[291] The students' performance trends do not seem to differ much after being exposed to a whole-school model of reform. In another instance, the effect of one standard deviation change in teacher effectiveness is larger than the effects of a costly reduction of class size from 25 to 15.[292] Furthermore, school-level reform on instruction, without directly tackling the issue of teacher effectiveness, generally has no detectable association with higher student achievement.[293] Given the

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[284] Barber, M., & Mourshed, M. (2007). p. 10.
[285] Barber, M., & Mourshed, M. (2007).
[286] Mendro, R. L., Jordan, H. R., Gomez, E., Anderson, M. C., & Bembry, K. L. (1998a, April). p. 1.
[287] Mendro, R. L., Jordan, H. R., Gomez, E., Anderson, M. C., & Bembry, K. L. (1998a, April).
[288] Barber, M., & Mourshed, M. (2007).
[289] Akiba, M., LeTendre, G. K., & Scribner, J. P. (2007). Teacher quality, opportunity gap, and national achievement in 46 countries. *Educational Researcher, 36*(7), 369-387.
[290] Hanushek, E. A., Kain, J. F., & Rivkin, S. G. (1998).
[291] Gross, B., Booker, T. K., & Goldhaber, D. (2009). Boosting student achievement: The effect of comprehensive school reform on student achievement. *Educational Evaluation and Policy Analysis, 31*(2), 111-126.
[292] Nye, B., Konstantopoulos, S., & Hedges, L. V. (2004).
Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417-458.
[293] Le V., Lockwood, J. R., Stecher, B. M., Hamilton, L. S., & Martinez, J. F. (2009). A longitudinal investigation of the relationship between teacher's self-reports of reform-oriented instruction and mathematics and science achievement. *Educational Evaluation and Policy Analysis, 31*(3), 200-220.

undeniable influence of teachers on student success, Rockoff concluded, "raising teacher quality may be a key instrument in improving student outcomes."[294] Similarly, Goldhaber posited that the effect of increases in teacher quality overrides the impact of any other educational investment, such as reductions in class size.[295] In the private sector, human capital is generally defined as the "accumulated value of an individual's intellect, knowledge, experience, competencies, and commitment that contributes to the achievement of an organization's vision and business objectives."[296] Extrapolating this idea to public education, the "business objective" is student achievement and future success, and "human capital" should refer to the knowledge and skill sets of teachers who interact with students every day in classroom. Not much advancement could be accomplished in student learning and school performance unless there is a dramatic improvement in "what teachers know and are able to do — their talent level."[297]

To illustrate, Finland and Singapore are two of the highest-performing education systems in the world today, but they were not always so. What they have accomplished is significant due to their effort to strengthen and elevate the teaching profession. In the early 1970s, less than half of Singapore's students reached fourth grade. Teachers were hired en masse, with little attention to quality. Singapore soon identified teacher quality as the key to improving education outcomes and government policy has been instrumental in identifying and nurturing teacher talent.[298] The case of Finland is similar. In the 1960s, only one in ten adults in Finland completed more than nine years of basic education, and Finland lagged behind its Scandinavian neighbors, such as Denmark, Norway, and Sweden. Today, partially due to its efforts in the preparation and support of teachers, Finland is among the top performers in the world.

Top-performing school systems recruit their teachers from the top third of each cohort graduating from their schools: the top five percent in South Korea, the top 10 percent in Finland, and the top 30 percent in Singapore. In comparison, the status and prestige accorded to teaching is much lower than other occupations in the United States. 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.[299] However, competitive high salaries, comprehensive training, and high social status standing make teaching a sought-after career option in Singapore, South Korea, and Finland.[300]

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[294] Rockoff, J. E. (2004). The impact of individual teachers on student achievement: Evidence from panel data. *The American Economic Review, 94*(2), 247-252. p. 251.

[295] Goldhaber, D. (2006). *Teacher pay reforms: The political implications of recent research.* Chicago: The Center for American Progress.

[296] Sigler, D., & Kashyap, M. U. (2008, Summer). Human capital management: A new approach for districts. *Voices in Urban Education, 20.* Retrieved from http://www.annenberginstitute.org/VUE/summer08/Sigler.php. p. 1

[297] Ibid.

[298] Speech of U.S. Secretary of Education Arne Duncan to the Microsoft Partners in Learning Global Forum. (November 18, 2011).

[299] Ingersoll., R. (2001). The status of teaching as a profession. In J. Ballantine and J. Spade (Eds.), *Schools and society: A sociological approach to education* (pp. 115-129). Belmont, CA: Wadsworth Press.

[300] Chung, J. (2009). *An Investigation of Reasons for Finland's Success in Programme for International Student Assessment.* Oxford University, Oxford, UK.

Auguste, B., Kihn, P., & Miller, M. (2010).

The available evidence suggests that the main driver of the variation in student learning is teacher quality. Consistent with this premise, this international comparative study noted above found that three factors matter most for school reform and improvement:[301]

- Getting the right people to become teachers;
- Developing them into effective instructors; and
- Ensuring that the system is able to deliver the best possible instruction for every child.

PRINCIPAL QUALITY

The international comparison indicated that the top performers have paid attention to principal quality and leadership development. For instance, Ontario, Canada (the largest school system in Canada) initiated a leadership strategy in 2008 that delineated the skills, knowledge, and attributes of effective leaders. Among the elements were a strong mentoring program reaching over 4,500 principals and vice principals and a new province-wide appraisal programs for school leaders.[302] Another illustration of principal quality can be found in Shanghai. A major undertaking in Shanghai has been the improvement of the overall school system by turning around low-performing schools. One of the strategies, which is relatively new and has gained increasing attention, is commissioned administration.[303] It is a special leadership program in which the government commissions the administration from high-performing schools to take over the administration of low-performing ones. The high-performing schools appoint their experienced leaders (such as deputy principals) to be the principals of the low-performing schools and send a team of experienced teachers to lead the instruction. This demonstrates a trust in the competence and professionalism of the leadership force as an essential component in school turnaround.

The education policies and practices in Singapore exemplify a clear understanding that high-quality teaching and strong school performance require effective leaders. The key is that Singapore has a unique approach to identifying and developing talent. 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 of three career paths would best suit them: [304]

- Teaching track (including steps of Senior Teacher, Lead Teacher, Master Teacher and finally, Principal Master Teacher);
- Senior specialist track (specialists in areas such as curriculum, instructional design, educational research, and statistics); and
- Leadership track (including trajectory of Subject Head/Level Head, Head of a Department, Vice Principal, Principal, Superintendent, and Director).

Teachers with potential as school leaders are moved to middle management teams and receive training paid by the government. Middle managers' performance is assessed for their potential to become vice principals, and later, principals. Each stage involves a range of experience and training to prepare candidates for their new roles in school leadership and innovation.[305] In Singapore, young teachers are continuously assessed for their leadership potential and given opportunities to demonstrate and learn; for example, they can serve on committees and later be promoted to head of a department at a relatively young age. After these experiences are monitored, potential principals are selected for

[301] Barber, M., & Mourshed, M. (2007). p. 13.
[302] OECD. (2010). *Strong performers and successful reformers in education.*
[303] Ibid.
[304] Tucker, M. S. (2011). *Standing on the shoulders of giants: An American agenda for education reform.* Washington, DC: National Center on Education and the Economy.
[305] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

interviews and go through leadership situational exercises.[306] This drastically differs from the United States' approach in selecting school leaders.

