

What Can Educators and Policymakers Learn from High-Performing Countries on International Assessments?

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Executive Summary

This report presents the findings of a literature review of research on high performing countries on international assessments. The report provides the contextual background for the interest in this topic and then an exposition of three international assessments and one national assessment in the United States. Then the report describes the recent history of educational reform, cultural attitudes toward education, governance of education, preparation and development of teachers, and curriculum and instruction of a selection of top-performing countries. It ends with a synthesis of researchers' views of how and why these countries have been successful on the assessments, and lessons for educators and policymakers in the US, specifically at the state level.

The methodology used in this review involved reviewing materials produced by the organizations sponsoring the international assessments including statistics and reports, books and articles focused on selected top-performing countries and their education systems or compilations of data and analysis across all the countries, and opinion pieces.

The study describes the Progress in International Reading Literacy Study (PIRLS) taken by fourth graders, Trends in International Math and Science Study (TIMSS) taken by fourth and eighth graders, the Programme of International Student Assessment (PISA) which assesses math, science, and reading of fifteen-year-olds, and the National Assessment of Educational Progress (NAEP) which assesses math, reading, science, and writing of fourth, eighth, and twelfth graders in the US. US students' average scores generally fall in the middle for the international assessments. US educators and policymakers express concern about the scores but also about the tests themselves and their fit with US educational goals and values.

Nevertheless, there has been considerable interest in exploring how and why students in other countries score high. This report compiles information on six of these countries or economies: Australia, Canada, Hong Kong and Shanghai (China), China, Finland, and Singapore. Reports and analyses by educational researchers and scholars have attempted to determine the commonalities across the various top-performing constituencies.

The report presents the consensus of researchers' examinations of successful practices of top-performing countries in the form of lessons for Maine educators and policymakers to ponder. These include:

- The top-performing countries have fairly recently reformed their educational systems based on a broad consensus of the population regarding the purpose of education and its importance to the lives of its citizens.
- With the support of stakeholders, the countries have been able to create coherent and aligned systems of curriculum and assessment to ensure equitable opportunities for learning for all students.
- The emphasis on equity means that local control and local financing of education has been abandoned or never existed in favor of distribution of resources based on needs of students, especially disadvantaged ones.
- The countries are examining the teaching methods of other countries and experimenting with approaches developed and championed by Americans, but there is no specific curriculum or instructional approach that characterizes all the countries' schools. In fact, there is as much variation within countries and schools as there is across them.
- What these countries have done, though, is place a high premium on quality teaching.

The general approach is to recruit top high school students to become teachers and to

prepare them well in universities. Prospective teachers follow a program of study of a particular discipline and then must attain more degrees or training or have intense apprenticeships to hone their craft. In addition, teachers spend a good portion of their workdays collaborating with colleagues on lessons or studying new teaching strategies. They spend less time actually teaching than teachers in the US, although their workdays are longer, and their pay is more comparable to other similarly educated professionals in their countries than it is to educators in the US.

Introduction

At the request of the Maine State Legislature, the Maine Educational Policy Research Institute (MEPRI) undertook a study of top-performing countries on international assessments. The work was conducted in winter 2014. The purpose of the study was to investigate the history of education reform, governance of educational systems, cultural attitudes to schooling, and teachers and teaching methods of countries whose students regularly perform well on such tests as the Programme for International Student Assessment (PISA) and Progress in International Reading Literacy Study (PIRLS). The goal was to discover insights into these countries' schooling practices that could offer useful school reform strategies for Maine. This report presents the findings from the study.

This report provides a synthesis of some of the recent writing about what investigators have learned about schooling and educational policy in high-performing countries. After some contextual background, the report explains the purpose and method of the most prominent international assessments and one national assessment, and then describes US results in comparison to other countries for the most recent administrations of each assessment. The report describes what we know of several high performing countries' history and culture relevant to education, their governance of education, preparation and development of teachers, and teaching and assessment practices, especially in the ways they differ from the US. The report concludes with a presentation of insights and lessons about what scholars have said could guide reform of education in the US in the future.

