COMMONWEALTH OF VIRGINIA

Commission on Youth

Comparison of Academic Achievement in Virginia to Leading Industrialized Nations

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Presentation Outline

- Study Mandate
- Identified Issues
- Study Activities

Study Mandate

- During the 2011 General Assembly Session, Senator Yvonne B. Miller introduced Senate Joint Resolution 320 requesting the Commission on Youth (COY) to study how Virginia school children compare academically to students in other countries.

- While Senator Miller's resolution did not pass, the COY adopted a two-year work plan for the *Comparison of Academic Achievement in Virginia to Leading Industrialized Nations.*

Study Mandate (cont.)

- Work Plan directs COY to:
  - compare the academic achievement of Virginia's students to that of students internationally for the past five years, especially in reading, math, and science;
  - identify features in the education systems of high-performing countries which rank higher than the U.S. in their students' international assessment scores;
  - determine whether any of the high-performing countries' educational features are best practices and appropriate for use in Virginia; and
  - consider other matters related to the objectives of this resolution and recommend feasible and appropriate options and alternatives.

Identified Issues

International Comparisons

- There is increasing attention to U.S. students' performance on international assessments.
- The rankings of high performing countries are emphasized, as is progress over time, gaps, and implications about future economic competitiveness.
- Both the U.S. Department of Education and states are looking to top performing countries for lessons on success.

Source: National Conference on Student Assessment. (2011). *Exploring the World of Assessments from a State's Perspective.*

Identified Issues (cont.)

- Virginia's high school graduates are entering a global job market where highly skilled workers are in increasing demand.
- Educators, policymakers, and stakeholders have increased their focus on grades, standardized test scores, course selection, dropout rates, and college completion rates.
- Employers have related concerns with the U.S. education system.

Identified Issues (cont.)

- The National Alliance of Manufacturing surveyed 800 participating companies to assess whether the U.S. K-12 system was doing a good job preparing students for the workplace.
  - 84% indicated “no”.
  - 93% of the Aerospace and Defense segment reported “no”.
- The top three most frequently-cited deficiencies of the education system were:
  - basic employability skills;
  - math and science; and
  - reading and comprehension.

Source: National Association of Manufacturers, Manufacturing Institute’s Center for Workforce Success & Deloitte Consulting. (2005). *2005 Skills Gap Report - A Survey of the American Manufacturing Workforce.*

Identified Issues (cont.)

Science, Technology, Engineering, and Math (STEM) Education

- Significant segment of STEM workforce is approaching retirement age.
- < 30% of high school students report interest in STEM-related majors.
- < 17% of post-secondary degrees awarded in the U.S. are in STEM.
- Other countries' post-secondary degrees awarded:
  - Japan – 64%
  - China – 52%
  - South Korea – 41%
  - Russia – 33%
  - UK – 26%

Source: ACT (2010); National Science Foundation, (2006); North Carolina School of Science and Mathematics, (2011).

Identified Issues (cont.)

- STEM workforce accounts for more than 50% of the nations sustained growth.

- Careers in STEM-related fields will increase by 18% from 2008 to 2018.

Source: U.S. Department of Labor (2007); U.S. Bureau of Statistics, as cited by North Carolina School of Science and Mathematics, (2011).