While Singapore recruits the best from the talented pool of their teachers and provides top-level training to prepare them to be leaders, in the United States, there are no policies to create a high-quality talent pool. Any teacher can apply to train as a principal or school head, and later for a position in a school.[307] Despite this, there soon may be a shortage of qualified individuals to fill school leadership positions and promote school improvement. A study funded by the National Association of Elementary School Principals and the National Association of Secondary School Principals found that approximately half of the surveyed school divisions reported a shortage in the labor pool for K-12 principal candidates, regardless of the schools' grade level or whether they were rural, suburban, or urban schools.[308] The major factors that keep those teachers identified by their school principal as

[306] Ibid.
[307] Ibid.
[308] Education Research Service. (1998). *Is there a shortage of qualified candidates for openings in the principalship? An exploratory study.* Arlington, VA: Author.

leaders or having leadership potential from choosing to be school principals are testing/accountability pressures, job stress, the amount of time required, and societal problems that make it difficult to focus on instruction.[309]

Research has consistently revealed that school leadership has an important impact on student achievement gains or progress over years.[310] In addition to this influence, research indicates that effective school leadership also has a significant positive effect on reduced student absenteeism, student engagement, student academic self-efficacy, staff satisfaction, and collective teacher efficacy.[311] Waters, Marzano, and McNulty conducted a meta-analysis of research on effects of principal leadership practices on student achievement.[312] After analyzing studies conducted over a 30-year period, they found that the effectiveness of a school's leadership is significantly associated with increased student academic performance. For instance, a number of leader behaviors, such as establishing clear goals and fostering shared beliefs, were associated with student learning. They found the average effect size between leadership and student achievement is .25. That means a one standard deviation improvement in leadership effectiveness can translate into an increase of ten percentile points in student achievement on a standardized, norm-referenced test. In addition, the research found certain leadership responsibilities are closely associated with student achievement; these are outlined in Table 55.

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[309] Hewitt, P. M., Denny, G. S., & Pijanowski, J. C. (2011). Why teacher leaders don't want to be principals. *AASA Journal of Scholarship and Practice, 8*(1), 13-23.

[310] Bamburg, J. D., & Andrews, R. L. (1991). School goals, principals, and achievement. *School Effectiveness and School Improvement, 2*, 175-191.

Brewer, D. J. (1993). Principals and student outcomes: Evidence from U.S. high schools. *Economics of Education Review, 12*(4), 281-292.

Hallinger, P., Bickman, L., & Davis, K. (1996). School context, principal leadership, and student reading achievement. *The Elementary School Journal, 96*(5), 527-549.

Heck, R. H. (2000). Examining the impact of school quality on school outcomes and improvement: A value-added approach. *Educational Administration Quarterly, 36*(4), 513-552.

Leithwood, K., & Jantzi, D. (2006). Transformational school leadership for large-scale reform: Effects on students, teachers, and their classroom practices. *School Effectiveness and School Improvement, 17*(2), 201-227.

Leitner, D. (1994). Do principals affect student outcomes? *School Effectiveness and School Improvement, 5*(3), 219-238.

Witziers, B., Bosker, R. J., & Krüger, M. L. (2003). Educational leadership and student achievement: The elusive search for an association. *Educational Administration Quarterly, 39*(3), 398-425.

[311] Leithwood, K., & Mascall, B. (2008). Collective leadership effects on student achievement. *Educational Administration Quarterly, 44*, 1-34.

Cheng, Y. C. (1994). Principal's leadership as a critical factor for school performance: Evidence from multi-levels of primary schools. *School Effectiveness and School Improvement, 5*(3), 299-317.

Griffith, J. (2004), Relation of principal transformational leadership to school staff job satisfaction, staff turnover, and school performance. *Journal of Educational Administration, 42*(3), 333-356.

Leithwood, K., & Jantzi, D. (2000). Principal and teacher leadership effects: A replication. *School Leadership and Management, 20*, 415-434.

Pounder, D. G., Ogawa, R. T., & Adams, E. A. (1995). Leadership as an organization-wide phenomena: Its impact on school performance. *Educational Administration Quarterly, 31*, 564-588.

Ross, J., & Gray, P. (2006). Transformational leadership and teacher commitment to organizational values: The mediating effect of collective teacher efficacy. *School Effectiveness and School Improvement, 17*(2), 179-199.

Silins, H., & Mulford, B. (2002). Leadership and school results. In K. Leithwood (Ed.), *The second international handbook of educational leadership and administration* (pp. 561-612). Norwell, MA: Kluwer Academic.

[312] Waters, T., Marzano, R. J., & McNulty, B. (2003). *Balance Leadership: What 30 Years of Research Tells U.S. About the Effect of Leadership on Student Achievement*. Retrieved February 25, 2008, from http://www.mcrel.org/PDF/LeadershipOrganizationDevelopment/5031RR_BalancedLeadership.pdf.

Table 55

Leadership Responsibilities Associated with Student Achievement[313]

Leadership Responsibilities	The extent to which the principal:	Average Effect Size[314]
Situational awareness	is aware of the details and undercurrents in the running of the school, and uses this information to address current and potential problems.	.33
Intellectual simulation	ensures the faculty and staff are aware of the most current theories and practices, and makes the discussion of these a regular aspect of the school's culture.	.32
Input	involves teachers in the design and implementation of important decisions and policies.	.30
Change agent	is willing to and actively challenges the status quo.	.30
Culture	fosters shared beliefs and a sense of community and cooperation.	.29
Outreach	is an advocate and spokesperson for the school to all stakeholders.	.28
Monitors/evaluates	monitors the effectiveness of school practices and their impact on student learning.	.28
Order	establish a set of standard operating procedures and routines.	.26
Resources	provide teachers with materials and professional development necessary for the successful execution of their jobs.	.26
Affirmation	recognizes and celebrates school accomplishments and acknowledges failures.	.25
Ideals/beliefs	communicates and operates from strong ideals and beliefs about schooling.	.25
Discipline	protects teachers from issues and influences that would detract from their teaching time of focus.	.24
Knowledge of curriculum, instruction, assessment	is knowledgeable about current curriculum, instruction, and assessment practices.	.24
Communication	establishes strong lines of communication with teachers and among teachers.	.23

[313] Adapted from Waters, T., Marzano, R. J., & McNulty, B. (2003). p. 5.

[314] *Effect size* is a measure of the magnitude of a treatment effect. Effect size helps determine if the treatment effect is practically significant. The effect size can be interpreted as the average percentile standing of the students who received treatment relative to the average untreated students. For instance, in this figure, the leadership practice of ideals/beliefs has an effect size of .25 on student achievement. An effect size of .25 would translate into a percentile gain of 10 point.

Similarly, the meta-analysis by Robinson, Llyod, and Rowe inductively derived five leadership dimensions that have been supported by literature as influential on student outcomes. [315] Table 56 outlines those leadership dimensions.

Table 56

Leadership Dimensions Linked to Student Achievement[316]

Leadership Dimension	Meaning of Dimension	Mean Effect Size
Establishing goals and expectations	Includes the setting, communicating, and monitoring of learning goals, standards, and expectations, and the involvement of staff and others in the process so that there is clarity and consensus about goals.	.42
Strategic resourcing	Involves aligning resource selection and allocation to priority teaching goals. Includes provision of appropriate expertise through staff recruitment.	.31
Planning, coordinating, and evaluating teaching and the curriculum	Direct involvement in the support and evaluation of teaching through regular classroom visits, and provision of formative and summative feedback to teachers. Direct oversight of curriculum through school-wide coordination across classes and year levels and alignment to school goals.	.42
Promoting and participating in teacher learning and development	Leadership that not only promotes but directly participates with teachers in formal or informal professional learning.	.84
Ensuring an orderly and supportive environment	Protecting time for teaching and learning by reducing external pressures and interruptions and establishing an orderly and supportive environment both inside and outside classrooms.	.27

NARROWING PERSISTENT GAPS IN STUDENT ACHIEVEMENT: EQUAL ALLOCATION OF EDUCATION RESOURCES

Based on PISA data, Finland's between-school variance on student achievement was only seven percent, whereas the between-school variance in the United States was 36 percent.[317] Larger between-school variance is generally related to social inequality, including both the differences in achievement across communities of different socio-economic status and the extent to which schools are funded and organized.[318] The PISA data indicated that the United States has a relatively strong relationship between schools' socio-economic and demographic background. This indicates that resources are inequitably distributed according to schools' socio-economic and demographic profiles. Researchers posited that high-quality instruction throughout primary school could substantially offset

[315] Robinson, V. M., Lloyd, C. A., & Rowe, K. J. (2008). The impact of leadership on student outcomes: An analysis of the differential effects of leadership types. *Educational Administration Quarterly, 44*, 635-674.
[316] Ibid.
[317] OECD. (2010). *Strong Performers and Successful Reformers in Education.*
[318] Darling-Hammond, L. (2010). *The flat world and education: How America's commitment to equity will determine our future.* New York: Teacher College Press.

disadvantages associated with low socio-economic background.[319] The benefits of equal access to effective teachers for all subgroups of students were evidenced by the highest-performance school systems around the world.