Methods

This report is the result of a review of the literature on the tests themselves, the results of the tests, and contemporary expositions and analyses of top-performing countries on the assessments. The sources were reports generated by the organizations which created and sponsored the assessments, as well as scholarly analyses and reports by others who critiqued issues related to the assessments, collected historical and contemporary data on countries participating in the tests, or summarized data collected by others. Since these tests have been given at intervals over two decades, there is a considerable body of work on the top-performing countries. Lately, though, some countries are moving swiftly into the top-performing category, so some attention has been paid to them. Table 1 below indicates the sources used for this analysis, specifically those that would provide lessons for US educators and policymakers. Full citations appear in the reference section at the end of this report.

Table 1. Sources Used for Countries Highlighted in this Report

	Darling-Hammond (2010)	OECD (2011)	Stewart (2012)	Ripley (2013)	Center on Int'l Ed. Bench-marking (2014)	Malone (2013)
China HK/Shanghai		X	X		X	X
Singapore	X	X	X		X	X
Finland	X	X	X	X	X	X
Australia			X		X	
Canada		X	X		X	
S Korea	X			X	X	
Poland				X		
Japan					X	
Netherlands					X	
New Zealand					X	
Russia						X
UK						X
Brazil						X
India						X

This study focuses on six countries representing different continents and contrasting histories, philosophies and cultures. In doing so, the report provides an array of strategies for considering educational reforms to improve student learning. The countries (or economies) chosen for this report are among those that have consistently performed at the top on international assessments and include: Australia, Canada, Hong Kong and Shanghai (China), China, Finland, and Singapore.

Background

US educators and policymakers have been engaged in educational reform for decades. A Nation at Risk in 1983 began the reform movement in highlighting the inadequacies of the education system for a large majority of students especially in light of the demands of an increasingly information and technology-based society. Goals 2000 and then No Child Left Behind (NCLB) were initiatives and legislation that dramatically focused education reform on the inequities of the present system. Analysis of US student assessment results still shows large discrepancies between the performance of White and Asian students and those of other minorities. NCLB has highlighted the differences, but reforms have not managed to address the problem (Darling-Hammond, 2010). Scholars have made the argument that international benchmarking is a legitimate approach because it has been done for quite a while, and the organizations engaged in it are careful and transparent in their approaches (Stewart, 2012).

Various international assessments introduced in the early 1990s have made it possible to look across countries to see how students perform at certain ages and in certain subjects. For a while, US educators and others simply noted the results. Granted, there has been some handwringing in addition to surprise that American students' average performance always seems

to fall in the middle of the developed countries. Nevertheless, many US educators believe we have a superior system that meets our needs and matches our values (Crotty, 2012; Meyer, 2013). Some scholars and educators have criticized the tests for their narrowness and high stakes, at least in the aggregate (Weintraub & Weintraub, 2014).

For all the talk of globalization, the US has not paid much attention to it in terms of education (Darling-Hammond, 2010; Stewart, 2012). Lately, though, as US results seem stagnant, and even some less developed countries have surpassed US students (e.g., Vietnam in science on the 2012 PISA test), educators, policymakers, and citizens, generally, have been more inclined to dig into the results and to explore not just what they might mean about US students' learning and ability, but more importantly, what they can teach us about how other countries educate their children.

Several new books have looked at the latter question, either by looking across the countries or focusing on one system. Other countries have done more, partly because they have examined other countries and adopted some of their practices. Individual states can learn from the countries that are doing well, specifically by looking at effective *systems* not just schools and practices (Malone, 2013; Stewart, 2012; Tucker, 2011).

Descriptions of the Assessments of PIRLS, TIMSS, PISA, and NAEP

One should note the distinction made by the Programme for International Student Assessment (PISA): *Assessments* refer to tests that are used to provide information about the proficiency and achievement of students in various constituencies in order to provide gauges of student learning and to signal improvements needed to promote student learning. *Examinations* are tests used to determine the proficiency and achievement of individuals. The results are for the use of the individuals and the institutions that are considering them for acceptance or

employment, or to determine completion of a course or training program. Some tests may do both of these things (e.g., the SAT in Maine), but the tests used in international comparisons are all considered assessments (OECD, 2013).