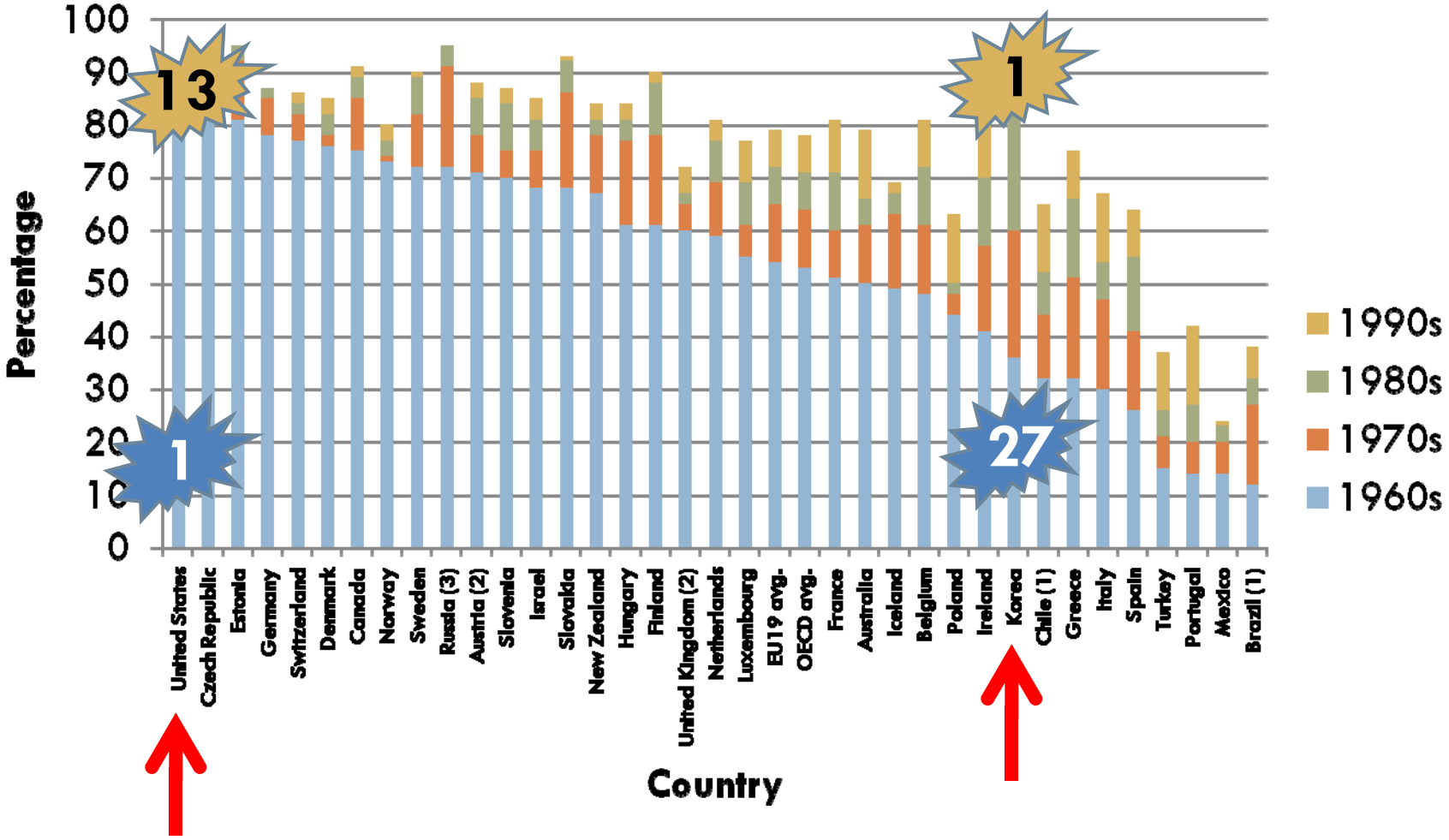
Identified Issues (cont.)

- 43% of students nationally are college ready in math, based on ACT Exam.
- 29% of students nationally are college ready in biology based on ACT Exam.
- Less than 10% of students nationally are taking AP math and science exams.

Source: ACT (2010); College Board (2010), as cited by North Carolina School of Science and Mathematics, (2011).

The U.S. is Falling Behind in HS Graduation Rates

Approximate percentage of persons with high school or equivalent qualifications in the age group 25-64
Year of Reference 2004



Source: Organization for Economic Co-operation and Development (OECD), *Education at a Glance 2008.*
Guthrie, J. (2011). National Conference for State Legislatures Presentation. *Is America Getting Its Money's Worth?: Schools and Productivity?*

Identified Issues (cont.)

- National level data on student achievement in the U.S. comes from two sources:
  - National Assessment of Educational Progress (NAEP)—also known as the "Nation's Report Card"
  - International assessments
    - Trends in International Mathematics and Science Study (TIMSS)
    - Program for International Student Assessment (PISA)
    - Progress in International Reading Literacy Study (PIRLS)

Identified Issues (cont.)

NAEP

- Each state has developed its own assessment of student progress, but the tests differ so much that there is no way to reasonably compare students based on exam results.
- In response, the NAEP was developed and is now the most widely cited data source of student achievement in the U.S.
  - The NAEP is a nationally representative assessment of U.S. students.
  - The NAEP is administered periodically to students in grades 4, 8, and 12 in math, science, and other subjects.