All students deserve quality education, but access to quality education is jeopardized for students who are assigned to less effective teachers. Research around the globe has confirmed that teacher quality is characterized by great unevenness. There are dramatic differences in teacher quality within states, regions, communities, schools, and even within grades. 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.[320] The students who need the strongest instruction often are taught by teachers with the least experience and expertise.[321] In addition, low income and minority students face higher teacher turnover and are more frequently taught by beginning teachers.[322] Among 39 countries, the Unite States ranked 36th in its ability to provide equal access to qualified math teachers for low- and high-socio-economic status students. In fact, 67.6 percent of high-socio-economic status students were taught by teachers with high qualifications compared with 53.2 percent for low-socio-economic status students. An opportunity gap of 14.4 percent is significantly larger than the international average of 2.5 percent.[323]

> On any measures of qualifications — extent of preparation, level of experience, certification, content background in the field taught, advanced degrees, selectivity of educational institution, or test scores on college admissions and teacher licensure tests — studies show that students of color and low-income and low-performing students, particularly in urban and poor rural areas, are disproportionately taught by less qualified teachers.[324]
>
> Year after year, decade after decade, countless studies told us that on these measures, we didn't have a fair distribution of teacher talent.… Poor children and black children were less likely to be taught by the strongest teachers and more likely to be taught by the weakest.[325]

Bembry and her colleagues found that low-achieving students were more likely to be assigned to less effective teachers. Additionally, they discovered that uneven distribution of quality teachers is not

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[319] Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417-458.

[320] Haycock, K., & Crawford, C. (2008). Closing teacher quality gap. *Educational Leadership, 65*(7), 14-19.
Sigler, D., & Kashyap, M. U. (2008, Summer).

[321] Boyd, D., Lankford, H., Loeb, S., & Wyckoff, J. (2005). Explaining the short careers of high-achieving teachers in schools with low-performing students. *American Economic Review, 95*(2), 166-171.
Lankford, H., Loeb, S., & Wyckoff, J. (2002). Teaching sorting and the plight of urban schools: A descriptive analysis. *Educational Evaluation and Policy Analysis, 24*(1), 37-62.

[322] Hanushek, E., Kain, J. F., & Rivkins, S. G. (2004). Why public schools lose teachers. Journal of Human Resources, 39(2), 326-354.
Scafidi, B., Sjoquist, D. L., & Stinebrickner, T. R. (2008). Race, poverty, and teacher mobility. *Economics of Education Review, 26*, 145-159.

[323] Akiba, M., LeTendre, G. K., & Scribner, J. P. (2007).

[324] Darling-Hammond, L. (2010). p. 38.

[325] Gordon, R., Kane, T. J., & Staiger, D.O. (2006). *Identifying effective teachers using performance on the job.* Washington, DC: Brookings Institution. pp. 15-16.

a random or occasional occurrence, but a systemic bias.[326] The cumulative effects of such a pattern of biased assignment of students to teachers partially explain the widening gap between the achievement of black and white student populations.[327] Additionally, research indicated that between-teacher variance is always larger in low socio-economic status schools.[328] This suggests that the distribution of teacher effectiveness is much more uneven in low-socio-economic status schools than in high-socio-economic status schools. Furthermore, the proportion of the total variance in student achievement gains accounted for by the teacher effect is higher in low-socio-economic status schools. Thus, it matters more which teacher a child receives in low- socio-economic status schools than it does in high-socio-economic status schools.[329]

School policy on teacher quality can be an important tool in raising the achievement of low income students. In particular, successive assignment of effective teachers can be a big step toward closing achievement gaps across income groups.[330] For all students of all achievement levels, teacher assignment sequences should be determined in a manner to ensure that no student is assigned to a teacher sequence (high-effectiveness versus low-effectiveness teachers) that will unduly diminish the student's academic achievement.[331] Based on the teacher effects estimates by Gordon, Kane, and Staiger, the average achievement difference between being assigned to a top quartile teacher and a bottom quartile teacher is 10 percentile points.[332] Stronge, Ward, and Grant found a difference of 30 percentile points.[333] Interestingly, the national black-white achievement gap in the United States is around 30 percentile points. African-American students and white students make comparable academic progress when they are assigned to teachers of comparable effectiveness.[334] Since the teacher impact is cumulative, having a top-quartile teacher for three to four years in a row would help substantially in closing the achievement gap.

Teacher effectiveness has important implications for success of students of different ethnic groups. Research findings on the relationship between teacher effectiveness and academic achievement of minority students include:

- "African-American students and white students make comparable academic progress when they are assigned to teachers of comparable effectiveness. However, at least in the system studied (Tennessee), black students were disproportionately assigned to the least effective teachers. The cumulative effects of such a pattern of assignment of students to teachers, offers at least a partial explanation for the widening gap between the mean achievement test scores of black and white student populations."[335]

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[326] Bembry, K. L., Jordan, H. R., Gomez, E., Anderson, M. C., & Mendro, R. L. (1998, April). *Policy implications of long-term teacher effects on student achievement.* Paper presented at the 1998 Annual Meeting of the American Educational Research Association, San Diego, CA.

[327] Sanders, W. L., & Horn, S. P. (1997). *Cumulative effects of inadequate gains among early high-achieving students.* Paper presented at the Sixth Annual National Evaluation Institute, Muncie, IN.

[328] Nye, B., Konstantopoulos, S., & Hedges, L. V. (2004).

[329] Ibid.

[330] Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica,* 73(2), 417-458.

[331] Sanders, W. L, & Rivers, J. C. (1996, November). *Cumulative and residual effects of teachers on future student academic achievement.* Knoxville, TN: University of Tennessee Value-Added Research and Assessment Center.

[332] Gordon, R., Kane, T. J., & Staiger, D.O. (2006).

[333] Stronge, J. H., Ward, T. J., & Grant, L.W. (2011).

[334] Sanders, W. L., & Horn, S. P. (1997). *Cumulative effects of inadequate gains among early high-achieving students.* Paper presented at the Sixth Annual National Evaluation Institute, Muncie, IN.

[335] Sanders, W. L., & Horn, S. P. (1997). *Cumulative effects of inadequate gains among early high-achieving students.* Paper presented at the Sixth Annual National Evaluation Institute, Muncie, Ind., p. 3.

- In a study of Chicago public high schools, estimates of teacher effects varied by initial (8th grade) test scores, race, and sex. The biggest impact of a higher quality teacher, relative to the mean gain of that group, was among African American students. There was no difference between boys and girls.[336]
- A one standard deviation, one semester increase in teacher quality raised 9th grade test score performance by 0.20 grade equivalents (23 percent of the average annual gain) for African American students and 0.13 grade equivalents (11 percent of the average annual gain) for Hispanic students. The difference was less important for non-African American, non-Hispanic students.[337]
- Drawing from a Los Angeles study, "…if all black students were assigned to four highly effective teachers in a row, this would be sufficient to close the average black-white achievement gap."[338]

Research findings on the relationship between teacher effectiveness and achievement of economically disadvantaged students indicate:

- Economically disadvantaged students systematically achieve less than their more advantaged peers, on average 0.6 standard deviations each year.[339]
- An effective teacher is effective with all students, regardless of the students' socio-economic status background; conversely, an ineffective teacher is ineffective with all students.[340]
- Among 39 countries, the United States ranked 36th in its ability to provide equal access to qualified math teachers for low- and high-socio-economic status students. In fact, 67.6 percent of high-socio-economic status students were taught by highly qualified teachers compared with 53.2 percent for low- socio-economic status students, showing an opportunity gap of 14.4 percent which is significantly larger than the international average of 2.5 percent.[341]
- Low-income and minority students face higher teacher turnover and tend to be taught more frequently by beginning teachers.[342]
- The estimated variation in the quality of instruction reveals that schools and teachers play an important role in promoting economic and social equity. A poor child who has high quality teachers for five consecutive years could have learning gains sufficiently large to close the achievement gap with their upper-income peers and offset the disadvantage associated with low socio-economic background.[343]

To promote equity in access to learning, the United States needs to ensure that all teachers can access high-quality training, quality preparation, and on-going professional development, and that there is equal allocation of quality teachers for all communities. One specific strategy is the creation of subsidies for teachers who will work in high-need fields and high-need locations.[344] Currently, Virginia is implementing a pilot program that awards up to $5,000 to teachers in schools identified as

[336] Aaronson, D., Barrow, L., & Sander, W. (2007).
[337] Ibid.
[338] Haycock, K., & Crawford, C. (2008).
[339] Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005). Teachers, schools, and academic achievement. *Econometrica, 73*(2), 417-458.
[340] Nye, B., Konstantopoulos, S., & Hedges, L. V. (2004).
[341] Akiba, M., LeTendre, G. K., & Scribner, J. P. (2007).
[342] Rivkin, S. G., Hanushek, E. A., & Kain, J. F. (2005).
[343] Ibid.
[344] Darling-Hammond, L. (2010).