Another important aspect of these international assessments to note is their sampling design. All of them employ random sampling techniques, often stratified sampling, to ensure that the results represent the country's population of the grade level or age chosen. In the US, all states participate in the testing for all four assessments described in this report (PIRLS, TIMSS, PISA and NAEP). Eight states pay to have their own results analyzed for the PISA.

The website of the National Institute of Education Sciences (IES) of the National Center for Education Statistics (NCES) provides information on the sponsors of each assessment and explains what each one is designed to measure. Each assessment's website, likewise, provides in-depth information and several ways to look at the data on interactive websites. (See the reference list for URLs for these sites.)

Education GPS is *sponsored by OECD* and provides internationally comparable data on education policies and practices, opportunities and outcomes on all OECD member countries and partners in PISA. Accessible any time, the Education GPS provides the most up-to-date information on “how countries are working to develop high-quality and equitable education systems” (<http://gpseducation.oecd.org/>). IES is the source for data on US school systems, states, and the entire country (<http://nces.ed.gov/>).

Progress in International Reading Literacy Study (PIRLS)

PIRLS is an international study of reading achievement of fourth graders conducted by the International Association for the Evaluation of Educational Achievement (IEA), an independent, international cooperative of national research institutions and governmental

research agencies. PIRLS succeeded the IEA studies that started in 1970. The study in 2001 started the trend for a five-year cycle of PIRLS testing. Publications and data management for the US for Trends in International Math and Science Study (TIMSS) and PIRLS are now part of the TIMSS and PIRLS International Study Center at the Lynch School of Education at Boston College. Like other international assessments, PIRLS provides results on reading achievement and other information based on surveys of students, teachers and administrators on such things as students' background and attitudes toward reading, teachers' instruction, and school resources. The PIRLS test addresses the process of comprehension and the purposes for reading, both for literary experience and for information. The test takes 80 minutes with each student reading and answering questions on a piece of literature and a piece of non-fiction.

Trends in International Mathematics and Science Study (TIMSS)

TIMSS is an international assessment of the mathematics and science knowledge of fourth (ages 9 and 10) and eighth graders (ages 13 and 14). Like PIRLS, TIMSS was developed by the International Association for the Evaluation of Educational Achievement (IEA) centered in the Netherlands to allow participating nations to compare students' educational achievement across borders. TIMSS has been given every four years since 1995.

TIMSS is a collaboration of many countries' curriculum, measurement, and education experts. TIMSS is based on the curricula of schools around the world and is designed to see what students know. According to its website, it seeks to "investigate how students are provided educational opportunities and the factors that influence how students make use of these opportunities . . . and to investigate three levels: the intended curriculum; the implemented curriculum; and the achieved curriculum." The assessment itself examines the achieved curriculum; the other two areas are plumbed via questionnaires for teachers and school

administrators. Because it is given to the same demographic of students twice (in fourth and then eighth grade), countries can track performance. US analysts also track the performance over time of ethnic and racial groups. In the US, TIMSS is conducted by the National Center for Education Statistics of the U.S. Department of Education.

The Programme for International Student Assessment (PISA)

PISA is sponsored by the Organization for Economic Cooperation and Development (OECD). PISA is a triennial international survey, which aims to evaluate education systems. Around 500,000 students took part in PISA 2012 representing all 34 OECD economies and about 30 others called “partners.” This number of students represents about 28 million 15-year-olds globally. Results are given in mathematics, science, and reading literacy, with a specific focus each year. In 2012, the focus was on mathematics. Students respond to questions on their background, attitudes, and school experiences; principals respond to a questionnaire about school characteristics and resources. These latter data sources are used for many analyses comparing conditions, governance, and support for education across countries. By noting their students’ performance over time, countries or other regions can gauge the impact of policy decisions.