Source: Organization for Economic Cooperation and Development. (2011). *Education at a Glance 2011: OECD Indicators.*

Identified Issues (cont.)

International Assessments

- **PISA** – The Program for International Student Assessment is given every 3 years to 15-year olds worldwide. The Organization 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 in 1995. The test is administered every 4 years. In 2007, approximately 60 countries participated.
- **PIRLS** – The Progress in International Reading Literacy Study assesses reading achievement in 4th graders in 50 different countries. PIRLS is conducted by the IEA. The PIRLS given in 2001 was the first in a projected cycle of testing that will occur every 5 years.

Source: Wilde, M. (2010). Global Grade: *How Do U.S. Students Compare?*

Educational Assessments

U.S. Assessment

	State NAEP	PISA	TIMSS	PIRLS
Assessment Name	National Assessment for Educational Progress	Program for International Student Assessment	Trends in International Mathematics and Science Study	Progress in International Reading Literacy Study
Responsible Organization	U.S. DOE, National Center for Education Statistics (NCES)	Organization for Economic Cooperation and Development (OEDC)	International Association for the Evaluation of Educational Achievement (IEA)	International Association for the Evaluation of Educational Achievement (IEA)
Subjects Tested	Reading, mathematics, writing, science, other	Reading, mathematics, writing, science, problem solving	Mathematics, science	Reading
Participating Jurisdictions	53 states and 21 urban districts	60 countries and 5 subnational entities in 2009	66 countries and 14 sub-national entities	55 countries and 7 subnational entities
Grade/Age Assessed	Grades 4 & 8, national results and some state-level results at grade 12	15-year olds	Grades 4 & 8	Grades 4
Number of Students Assessed	More than 900,000 students	More than 5,000 students in each participating jurisdiction/country	At least 4,000 students in each participating jurisdiction/country	3,500 to 4,000 students in each participating jurisdiction/country
Achievement Levels Reported	Basic, Proficient, Advanced	Reading has 7; Math & Science have 6.	Low, intermediate, high, advanced	Low, intermediate, high, advanced
Testing Cycle	NCLB requires states receiving Title I funding to participate in state reading and mathematics assessment every 2 years	Every 3 years, each assessment year focuses on 1 subject but the other 2 are also tested	Every 4 years	Every 5 years
Most Recent Test Results	2011; TIMSS Linking Study to be conducted in 2011	2009	2007 & scheduled for 2011	2006 & scheduled for 2011

Source: National Conference on Student Assessment. (2011). *NAEP, PIRLS, TIMSS, and PISA At A Glance.*

Identified Issues (cont.)

2011 NAEP – National Results

- NAEP test data show slight gains in math, but mixed results in reading, with 4th grade scores flat, compared to 2009 results.
  - In math, 4th graders and 8th graders scored, on average, 1 percentage point higher in 2011 than in 2009.
  - In reading, 4th grade scores did not change from 2009. 8th grade students scored an average of 1 point higher in 2011 than in 2009.
- Asian students, this year for the first time in their own category, had the highest scores of any single group.
- The overall achievement gap between Caucasian and African-American students showed no real change since 2009, with a 25-point gap in reading in 4th graders and 8th graders and in math among 4th graders.
- The gap between Hispanic and Caucasian 8th graders in reading and math closed slightly in 2011.

Source: National Assessment Education Program (NAEP). (2011).

Identified Issues (cont.)

Results from the 2011 NAEP – Virginia

- Virginia students continue to rank among the nation's highest achievers in reading and math and outperform their peers nationwide.
- Only three states, Massachusetts, New Hampshire, and New Jersey, had statistically higher 4th grade reading scores.
  - The percentage of 8th graders who met or exceeded the NAEP standard for proficiency increased by 4 points, to 40% percent in 2011.
  - By comparison, the national rate of 8th graders judged proficient is 34%.

Source: Virginia Department of Education. (2011).

Identified Issues (cont.)