"hard-to-staff" and who obtain high student-achievement growth with their students.[345] This is an opportunity to attract teachers who can help bridge achievement gaps and improve performance in schools that need it most.

INVESTING IN TEACHER QUALITY AND TEACHER COLLABORATION

Of all the control factors in the educational enterprise, teacher quality matters most. Because of this, there is no other school-related factor that will touch the lives of students so profoundly. It is incumbent that the United States ascertain what is good teaching, make the best possible choices in selecting good teachers, develop teaching corps based on the qualities of teacher effectiveness, and work to retain the best teachers. Educators increasingly emphasize the significance of linking teacher effectiveness to various aspects of district/school personnel administration, including:

- Recruiting and inducting potentially effective teachers;
- Designing and implementing professional development;
- Conducting valid and credible evaluations; and
- Dismissing ineffective teachers and retaining effective ones.[346]

This type of alignment is receiving more and more attention in the provision of quality education to all students and the improvement of school performance. One study asked highly effective teachers to rate their professional growth experiences in terms of how valuable they were in helping the teachers develop and improve their teaching skills. Table 57 summarizes how much (or little) the teachers valued typical professional growth opportunities.[347]

These teachers tended to rate personalized learning experiences, such as working individually with peers and mentors, or attending conferences selected by themselves higher than those standardized for all teachers (e.g., college coursework, district staff development). When asked what steps would improve the effectiveness of teachers in their schools, these teachers responded:[348]

- More social/collaborative time (39 percent)
- Time for teachers to get together (22 percent)
- Make sure teachers are valued/appreciated/empowered (21 percent)
- Have teachers observe other teachers/schools (18 percent)
- Improve attitude towards students (17 percent)
- Provide more class time/preparation time (17 percent)

[345] Virginia Department of Education. (2011). *Governor McDonnell launches Teacher Performance-Pay Initiatives.* Retrieved from http://www.doe.virginia.gov/news/news_releases/2011/apr19_gov.shtml.
[346] Hanushek, E. A. (2008). *Teacher deselection.* Retrieved December 13, 2009, from http://www.stanfordalumni.org/leadingmatters/san_francisco/documents/Teacher_Deselection-Hanushek.pdf.
National Academy of Education. (2008). *Teacher quality: Education policy white paper.* Washington, DC: The author. Retrieved December 14, 2009, from http://www.naeducation.org/Teacher_Quality_White_Paper.pdf.
Odden, A. (2004). Lessons learned about standards-based teacher evaluation systems. *Peabody Journal of Education, 79*(4), 126-137.
[347] Carter, P. J. (2003). *A review of highly effective teachers in Hamilton County: Analysis of current trends and implications for improvement.* Chattanooga, TN: Public Education Foundation. Retrieved from http://pef.ddngroup.com.
[348] Ibid.

Table 57

Effective Teachers' Perspectives on the Value of Selected Professional Experiences[349]

Professional Experience	Rank	Mean
Help from peers	1	3.62
Personal professional development	2	3.34
Help from mentor	3	3.31
Student teaching	4	3.17
College courses	5	3.00
Help from consultants	6	2.83
System professional development	7	2.79
Note: Based on a four-point rating scale (from 1=least valuable to 4=most valuable)		

When asked how a principal can help a teacher become more effective, these teachers responded:[350]

- Be supportive/be there for the teacher/support staff with what they need (60 percent)
- Help struggling teachers/give advice/identify strengths and weaknesses (40 percent)
- Provide staff development opportunities/opportunities to learn (28 percent)
- Constructive criticism and feedback (32 percent)
- Visit classrooms (28 percent)
- Be very aware of what is going on in the building, be visible (26 percent)
- Allow teacher to model (24 percent)

High Quality Professional Development

There is evidence that teachers who receive substantial high-quality professional development can help students achieve more.[351] High-quality professional development refers to a focus on content and pedagogy, in-depth active learning, extended duration, and collective participation.[352] As an example, based on the findings of one meta-analysis, teachers who received substantial professional development (49 hours) boosted their students' achievement by 21 percentile points; this effect size was fairly consistent across all content areas.[353] Such research suggests that for professional

[349] Carter, P. J. (2003).
[350] Ibid.
[351] Little, J. W. (1993). Teachers' professional development in a climate of education reform. *Educational Evaluation and Policy Analysis, 15*(2), 129-151.
[352] Desimone, L.M., Porter, A.C., Garet, M.S., Yoon, K.W., & Birman, B.F. (2002). Effects of professional development on teachers' instruction: results from a three-year longitudinal study. *Educational Evaluation and Policy Analysis, 24* (2), 81-112.
[353] Yoon, K. S., Duncan, T., Lee, S., Scarloss, B., & Shapley, K. L. (2007). *Reviewing the evidence on how teacher professional development affects student achievement.* Washington, DC: Regional Educational Laboratory Southwest.

development to support an increase in student learning outcomes, sufficient time must be coupled with high-quality development.

Franke and others found that when teachers engaged in meaningful, effective professional learning activities, they were inclined to: [354]

- View children's thinking as central to their instruction;
- Possess detailed knowledge about children's thinking;
- Perceive themselves as creating and extending their own knowledge about children's thinking; and
- Collaborate with other colleagues who possess knowledge about children's thinking.

Critical factors that may directly impact professional development include the level of support provided by the school and district, the culture of learning within the school, and the resources and materials available, the facilities and teachers having sufficient time to plan for classroom activities.

Factors Strengthening Professional Development

Contextual Factors

Contextual factors involve the organization of adults into learning communities, the skill and effectiveness of leadership, and the resources available to support adult learning and collaboration.[355] It follows that several factors may influence the contextual setting in which professional development occurs and the manner in which contextual factors directly impact success.

Current literature reveals that professional learning communities support positive outcomes in both teacher participation and improvement, in addition to promoting increased student learning outcomes.[356] In this regard, Grossman, Wineburg, and Woolworth identified several key components of a professional community that may promote productive settings for teacher learning and growth:[357]

- Development of a group identity and norms of interaction;
- Formulation of a sense of communal responsibility for the regulation of norms and behavior; and
- Willingness of community members to assume responsibility for colleagues' growth and development.

A study by Ingvarson, Meiers, and Beavis suggested that professional learning communities impact teacher learning outcomes.[358] Thus, when teachers perceived that their school provides opportunities to share ideas about teaching and learning, student progress, and student outcomes, they are more inclined to report positive effects from professional development activities. Similarly, when teachers perceive support from administration and other colleagues in their attempt to implement new

[354] Franke, M. L., Carpenter, T. P., Levi, L., & Fennema, E. (2001). Capturing teacher' generative change: A follow-up study of professional development in mathematics. *American Educational Research Journal, 38*(3), 653-689.
[355] National Staff Development Council. (2001). Standards for staff development-revised. Oxford, OH: National Staff Development Council.
[356] Desimone, L.M., Porter, A.C., Garet, M.S., Yoon, K.W., & Birman, B.F. (2002).
Guskey, T.R. (2000).
[357] Grossman, P., Wineburg, S., & Woolworth, S. (2001). Toward a theory of teacher community. *Teachers College Record, 103*, 942-1012.
[358] Ingvarson, L., Meiers, M., & Beavis, A. (2005). Factors affecting the impact of professional development programs on teachers' knowledge, practice, student outcomes & efficacy. *Education Policy Analysis Archives, 13*(10). Retrieved from http://epaa.asu.edu/epaa/v13n10.

ideas from professional development programs, they are more inclined to report that professional development activities positively influenced their knowledge and practice.