The PISA assessment focuses on 15-year-olds (specifically between 15 years 3 months and 16 years 2 months) because that age is when most children are nearing the end of compulsory schooling. Nevertheless, PISA is not linked to school curriculum. The test is an assessment of how well students can apply their learning. They take a mix of multiple-choice and constructed response items in different combinations even within a school. The tests contain text, pictures, graphs or tables depicting real world situations. Countries pay the full costs of participation that include the technical expertise of an international contractor which administers it. PISA does not give a collective score for all subjects; it provides a score for each subject and

ranks countries by their mean score in each subject. OECD provides an explanation of the importance of this kind of assessment:

- *Public policy issues.* Governments, principals, teachers and parents all want answers to questions such as: "Are our schools adequately preparing young people for the challenges of adult life?", "Are some kinds of teaching and schools more effective than others?", and "Can schools contribute to improving the futures of students from immigrant or disadvantaged backgrounds?"
- *Literacy.* Rather than examine mastery of specific school curricula, PISA looks at students' ability to apply knowledge and skills in key subject areas and to analyze, reason and communicate effectively as they examine, interpret and solve problems.
- *Lifelong learning.* Students cannot learn everything they need to know in school. In order to be effective lifelong learners, young people need not only knowledge and skills, but also an awareness of why and how they learn. PISA measures student performance in reading, mathematics and science literacy and also asks students about their motivations, beliefs about themselves and learning strategies. (OECD)

PISA is highly regarded since it gauges problem solving and critical thinking ability.

"PISA is specifically designed to be an assessment that requires transfer, and asks questions in the areas that you would not really pick up in the regular curriculum: They're longer, take a whole page to write about; they're the kind of questions different from the normal questions we expect on tests. In my view, we ought to be as a country creating our own PISA-like assessments if we're serious about the 21st-century skills." (Smith as quoted in Sparks, 2012, p. 38).

But OECD and PISA have critics. A commentary in *Teachers College Record* criticizes the test and its results because it lauds countries known for very strict laws, heavy-handed governments, and homogeneous populations. Furthermore, the OECD is an economic development organization, so its focus is on preparing citizens for participation in the economy, not appreciating art or literature or understanding and critiquing policies and governance issues. The author of the commentary warns of the global takeover of education and of the marketing of curriculum and tests by an agency with little connection to education (Meyer, 2013).

The OECD produces several reports after each administration of PISA, notably analyses of US results on such issues of concern as the achievement gap between more wealthy students and disadvantaged ones (especially of ethnic minorities, the effects of teacher morale and school climate), the impact of expectations for learning and behavior, and inequities in opportunities to learn. Other OECD reports provide overviews of countries with high-performing students with regard to history of reform, school governance, resources, curriculum, instruction, and quality of teaching.

National Assessment of Educational Progress (NAEP)

There is no required national test of student performance for the US as a whole. Individual states or consortia have their own tests. There are definite expectations for Adequate Yearly Progress defined by No Child Left Behind although, at this point, Maine and several other states have had many of those expectations waived (Cousins, 2013). The Common Core Standards and the tests that are in the pilot stage right now will provide more of a national overview of student performance. The National Assessment of Educational Progress (NAEP) is the closest thing we have at the moment for cross-state and national comparisons in the US.

NAEP, a congressionally-mandated project, is administered by the National Center for Education Statistics (NCES), located within the U.S. Department of Education's Institute of Education Sciences. Since 1969, it has provided a common measure of student achievement for the country, states, and some cities. Title I funding is the mechanism to ensure compliance from states and from schools. Each participating student represents hundreds of other public school students in a state. Non-public school students are also represented in the national sample. The main NAEP assessment is usually administered to samples of fourth and eighth graders in each state; a sample of grade 12 students is assessed to provide national level results.

As in the international tests, students, teachers, and principals complete questionnaires to supply contextual information about students' schools and learning experiences. The central NAEP assessments are conducted in a range of subjects with fourth, eighth, and twelfth-grade students across the country. Mathematics and reading are assessed every two years; and science and writing, every four years. Other subjects are assessed periodically so educators and policymakers can examine trends over time. Recently, a linking study across TIMSS and NAEP results have allowed researchers and educators to compare individual states with countries on the performance of eighth graders in mathematics and science (National Center for Educational Statistics, 2013).

Where the US Stands on the Latest Assessments

TIMSS and PIRLS, 2011

In 2011, 63 countries and 14 states or other benchmarking entities took part in the TIMSS assessment of fourth and eighth graders on math and science. In the same year, PIRLS was given to fourth graders to assess reading in 49 countries and 9 states or other benchmarking entities (Loveless, 2013). About 600,000 students took TIMSS; 325,000 took PIRLS (Martin &

Mullis, 2013). The synchronous administration of these assessments occurs only every 20 years. The results were released in December 2012.