Results from the 2011 NAEP – Virginia Math

8th Grade

- The percentage of 8th grade students who met or exceeded the NAEP standard for math proficiency increased to 40% in 2011, compared to 36% in 2009.
- The percentage of 8th graders achieving at the "advanced level" in math rose 3 points, to 11%.
- The "average" math score for students in 8th grade also increased by 3 points.

4th Grade

- The average math score for 4th grade students who met or exceeded the standard for math proficiency increased by 3 points to 46%– 6 points higher than the percentage nationwide.
- The percentage of 4th graders achieving at the "advanced level" in math rose from 7% in 2009 to 9% in 2011.
- The average math score of 4th graders was 5 points higher than the national average, and has increased 2 points since 2009.

Source: Virginia Department of Education. (2011).

Identified Issues (cont.)

Results from the 2011 NAEP – Virginia Reading

8th Grade

- The reading performance of Virginia 8th graders was flat, compared to achievement in 2009.
- 36% of 8th grade students performed at the "proficient level" or above in reading in 2011, a statistically insignificant increase since 2009.
- 8th grade students achieved an "average" reading score that was statistically similar to the 2009 state average.

4th Grade

- Reading achievement of 4th grade students in 2011 was statistically similar to performance on the 2009 test.
- 4th grade students achieved an "average" score of 226 in reading, which was significantly higher than the national average.

Source: Virginia Department of Education. (2011).

Identified Issues (cont.)

International Assessments

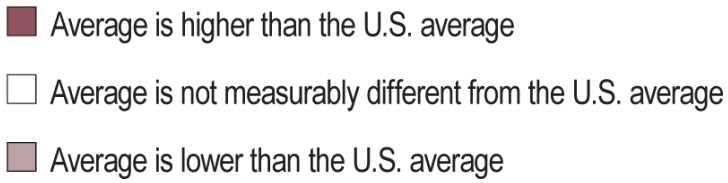
- U.S. students are not performing as well in math and science as are students in many other countries.
  - PISA 2009
    - U.S. ranks – 31st in math, 23rd in science
  - TIMSS 2007
    - U.S. ranks – 4th grade: 12th in math, 3rd in science
    - U.S. ranks – 8th grade: 28th in math, 17th in science
    - U.S. ranks – 12th grade: 19th in math, 16th in science

Source: OECD, as cited by North Carolina School of Science and Mathematics, 2011.

PISA 2009 Math

Mathematics literacy scale	
Country	**Score**
OECD average	496
OECD countries	
Korea, Republic of	546
Finland	541
Switzerland	534
Japan	529
Canada	527
Netherlands	526
New Zealand	519
Belgium	515
Australia	514
Germany	513
Estonia	512
Iceland	507
Denmark	503
Slovenia	501
Norway	498
France	497
Slovak Republic	497
Austria	496
Poland	495
Sweden	494
Czech Republic	493
United Kingdom	492
Hungary	490
Luxembourg	489
United States	**487**
Ireland	487
Portugal	487
Spain	483
Italy	483
Greece	466
Israel	447
Turkey	445
Chile	421
Mexico	419

- The U.S. average score of 487 is lower than the OECD average score of 496.
  - 17 OECD countries had higher average scores.
  - 11 were not measurably different.
  - 5 had lower average scores.



Source: Fleischman et al. (2010). *Highlights From PISA 2009: Performance of U.S. 15-Year-Old Students in Reading, Mathematics, and Science Literacy in an International Context.*
National Center for Education Statistics. (2010). *PISA 2009 Results.*

PISA 2009 Science

Science literacy scale	
Country	**Score**
OECD average	501
OECD countries	
Finland	554
Japan	539
Korea, Republic of	538
New Zealand	532
Canada	529
Estonia	528
Australia	527
Netherlands	522
Germany	520
Switzerland	517
United Kingdom	514
Slovenia	512
Poland	508
Ireland	508
Belgium	507
Hungary	503
United States	**502**
Czech Republic	500
Norway	500
Denmark	499
France	498
Iceland	496
Sweden	495
Austria	494
Portugal	493
Slovak Republic	490
Italy	489
Spain	488
Luxembourg	484
Greece	470
Israel	455
Turkey	454
Chile	447
Mexico	416

- The U.S. average score of 502 is not measurably different from the OECD average of 501.
  - 12 OECD countries had higher average scores.
  - 12 were not measurably different.
  - 9 had lower average scores.