Structural and Process Features

Research found that the structural and process features of professional development programs effect teachers' knowledge, practice, and efficacy. Structural features include such items as contact hours, time span, and sufficient time to implement new learning; whereas process features include concepts related to content and pedagogy and the manner in which the information is presented and followed up. In this regard, a three-year longitudinal study on effective professional development determined that "…professional development focused on specific teaching practices increased teachers' use of those practices in the classroom."[359] Other studies demonstrated that a number of structural features exerted a consistent and significant impact on the effectiveness of the program; these features included content focus, active learning, follow-up and feedback.[360]

Professional development programs which engage teachers in active learning tend to be effective in promoting self-reflection related to current teaching practices and the identification of specific areas of growth.[361] In this regard, research indicates teachers prefer content-centered professional development programs because they tend to improve their knowledge of subject and content-specific pedagogy.[362] It follows that effective professional development programs ought to directly focus on classroom-based knowledge and practice—the subject content, how students learn that content, and the use of effective pedagogical methods.[363] Finally, evaluative measures, follow-up, and feedback are found to be essential components of effective professional development programs in the way they support the development of new skills and facilitate the changes advocated in the programs.[364]

Collective Participation

In-service training in which teachers were told what to do and how to do it without follow-up did not produce long-term results, because teachers were reduced to the status of technicians with no part in initiating or planning the changes they were required to implement. There must be a shift from the traditional notion of knowledge dissemination to one of knowledge-sharing among educators.[365] As such, former researchers recognized the needs of the adult learner to be actively engaged in the learning. Current researchers view learning as a process requiring support and feedback, not a single event.[366] Today, collective participation emphasizes professional collaboration as an important means to achieve the mission and vision of the organization.

Collective participation occurs in an open and reflective learning environment whereby teachers are provided opportunities to evaluate their practice in a supportive and collegial manner. In this

[359] Desimone, L.M., Porter, A.C., Garet, M.S., Yoon, K.W., & Birman, B.F. (2002). Effects of professional development on teachers' instruction: results from a three-year longitudinal study. *Educational Evaluation and Policy Analysis, 24* (2), 81-112.
[360] Ingvarson, L., Meiers, M., & Beavis, A. (2005).
[361] Jeanpierre, B., Oberhauser, K., & Freeman, C. (2005). Characteristics of professional development that effect change in secondary science teachers' classroom practices. *Journal of Research in Science Teaching, 42*(6), 668-690.
[362] Garet, M., Porter, A., Desimone, L., Birman, B., & Yoon, K. (2001).
Ingvarson, L., Meiers, M., & Beavis, A. (2005).
[363] Cohen, D., & Hill, H. (2000).
[364] Guskey, T. R. (2002). Professional development and teacher change. *Teachers and Teaching: Theory and Practice, 8*(3/4), 381-391.
[365] Darling-Hammond, L. & McLaughlin, M. W. (1995). Policies that support professional development in an era of reform. *Phi Delta Kappan, 76*(8), 597-604.
[366] Thomas, E. (2008). Thoughtful planning fosters learning transfer. *Adult Learning* 18 (3), 4-8.

knowledge-sharing environment, teachers have opportunities to share what they know, discuss what they want to learn, and connect new concepts and strategies to their own unique contexts. Thus, to maximize the teacher learning outcomes in content and pedagogy, professional development should be participant-driven, grounded in inquiry, reflective, and experimental. In addition, blocks of time should be allocated for teacher collaboration and work. Finally, new initiatives should be supported through modeling, coaching, and collective problem-solving.[367]

Powerful cases of teacher collaboration can be seen in Shanghai. There has been an increase in formal in-service education based on the existing collaborative professional development model embedded in the school structure. Chinese teachers, even at the primary level, are organized into teacher research groups, in which all members teach the same subject. The teachers share office workspace, schedule common planning and meeting time, and have rich opportunities for interaction with others. Each teacher research group is led by a teacher identified as one of the best in that subject. With a focus on improving their practices, members of teacher research groups discuss ways to teach the subject, observe one another in class, organize in-service education, and mentor new and pre-service teachers. The groups meet after students have completed their exams to determine where the weak points were and how to improve those areas. Novice teachers teach public lessons that are critiqued by their colleagues.[368]

Over the years, a number of teacher development practices have emerged in China, many of which have become standard practice; for instance, "lesson research," which includes collective lesson preparation, lesson observation, and post-observation conferencing; "open lessons," which are demonstration lessons; and one-on-one "the old guiding the young" mentoring practice.[369] However, in the United States, mentoring and induction systems often are narrow and sporadic add-ons to non-collaborative organizational structures.[370] American teachers work in "egg-crate" classrooms and have less time to interact with their peers or with mentors.[371] Mentors frequently do not teach the same subject or grade level as their novice teachers and may not even teach in the same building. All of these factors affect the kinds and depth of collaboration that is possible.[372]

BALANCING CENTRALIZATION AND DECENTRALIZATION: ACCOUNTABILITY AND AUTONOMY

In the United States, publicly funded mass schooling that is highly localized and decentralized has a long history. The United States Constitution does not include education among the functions of the federal government, and the responsibility of schooling is left to the 50 individual states. The states, in turn, delegate substantial responsibility to local districts in which the students and their families reside, with school boards serving as the governing body. Since the mid-twentieth century, as federal and state influence over districts and schools has grown and external accountability has increased in the form of learning standards and standardized testing, local control is gradually dissipating, and districts and

[367] Darling-Hammond, L. & McLaughlin, M. W. (1995).
Jeanpierre, B., Oberhauser, K., & Freeman, C. (2005).
Thomas, E. (2008).
[368] Preus, B. (2007).
[369] Tsui, A. B. M. & Wong, J. L. N. (2009). In Search of a Third Space: Teacher Development in Mainland China. In C. K. K. Chan & N. Rao (Eds.), *Revisiting the Chinese Learner: Changing Contexts, Changing Education* (pp. 281-311). Hong Kong: Comparative Education Research Centre/Springer Academic Publishers.
[370] Preus, B. (2007).
[371] Strauss, V. (2011). *Teacher training: U.S. vs. Finland, Singapore, & China.* Available at http://gideonlearning.wordpress.com/2011/03/28/teacher-training-us-vs-finland-singapore-china/.
[372] Preus, B. (2007).

schools are no longer the autonomous bodies they once were. Despite these changes, the United States educational system remains far more decentralized than many other countries.[373]

The educational reform initiatives in the top-performing Asian countries—Singapore, Shanghai, and South Korea—have become more "American" by becoming increasingly decentralized and learner-centered. Meanwhile, the United States reforms are moving in precisely the opposite direction.[374] 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. Yong Zhao, an internationally known researcher who focuses on the implications of globalization on education, has commented that "the current or proposed reform initiatives—centralized curriculum, standardized testing, accountability, required courses of study—could kill creativity, the United States' real competitive edge."[375] Paul Houston, a well-known author in the field of physical chemistry, commented that the United States should "rediscover its competitive edge, not by becoming more like the Asians, but by becoming more like Americans."[376]

European and Asian countries which have sustainably improved student learning have done so by focusing intensively on creating curriculum and assessments targeting the so-called 21st century skills: the abilities to find and organize information to solve problems, frame and conduct investigations, analyze and synthesize data, apply learning to new situations, self-monitor and improve one's own learning and performance, communicate well in multiple forms, work in teams, and learn independently.[377] An example of Asian countries' "Americanization" is Singapore's move 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. This is exemplified by their national education slogans, "Thinking Schools, Learning Nation" and "Teach Less, Learn More."[378]

Chinese educational reforms at national, provincial, and local levels are attempting to decrease the density of curriculum, encourage teachers to adopt more student-centered inquiry and problem-solving activities, empower teachers with more autonomy, and encourage teachers to be more innovative and flexible with curriculum to better meet the needs of the students. In contrast, the reform in the United States is driving its educational system toward centralization of elementary and secondary education and is increasingly becoming more test-oriented.