Because these results came out at the same time and provide data on children of the same age, several reports have looked at the two together. IEA published a report (Martin & Mullis, 2013) looking at the relationship between reading, math, and science results for fourth graders. These data combined with the data compiled from a variety of questionnaires allowed the authors to note not only the connection between performance in reading, math and science but also to analyze the effect of various measures of school effectiveness including orderliness of schools (discipline), teacher quality, and other factors such as the extent to which parents read to children. A Brookings report (Loveless, 2013) provides an overview of the results for the US and discusses trends in education gleaned from the data, in this case, the extent of ability grouping in schools and the effects of a policy of providing algebra in the eighth grade.

On the 2011 PIRLS Reading Assessment for fourth graders, the US scored 566 which was a 14 point gain since 2001. (The range of scores is 0-1000; all tests had a mean of 500 and a standard deviation of 100.) Only four countries or economies scored significantly higher (i.e., statistically significant, $p < .05$) than the US: Hong Kong (China), Russian Federation, Finland, and Singapore.

TIMSS scores range from 0-1000 with an average of 500. On TIMSS in math, the fourth graders in the US scored in the middle of the pack, 541. The top countries were Singapore, Korea, Hong Kong (China), Chinese Taipei, and Japan. US eighth graders scored in the middle (509), just above the international average of 500. In science, US fourth graders scored 544, and eighth graders scored 525.

The US did reasonably well in all three subjects on PIRLS and TIMSS. Generally, the

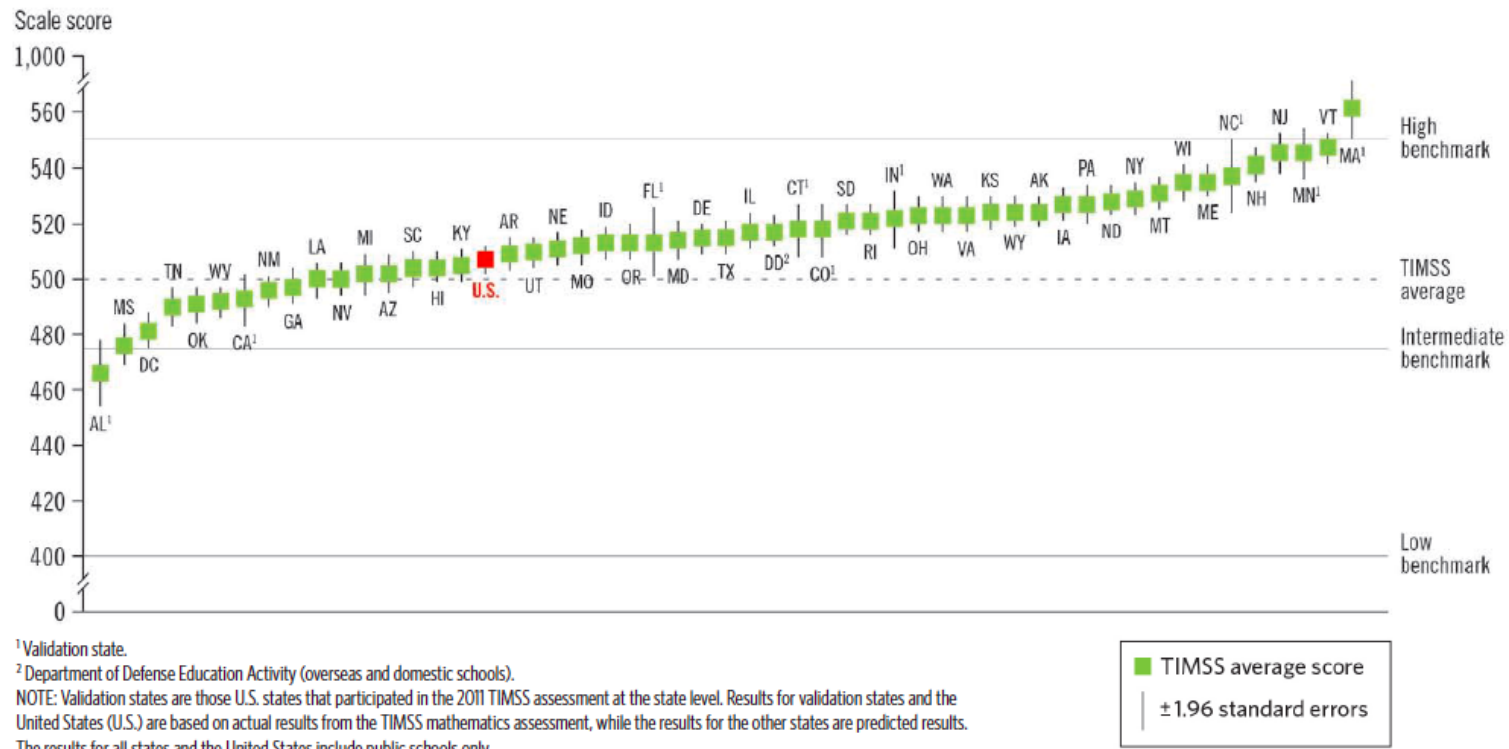
US scores were significantly above the international average, but significantly below students from eight other countries depending on the subject of the assessment. The overall gain of 12 points from 1995 is statistically significant. Loveless (2013) concludes, “Over the past decade, countries joining TIMSS have been economically developing nations or, in the case of the Middle East, nations possessing abundant national wealth but lacking a tradition of public schooling. Such compositional changes can make international averages easier to surpass. Leading the world in reading, math, or science remains a challenge for the US” (p. 8).