Average is higher than the U.S. average

Average is not measurably different from the U.S. average

Average is lower than the U.S. average

Source: Fleischman et al. (2010). *Highlights From PISA 2009: Performance of U.S. 15-Year-Old Students in Reading, Mathematics, and Science Literacy in an International Context.*
National Center for Education Statistics. (2010). *PISA 2009 Results.*

PISA 2009 Reading

Combined reading literacy scale

Country	Score
OECD average	493
OECD countries	
Korea, Republic of	539
Finland	536
Canada	524
New Zealand	521
Japan	520
Australia	515
Netherlands	508
Belgium	506
Norway	503
Estonia	501
Switzerland	501
Poland	500
Iceland	500
United States	**500**
Sweden	497
Germany	497
Ireland	496
France	496
Denmark	495
United Kingdom	494
Hungary	494
Portugal	489
Italy	486
Slovenia	483
Greece	483
Spain	481
Czech Republic	478
Slovak Republic	477
Israel	474
Luxembourg	472
Austria	470
Turkey	464
Chile	449
Mexico	425

- The U.S. average score of 500 is not measurably different from the OECD average score of 493.
  - 6 OECD countries had higher average scores.
  - 14 were not measurably different from the U.S.
  - 13 had lower average scores.

Average is higher than the U.S. average

Average is not measurably different from the U.S. average

Average is lower than the U.S. average

Source: Fleischman et al. (2010). *Highlights From PISA 2009: Performance of U.S. 15-Year-Old Students in Reading, Mathematics, and Science Literacy in an International Context.*
National Center for Education Statistics. (2010). *PISA 2009 Results.*

TIMSS 2007

International Educational Scores – TIMSS 2007 8th Grade Average Scores					
Countries:	**Global Rank**	**Math**		**Science**	
		Rank	Score	Rank	Score
Singapore	**1**	3	593	1	567
Taiwan	**2**	1	598	2	561
South Korea	**3**	2	597	4	553
Japan	**4**	5	570	3	554
Hong Kong	**5**	4	572	9	530
Hungary	**6**	6	517	6	539
England	**7**	7	513	5	542
Czech Republic	**8**	11	504	7	539
Russia	**9**	8	512	10	530
Slovenia	**10**	12	501	8	538
United States	**11**	9	508	11	520
Lithuania	**12**	10	506	12	519
Australia	**13**	14	496	13	515
Sweden	**14**	15	491	14	511
Armenia	**15**	13	499	17	488
Italy	**18**	19	480	16	495