Finnish teacher education programs are able to attract ten applicants for every opening; meanwhile, the teacher compensation is not as high as some other countries. How has Finland managed to make teaching the most desirable career choice? The major reasons teaching is such an attractive profession

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[373] Ingersoll, R. M. (Ed.). (2007).
[374] Preus, B. (2007).
Tan, J., & Gopinathan, S. (2000). Education Reform in Singapore: Towards Greater Creativity and Innovation? *NIRA Review*(6), 5-10.
Zhao, Y. (2009). *Catching Up or Leading the Way: American Education in the Age of Globalization.* Alexandria, VA: ASCD.
[375] Zhao, Y. (2006). Are we fixing the wrong things? *Educational Leadership, 63*(8), 28-31. p. 30.
[376] Houston, P. D. (2006). Barking up the right tree. *Phi Delta Kappan, 88*(1), 67-69. p. 67-69.
[377] Darling-Hammond, L., & McCloskey, L. (2008).
[378] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).

for talented young people are the autonomy, respect, and trust that this profession receives.[379] PISA data found that while external accountability is in place, the countries in which schools have greater autonomy over curriculum, assessment, and allocation of resources, tend to have better student performance than those countries with less autonomy. However, in countries where there are no external accountability policies, the reverse is true.[380] Although almost all the top-performing countries have a nation-wide core curriculum, the curriculum is not detailed and prescriptive. It is usually ten pages long and functions more as a framework, giving educators the latitude to decide what they will teach and how they will teach it. For instance, in Finland, teachers select their own textbooks and other instructional materials. In Shanghai, teachers are beginning to enjoy the same autonomy.

Although it may seem counterintuitive to those accustomed to external testing as a means of accountability, Finland's use of school-based, student-centered, open-ended tasks embedded in the curriculum is touted by its leaders as an important reason for the nation's extraordinary success on international exams. The current Finnish national core curriculum is a much leaner document, reduced from hundreds of pages of highly specific prescriptions to descriptions of a small number of skills and core concepts each year. This guides teachers in collectively developing local curriculum and assessments that encourage students to be active learners who can find, analyze, and use information to solve problems in novel situation.[381]

The traditional education system in China is often criticized for its emphasis on conformity, being highly examination-oriented, discouraging students' creativity development, and authoritarian teachers for whom the rigid and centralized curriculum is a more important agenda than catering to individual differences among students.[382] Preus observed that national education reform in China since 2001 is moving its educational system toward decentralization of elementary and secondary education.[383] The Chinese government has begun to loosen its control over curriculum and assessment. For instance, the central government used to have complete control over the development and selection of textbooks. Under new guidelines intended to stimulate innovation and creativity, teachers at the provincial, local, and school levels are beginning to enjoy the autonomy to develop and select textbooks.[384] China is striving to establish a "quality-oriented" rather than a "test-oriented" system.[385] This reform is considered to be one of the most ambitious and far-reaching sets of changes to schooling in recent Chinese history.[386] In addition to overhauling objectives and content of curriculum materials, the reform calls for a paradigm shift in educational philosophy and a corresponding transformation in teaching practices at the classroom level. This represents a significant shift from traditional Chinese teacher practices, which focused primarily upon memorization, drill, and the use of prescribed textbooks, to practices that foster individuality, self-expression, inquiry, and creative thinking skills.

[379] OECD. (2010). *PISA 2009 results: What makes a school successful?* (Volume IV).
[380] Ibid.
[381] Darling-Hammond, L., & McCloskey, L. (2008).
[382] Cheng, V. M. Y. (2004). Progress from traditional to creativity education in Chinese societies. In S. Lau, A. H. H., Hui. And G. Y. C., Ng (Eds.). *Creativity: When east meets west* (pp. 137-168). River Edge, NJ: World Scientific Publications.
[383] Preus, B. (2007).
[384] Ibid.
[385] Ibid.
[386] Sargent, T. C. (2006). *Institutionalizing educational ideologies: Curriculum reform and the transformation of teaching practice in rural China.* Unpublished doctoral dissertation, University of Pennsylvania, Philadelphia.

The guidelines of this nationwide reform, as drafted by the Ministry of Education, call for: [387]

- A move away from pure knowledge transmission towards fostering learning attitudes and values.
- A move away from discipline-based knowledge towards more comprehensive and balanced learning experiences.
- A move away from pure "bookish" knowledge towards improving the relevance and interest in the content of a curriculum.
- A move towards increased student participation, real-life experience, capacity in communications and teamwork, and ability to acquire new knowledge and to analyze and solve problems.
- A deemphasizing of the screening and selective functions of assessments and, instead, an emphasis on their formative and constructive functions.
- A move away from centralization to leave room for adaption to local relevance and local needs.

RENEWED FOCUS ON K-12 STEM EDUCATION (SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS)

The primary driver of future global knowledge economy and concomitant creation of jobs is innovation, largely derived from science and engineering advances.[388] In the foreseeable future, increasing numbers of jobs in all fields will require knowledge of STEM.[389] A successful K-12 STEM education is essential to sustainable scientific leadership and economic competitiveness.[390] However, research suggests many Virginia students are not prepared for the demands of today's economy or that of the future; the state of STEM learning in Virginia is warrants concern. For example, according to the National Assessment of Education Progress, about 57 percent of Virginian 4th graders are not proficient in mathematics when they complete 4th grade, and about 68 percent 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.[391] 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 subjects with qualified teachers. In particular, schools in high-poverty communities often do not have access to knowledgeable teachers in these fields.[392] There are many mathematics and science teachers who lack the level of preparation in the subject areas and teaching of them that the

[387] OECD. (2010). *Strong performers and successful reformers in education.*
[388] National Academy of Sciences, National Academy of Engineering, & Institute of Medicine. (2007). *Rising above the gathering storm revisited: Rapidly approaching category 5.* Washington, DC: The National Academies Press.
[389] Lacey, T. A., & Wright, B. (2009). Occupational employment projections to 2018. *Monthly Labor Review, 132*(11), 82-123.
[390] President's Council of Advisors on Science and Technology. (2010). *Prepare and inspire: K-12 education in science, technology, engineering, and math (STEM) for America's future.* Washington, DC: Author.
[391] National Research Council. (2011a). *Successful K-12 STEM Education: Identifying Effective Approaches in Science, Technology, Engineering, and Mathematics. Committee on Highly Successful Science Programs for K-12 Science Education.* Board on Science Education and Board on Testing and Assessment, Division of Behavioral and Social Sciences and Education. Washington, DC: The National Academies Press.
[392] President's Council of Advisors on Science and Technology. (2010).

professional community deems adequate. Too many middle and high school teachers teach STEM subjects out of their field.[393] For instance, a 2008 study indicated that 40 percent of mathematics classes in high-poverty schools were taught by out-of-field teachers.[394]

Employers in many industries lament that job applicants lack the needed mathematics, computer, and problem-solving skills to succeed. International students fill an increasing portion of elite STEM positions in the United States. In 2007, international students constituted more than a third of the students in United States science and engineering graduate schools, and more than 70 percent of those students remain in the United States to work after earning their degrees.[395]

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. 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 of degrees in China, India, and Japan.[396]

In addition, the problem of out-of-field teaching, where teachers educated and trained in one field are assigned to teach classes in another field, is much more severe in the United States, especially in secondary STEM subject areas.[397]

- Over one-third of all secondary school mathematics teachers in the United States do not have a major in mathematics, mathematics education, or a related discipline such as engineering, statistics, or physics.
- Over one-third of all those teaching secondary school English classes do not have a major in English or related subjects such as literature, communications, speech, journalism, English Education, or reading education.
- Twenty-nine percent of all those teaching secondary school classes in any science do not have a college major in any one of the sciences or in science education

There is a broad spectrum of strategies that Virginia can implement to ensure there will be a sufficient supply of human capital for the state's growth and development in an increasingly science- and technology-driven world. Countries that are high-performing in science and math demonstrate several aspects of practice are crucial to student learning:

- A rigorous and coherent curriculum that deepens STEM learning over time—International comparison data suggests the underperformance of United States students in STEM disciplines might be explained by differences in United States standards, curricula, and textbooks. Traditionally, the standards and curriculum in the United States have been broad but superficial. Current initiatives on the Common Core State Standards for mathematics[398] and the

[393] Ingersoll, R., & Perda, D. (2010). Is the supply of mathematics and science teachers sufficient? *American Educational Research Journal, 47*(3), 563-594.
[394] Ingersoll, R. (2008). *Core problems: Out-of-field teaching persists in key academic courses and high-poverty schools.* Washington, DC: Education Trust.
[395] National Academy of Sciences, National Academy of Engineering, & Institute of Medicine. (2007).
[396] Kuenzi, J. J. (2008). *Science, technology, engineering, and mathematics (STEM) education: Background, federal policy, and legislative action.* Congressional Research Service. Retrieved from http://www.fas.org/sgp/crs/misc/RL33434.pdf.
[397] National Research Council. (2011a).
[398] Common Core State Standards Initiative. (2010). *Common core state standards for mathematics.* Retrieved from http://www.corestandards.org.