Linking Study Results on NAEP and TIMSS, 2011

The TIMSS structure is similar to that of NAEP, although it puts different weight on content areas (Robelin, 2012). The study was conducted in 2011 with eighth-grade students in all 52 states/jurisdictions (includes District of Columbia and Department of Defense schools) that participated in the NAEP mathematics and science assessments. The TIMSS results were predicted based on NAEP scores. Because NAEP was given at approximately the same time in 2011 as TIMSS, students in the participating states had items from both assessments “braided” into their exams, such that students responded to questions from both assessments at the same time to help validate the results (International Center for Education Statistics, 2013).

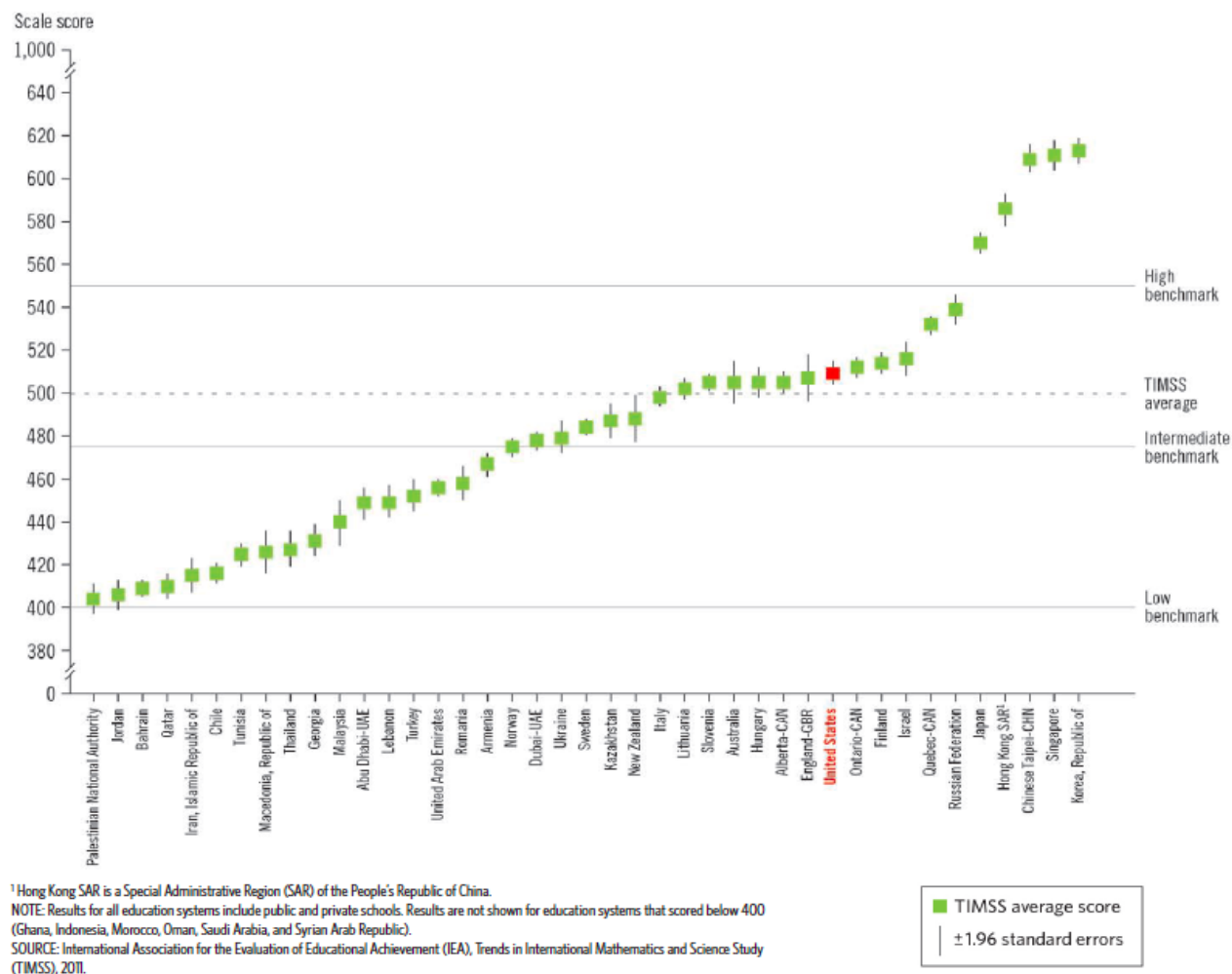
To provide a sense of how the scores look across countries and across the nation, the Linking Study report (IES, 2013, pp. 14 -15) includes two figures for eighth-grade math shown here. The first figure shows a comparison by state, while the second figure shows an international comparison.

Figure 1. Average scores and confidence intervals in TIMSS eighth-grade mathematics, by state: 2011



From U.S. States in a Global Context: Results from the NAEP-TIMSS Linking Study, p. 12

Figure 2. Average scores and confidence intervals in TIMSS eighth-grade mathematics, by education system: 2011



From U.S. States in a Global Context: Results from the NAEP-TIMSS Linking Study, p. 13

Some findings from The Linking Study (International Center for Education Statistics, 2013, p. 1-3) include the following:

Mathematics

- Average scores for public school students in 36 states (including Maine) were higher than the TIMSS average of 500.
- Ten states were not significantly different from the TIMSS average.
- Six states were lower than the TIMSS average.
- Massachusetts scored higher than 42 of the 47 participating education systems.
- Alabama scored higher than 19 education systems around the world.

Science

- Average scores for public school students in 47 states (including Maine) were higher than the TIMSS average of 500.
- Two states were not significantly different from the TIMSS average; three states were lower.

PISA Results, 2012

The results from the 2012 PISA tests were released in December 2013. The US results are the same as they have been over the years in that the average scores of 15-year-olds who sat for the tests in the US are in the middle of the OECD countries or partners, and are about the average for all the students who took the assessments. Eighteen education systems had higher average scores than the US in all three subjects. As noted, eight US states participated in the PISA test as single economies even though students in the entire country were assessed to produce the US scores. Table 2 shows the results on the PISA test in 2012.