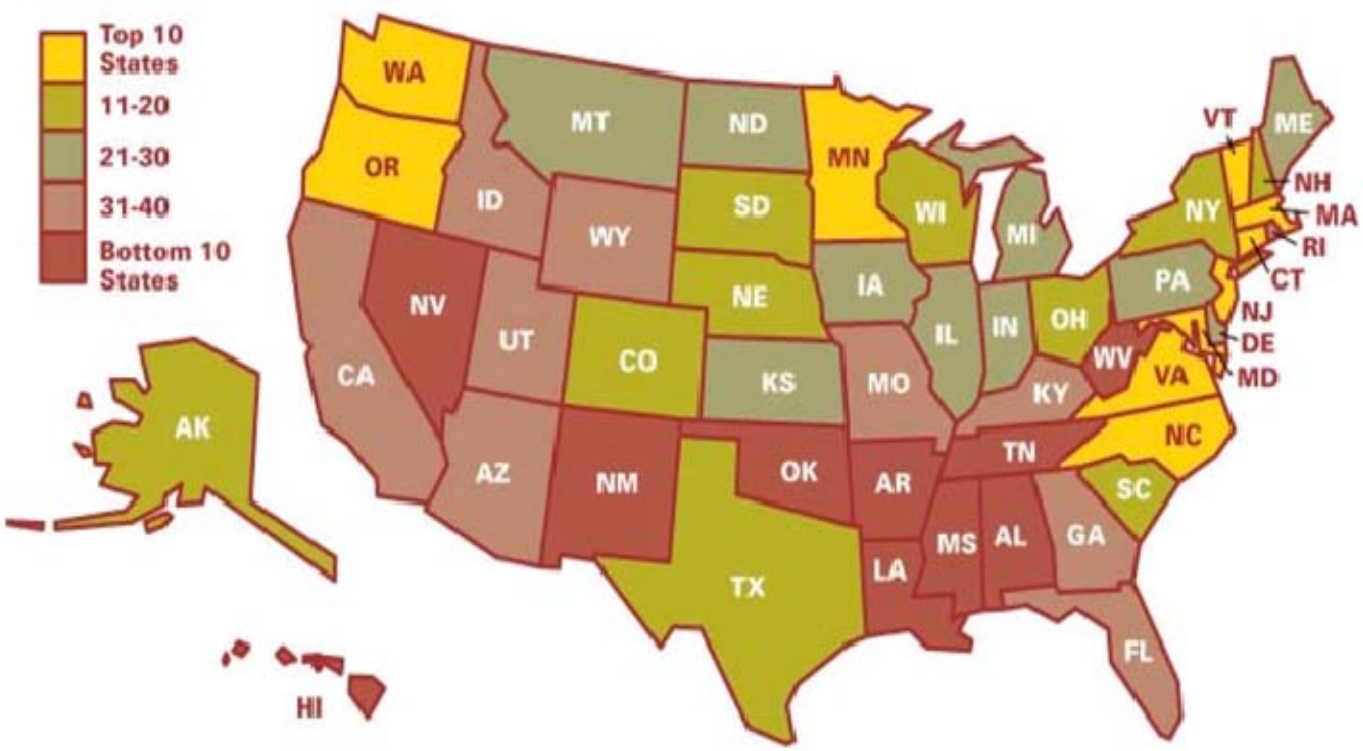
- Data from *TIMSS 2007* is consistent with the NAEP and PISA exams.
- U.S. Math Rank 8th Grade Students
  - 9th out of 48 participating countries
  - 7th out of 15 countries with advanced economies
- U.S. Science Rank 8th Grade Students
  - 11th out of 48 participating countries
  - 9th out of 15 countries with advanced economies
- Singapore Math Rank
  - 1st out of all participating countries for both 4th and 8th grade students

Identified Issues (cont.)

- A recent study provides a state-by-state comparison of PISA results.
  - The top performing state—Massachusetts—is behind 14 countries who participated in the PISA assessment;
  - Virginia is behind 22 countries whose students score “advanced levels” in math; however,
  - Virginia ranks 6th in the U.S.

Source: Virginia Department of Education Annual Report on the Condition and Needs of Public Schools in Virginia. (2011).

States' Ranking in Advanced Level Math*



*Findings compiled from PISA and NAEP results for the U.S. 2009 Graduating Class

Source: Hanushek, E.A., Peterson, P.E., & Woessmann, L. (2010). *Teaching Math to the Talented. Which Countries And States are Producing High Achieving Students?*

Identified Issues (cont.)

Positive Findings from International Assessments

- 99% of U.S. K-12 teachers meet state qualifications.
- The U.S. exceeds the OECD average at 1,068 class time hours for high school.
- Average U.S. class size remains lower that most other nations.
- Despite the high price of a college degree, graduates more than make up for it in future earnings and lower unemployment rates.
  - The unemployment rate for high school dropouts is 15.8%, but for college graduates it drops to 4.9%.
  - A college graduate earns about 87% more over their lifetime than a high school graduate who doesn't go to college.
- The U.S. ratings for college completion rates are based on the number of bachelors' degrees and does not include professional certificates.

Source: Organization for Economic Cooperation and Development. (2011). *Education at a Glance 2011: OECD Indicators.*

Identified Issues (cont.)

Numeric Rankings are misleading.

2000 PISA Reading results for 27 countries showed:

- U.S. ranking 15th for students aged fifteen, however:
  - 3 countries scores were significantly higher;
  - 19 countries scores were statistically no different; and
  - 4 countries scored significantly below the U.S.

Source: The Center for Public Education. (2007). *More than a Horse Race: A Guide to International Tests of Student Achievement*

Identified Issues (cont.)

Diverse Education Policies

- Finland's rank in the 2009 PISA 8th grade
  - 2nd in math, 1st in science, 2nd in reading
- Finland's Educational System
  - Teachers required to have master's degrees.
  - Students are separated into academic and vocational tracks for the last 3 years of high school.
    - 50% in each track
  - Diagnostic testing used early and frequently.
  - Teachers get one afternoon per week for professional development.
  - Few students in Finland speak a language other than Finnish
  - All schools receive identical per pupil funding.