Conceptual Framework for New Science Standards[399] may be useful in developing curriculum that focuses on important concepts and skills with depth.

- Alignment among curriculum, instruction, and assessment —International data indicates that the majority of United States students receive less rigorous content coverage than those in other higher performing countries.[400] Research evidence supports the adoption of rigorous curriculum standards and the alignment of classroom instruction and assessments to those standards as a way to lead student achievement gains.[401]
- Teachers who are more prepared to teach in the STEM disciplines —Finnish students' success in STEM subjects is largely due to consistent efforts focusing on teacher preparation, professional development opportunities, and materials shown to be relevant to the curriculum. This practice is corroborated by research evidence which showed that the extent to which prospective teachers are prepared to use the mathematics curriculum that they will be teaching has a significant effect on their students' achievement when they begin teaching.[402]
- Teachers with high capacity to teach in their disciplines —Teachers need solid content knowledge to be effective in the classroom, especially at the secondary level.[403] In the United States, a high percentage of teachers who teach science and mathematics courses are not certified in the subjects they teach and did not major in a related field in college.[404]
- The relationship between teacher certification in mathematics and students' mathematics achievement—Research has shown that students whose teachers had bachelor's degrees in mathematics achieved more in mathematics than students whose teachers had bachelor's degrees in non-mathematics subjects.[405] [406]
- A supportive system of assessment and accountability —Current assessments, with its focus on multiple-choice items and fact memorization, are limiting teachers' motivation and ability to

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[399] National Research Council. (2011). *A framework for K-12 science education: Practices, crosscutting concepts, and core ideas.* Washington, DC: The National Academies Press.

[400] Darling-Hammond, L. (2010).

[401] Schmidt, W. H. (2011). *STEM reform: Which way to go?* Paper presented at the National Research Council workshop on successful STEM education in K-12 schools. Retrieved from http://www7.nationalacademies.org/bose/STEM_Schools_Schmidt_Paper_May2011.pdf.

[402] Boyd, D. J., Grossman, P. L., Lankford, H., Loeb, S., & Wyckof, J. (2009). Teacher preparation and student achievement. *Educational Evaluation and Policy Analysis, 31*, 416-440.

[403] Hill, H. C., Rowan, B., & Ball, D. L. (2005). Effects of teachers' mathematical knowledge for teaching on student achievement. *American Educational Research Journal, 42*, 371-406.

Harris, D. N., & Sass, T. R. (2007). *Teacher training, teacher quality and student achievement.* Washington, DC: National Center for Analysis of Longitudinal Data in Education Research. Retrieved from www.caldercenter.org/PDF/1001059_Teacher_Training.pdf.

Rowan, B., Chiang, F.S., & Miller, R. J. (1997). Using research in employees' performance to study the effects of teachers on student achievement. *Sociology of Education. 70*, 256-284.

[404] National Research Council. (2010b). *Preparing teachers: Building evidence for sound policy.* Committee on the Study of Teacher Preparation Programs in the United States. Washington, DC: The National Academics Press.

[405] Goldhaber, D. D., & Brewer, D. J. (1997a). Evaluating the effects of teacher degree level on educational performance. In W. J. Fowler (Ed.), *Developments in school finance, 1996* (pp. 197-210). Washington, DC: National Center for Educational Statistics, U.S. Department of Education.

Goldhaber, D. D., & Brewer, D. J. (2000). Does teacher certification matter? High school certification status and student achievement. *Educational Evaluation and Policy Analysis, 22*(2), 129-145.

[406] Darling-Hammond, L., Holtzman, D. J., Gatlin, S. J., & Heilig, J. V. (2005). Does teacher preparation matter? Evidence about teacher certification, Teach for America, and teacher effectiveness. *Educational Policy Analysis Archives, 13*(42). Retrieved from http://epaa.asu.edu/epaa/v13n42/v13n42.pdf.

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teach in ways that are known to promote learning of scientific and mathematical content and practices.

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XI. Dedication

YVONNE B. MILLER
1934-2012

This report is dedicated to the late Senator Yvonne B. Miller who served as chair of the Commission on Youth in 2010 and 2011. Her foresight led to the adoption of a two-year study currently being conducted by the Commission to compare academic achievement of Virginia students with students in other leading industrialized countries. Senator Miller understood the value of education and knew that Virginia's future depended on investments in its young people.

As a founding member of the Virginia Commission on Youth (1991), Senator Miller served as a constant voice for children. She always supported and stood with families. She took great pride in speaking for those who did not otherwise have a voice. As a long-time supporter of kinship care, Senator Miller fought for families who were doing their best to take care of the children of other family members. She served on the Commission's Kinship Care Advisory Group, as well as kinship care committees of the Department of Social Services and Department of Aging. This year, as a direct result of her tireless efforts, Virginia will implement custody assistance, and this will become a part of her legacy.

Her passing was not only a great loss to the Virginia Commission on Youth and the General Assembly, but also a great loss to all citizens of the Commonwealth.

Appendix A

Educational System Attributes: The Netherlands

A sixth country, The Netherlands, was added upon the request of the Virginia Commission on Youth during the preliminary presentation made in December 2011. The Netherlands ranked at the 10th in reading, 12th in mathematics, and 11th in science in the 2009 PISA. In addition, in Grade 4 TIMSS, The Netherlands ranked at the 9th. These outcomes are remarkably higher than the average. An education profile for The Netherlands is provided below.

Table 1

General Information and Background of The Netherlands

Population	16.6 million [407]
GDP per capita	$42,300[408]
Number of Schools[409]	
Primary	6,993
Secondary	659
Special Schools	327
Postsecondary	
Vocational	50
University	13
Total students[410]	
Primary	1,534,362
Secondary	939,629
Special Schools	68,765
Postsecondary	
Vocational	416,934
University	241,686
Demographics: Predominantly Dutch. Major minority groups include Moroccans, Turks, Surinamese and Dutch Caribbean.	

PISA 2009 Results
Reading: 508
Math: 526
Science: 522
Scores are above the United States' averages in all subjects, but below all comparison countries in all subjects.

Number of schools and enrollment

Only one-third of the educational system in the Netherlands is completely state run, while the remaining two-thirds are organized by what are called "special schools," which are religious schools similar to private schools, but still publicly funded. Special schools are required to adhere to a national curriculum but are allowed to decide how to teach the content, as well as teach any additional content.

The school system is comprised of 6,993 primary schools serving approximately 1.5 million students, 659 secondary schools serving approximately 900,000 students, and 63 postsecondary schools serving approximately 650,000 students.[411]

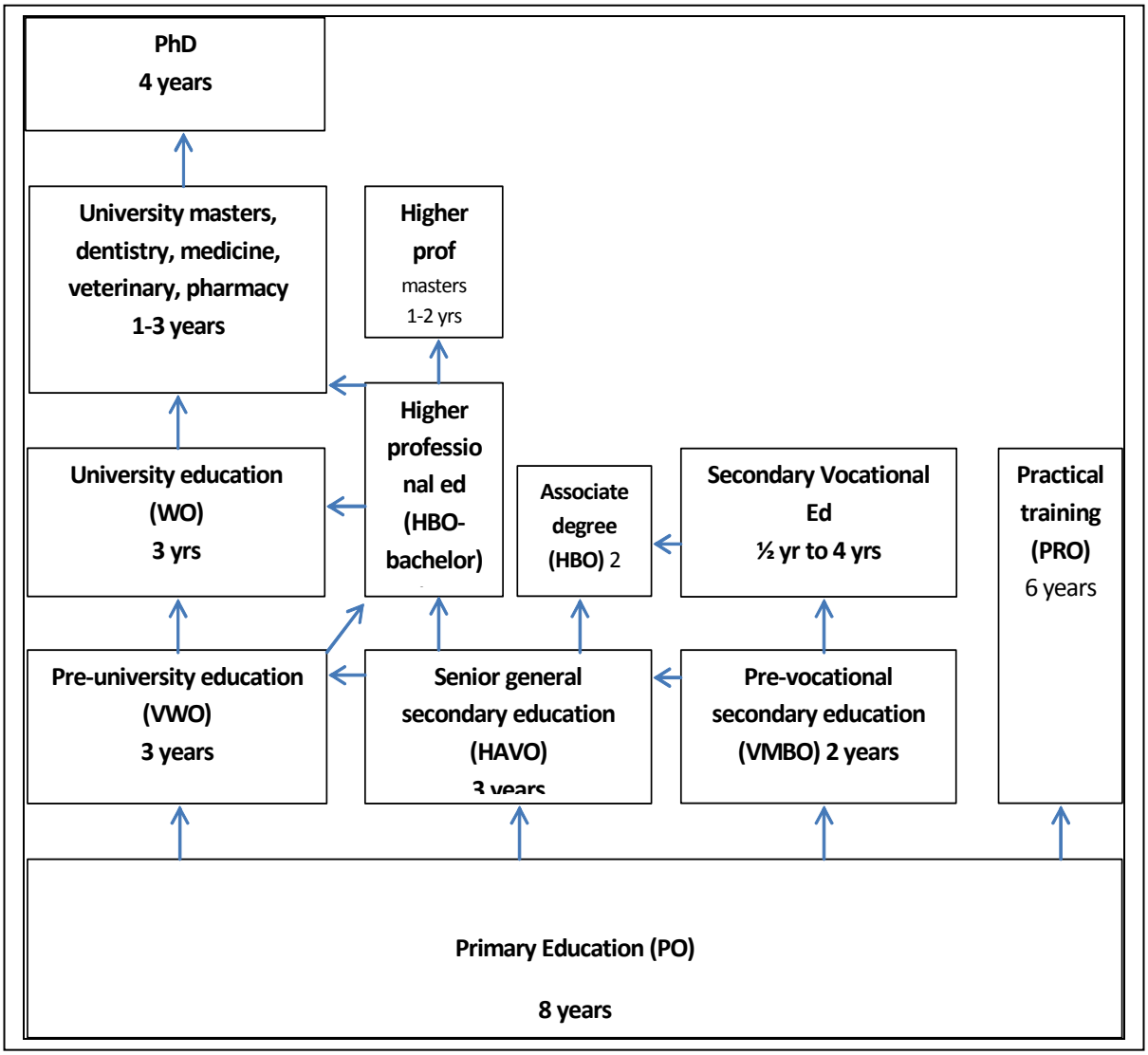
Education is compulsory, beginning no later than age five, although most Dutch children begin at age four, and lasting for 12 years. Following eight years of primary education, students choose one of the

[407] U.S. Department of State. (2011). *Background notes: The Netherlands.* Retrieved from http://www.state.gov/r/pa/ei/bgn/3204.htm.
[408] Ibid.
[409] Statistics Netherlands. (2012). *Education financing, education expenditure and CBS/OECD indicators.* http://statline.cbs.nl/StatWeb/publication/?VW=T&DM=SLEN&PA=80393ENG&LA=EN
[410] Ibid.
[411] Statistics Netherlands. (2012).

following more specialized secondary tracks: VMBO (pre-vocational four-year track), HAVO (general secondary education 5-year track), or VWO (pre-university 6-year track).[412] If a student's track is completed prior to satisfying the 12-year requirement, that student must continue to take classes at least two days a week.

Figure 1

The Netherlands Education Structure[413]



Education Finance

Public and special schools in the Dutch education system are publicly funded, with additional, optional contributions provided by families. Public expenditure per student in primary and secondary schools

[412] Government of the Netherlands. (n.d.). http://www.government.nl/issues/education.
[413] Dutch Eurydice Unit. (2007). *The Education System in the Netherlands 2007*. The Hague, Netherlands: Ministry of Education, Culture and Science.

amounted to $9,251 per student and, in tertiary education, $17,245 per student.[414] In 2010, public expenditure on education was 5.9 percent of the GDP (Statistics Netherlands, 2012). Each public and special school is allocated a specific discretionary budget from the government, based on number of students. Additional government educational funds are provided to primary and secondary schools as an incentive to their admitting socio-economically challenged students. Further, public and special schools cannot charge any additional tuition, but are permitted to use religious criteria in the admission process.

Parents are free to choose which schools their children attend and the public funding for schools follows the student.[415] Primary and secondary education is free and postsecondary education is virtually free, so long as the student completes the program. In the Dutch tertiary education, the virtually free education is provided through a series of loans provided to students each month; however, the repayment of the loans is contingent upon the completion of the compulsory education within the respective time period. Students who complete compulsory programs within provided time periods are not required to repay the education loans provided by the government (Statistics Netherlands, 2012).

Brief History of the Educational System

Although a new Constitution was adopted by The Netherlands in 1848 which granted the freedom to provide education, the government refused to fund private schools in an attempt to keep education funding nondenominational. Protestants and Catholics strongly advocated for denominational schools that were still funded by the government. By 1917, an agreement was reached, and the Constitution was amended to provide all primary schools with public funding, regardless of denomination. This public funding of all schools, regardless of denomination, was eventually extended to all tracks of Dutch education. The term "special schools" was given to religious schools receiving government funding. Although these schools were allowed to determine the content and how it was taught, they are still required to abide by the basic curriculum provided by the Ministry of Education, Culture and Science. Currently, more than two-thirds of schools in The Netherlands are publicly-funded special schools. The Dutch school system is a strong proponent of providing discretionary funds to schools and leaving all of the decision-making to the schools themselves (Ministry of Education, Culture and Science, 2007).

School Turnaround Strategy

In response to a growing shortage of secondary teachers, the Dutch Department of Education, Culture and Science developed an action plan focusing on new policy for retaining high-quality teachers and recruiting new high-quality teachers. The action plan focuses on the improvement of rewards and professionalism of teachers, highlighting the following major recommendations: [416]

- Rewards in salary and benefits will reflect performance and results, especially in the secondary and senior secondary education fields.
- Salary supplements will be introduced as incentives to recruit more teachers in the junior/vocational track of secondary education, as well as for teachers already being paid the maximum salary, but still performing well.
- Increased salaries of school managers.
- The development of a private professional teacher registry.

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[414] OECD. (2011). *Country statistical profile: Netherlands, Country statistical profiles: Key tables from OECD.* doi: 10.1787/csp-nld-table-2011-1-en.

[415] Frontier Centre for Public Policy. (2003). *Frontier background brief analysis: The public school market in the Netherlands: Money follows the child.* Retrieved from http://www.fcpp.org/pdf/FB16%20Dutch%20School%20Model.pdf.

[416] Department of Education, Culture and Science. (2008). *Teachers matter: tackling the teacher shortage and improving the position and quality of teachers in the Netherlands.* Retrieved from http://english.minocw.nl/documenten/Actieplan_LeerKracht_ENGDEF.pdf.

- Increased funding for training grants and professional development.
- Agreements will be made to alleviate teacher's workloads to allow teachers to focus more on teaching.
- "Fast Tracks" will be used to recruit qualified teachers from various fields, including post-graduate students, in order to address the immediate shortage of teachers.

The government is attempting not only to increase the salary and possible supplements for teachers, especially in needed fields, but also attempting to increase the professionalism of teachers by having them dictate the requirements to be a teacher.

Appendix B

Listing of Tables and Figures

TABLES

FIGURES

Appendix C

References

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