Source: Wilde, M. (2010). Global Grade: *How Do U.S. Students Compare?*

Identified Issues (cont.)

- Diverse Education Policies

Singapore & U.S. Treatment of At-Risk Students

Singapore

- Supplementary after-school instruction lead by a specially-trained teacher (Grade 1+)
- Weaker math students identified for special track with more instruction and same content, but at a slower pace (Grades 5-6)
- Students streamed based on Primary School Leaving Exam (Grade 7+)

U.S.

- Compensatory education often taught by teacher aides
- No Child Left Behind holds students to same standards
- Hold schools rather than students accountable.

Source: U.S. Department of Education (2009). *Singapore Math: How It Can Help Improve U.S. Mathematics Learning*. Presentation to Maryland State Board of Education.

Study Activities

- Compile a “snapshot” comparing Virginia’s educational progress to other states
  - No Child Left Behind (NCLB) accountability scores
  - Graduation rates
  - Adequate Yearly Progress/Test scores
  - Highlights from high performing states
  - STEM initiatives
  - Practices from states that excel
  - Innovative methods used to measure students’ progress

Study Activities (cont.)

- Identify other countries' educational systems' attributes and best practices
  - Select countries that will best generate beneficial comparisons/contrasts
  - Select appropriate elements for comparison
    - Student data
    - Curriculum
    - System attributes
    - Educational outputs
  - Select data sources
    - TIMSS 2007/2011
    - PISA 2009
    - PIRLS 2011
    - 2011 NAEP/TIMSS Linking Study

Study Activities (cont.)

- Partner with the College of William and Mary School of Education to assist COY with country selection and analysis of comprehensive literature review for the international comparison.
  - Researchers in their School of Education will be visiting Shanghai schools on a related project during fall 2011, adding the opportunity for a site visit and interacting with their system face-to-face.
  - Their faculty is working with Virginia school divisions and other educational organizations to design and implement evaluation systems for teachers, administrators, and support personnel.

Study Activities (cont.)

Countries recommended for in-depth study

- Shanghai—While new to the international assessments, Shanghai has been a top performer according to PISA 2009 in all 3 categories.
- Canada—Proposed based on proximity to the U.S. and a similar decentralized educational system. It outscores the U.S. & its ranking is comparable to Japan and New Zealand.
- Japan—This nation is a consistent top performer across years, grades, and subjects according to TIMSS and PISA. It was selected due to its larger population and economic competitiveness.
- South Korea—Although South Korea only has secondary-school level data available on PISA and TIMSS, those data ranked in the top 2 in PISA Reading Grade 10 and TIMSS Math Grade 8, the top 4 in PISA Math Grade 10 and TIMSS Science Grade 8, and the top 6 in PISA Science Grade 10.
- Finland—This nation is consistently in the top 5 ranking and provides representation from Europe.
- New Zealand—New Zealand ranks 2nd, 3rd, and 5th on the PISA when compared with the 30 OECD countries. New Zealand ranks higher than other English-speaking countries, the U.K. and U.S.

Identified Issues (cont.)

Convene Advisory Group

Secretary of Education
Superintendent of Public Instruction
Representatives from Higher Education/Academia
Virginia Department of Education
Virginia School Boards Association
Virginia Association of School Superintendents

Virginia Association of Secondary School Principals
Alternative Education Representatives
Court Service Unit Representatives
Business Representatives
Industry & Technology Representatives
Parents/Students

Board of Education
Virginia PTA
Virginia Manufacturers Association
Career and Technical Education Officials

Virginia Education Association
Virginia Association of Elementary School Principals
Governor's Academies/STEM

Educators/Guidance Counselors
State Council of Higher Education
Virginia Community College System
Private School Representatives

Study Activities (cont.)

- Identify national/other states' policies
  - Common Core State Standards
  - Enhanced student assessment systems
  - Enhancing teacher performance
- Identify international/national best practices which can be adopted in Virginia
- Develop consensus
- Develop recommendations.
- Solicit feedback recommendations
- Present recommendations