Table 2. PISA 2012 Average Test Scores of 38 Participating Countries/ Economies

Education System	Math	Science	Reading
Shanghai, China	613	580	570
Singapore	573	551	542
Hong Kong, China	561	555	545
Chinese Taipei	560	523	523
South Korea	554	538	536
Macau, China	538	521	509
Japan	536	547	538
Liechtenstein	536	525	516
Switzerland	531	515	509
Netherlands	523	522	511
Estonia	521	541	516
Finland	519	545	524
Canada	518	525	523
Poland	518	526	518
Belgium	515	505	509
Germany	514	524	508
Massachusetts	514	527	527
Vietnam	511	508	528
Austria	506	506	490
Connecticut	506	521	521
Australia	504	521	512
Ireland	501	522	514
Slovenia	501	514	481
Denmark	500	498	496
New Zealand	500	516	512
Czech Republic	499	508	493
France	495	499	505
United Kingdom	494	514	499
Iceland	493	478	483
Latvia	491	502	489
Luxembourg	490	491	488
Norway	489	495	504
Portugal	487	489	488
Italy	485	494	490
Spain	484	496	488
Russia	482	486	475
Slovakia	482	471	463
United States	481	497	498
OECD Average	494	496	501

Source: PISA 2012 Results in Focus, OECD.

According to the National Center for Education Statistics, some highlights of the results include:

- Average scores in mathematics literacy ranged from 613 in Shanghai-China to 368 in Peru. The US average score was 481, which was lower than the OECD average of 494. The US average was lower than the states of Massachusetts and Connecticut, but higher than Florida.
- In the US, 9% of 15-year-old students scored at proficiency level 5 or above (there are 6 levels), which was lower than the OECD average of 13% in mathematics literacy. The percentage of 15-year-old students performing below level 2, which is considered a baseline of proficiency by the OECD, ranged from 4% in Shanghai-China to 76% in Indonesia. In the US, 26% of 15-year-old students scored below level 2, which was higher than the OECD average of 23%.
- In science, Shanghai, China had the highest average scores; Peru had the lowest. The US average score was not measurably different from the OECD average. The US average was lower than 22 education systems, higher than 29 education systems, and not measurably different from 13 education systems.
- The percentage of low performers in science in the United States overall (18%) was higher than the states of Connecticut (13%) and Massachusetts (11%), but not measurably different from Florida (21%). The percentage of top-performing 15-year-old students (those scoring at level 5 or above) in the United States was 7%.
- Shanghai-China had the highest average scores in reading literacy; Peru had the lowest. The US average score was not measurably different from the OECD average. The US

average was lower than 19 education systems, higher than 34 education systems, and not measurably different from 11 education systems.

- In the US, 8% of US 15-year-old students scored at proficiency level 5 or above. In reading literacy, the percentage of US 15-year-old students performing below level 2, was 17%.

Portraits of Education Systems in High-Performing Countries

Controversy continues over the importance of the PISA results and what they tell us about students in the US compared to students around the world (Hanushek, 2014; Weintraub & Weintraub, 2014). OECD, in its material on PISA, makes a strong case for the ways that several countries have improved and why. Furthermore, that organization is focused on indicators that can provide insight into students, teachers, and schools regarding such things as equity, engagement, and time allotted to subjects in schools as ways to think about how to improve teaching and learning.

Since the era of international testing began, there is a plethora of books and articles not only on the results of the assessments and their implications but also on what can be learned from studying countries that have consistently done well (e.g., Finland, Hong Kong-China) or have zoomed to the top (Shanghai-China)—or are higher than they had been—(e.g., Canada) on the ordered lists of results. Some of those in high regard have slid down a notch (e.g., Finland moved from 6th to 12th in the latest PISA test). The countries are vastly different from each other and the US in size, wealth, governance, history, and culture. Nevertheless, scholars and researchers have endeavored to analyze characteristics of the countries doing well to see if there are lessons for the United States.

Here are some ways to think about what policymakers in the US might take away from examining the countries or economies. First, it may be more practical or feasible for states, as opposed to the national government, to decide to adopt certain practices in education used in other countries (Stewart, 2012; Tucker, 2011). Second, places wishing to improve should consider the industrial benchmarking model as opposed to the clinical model most often used in education (OECD, 2010, p. 22). In other words, rather than seeking the one best model for teaching a lesson or reforming a school as the clinical model does, policymakers could analyze data from the most successful countries and combine the best pieces from elsewhere with innovative ideas from home for an approach that works well for a specific population. Third, in planning for improvement, policymakers should think in terms of *systems* not just schools (Stewart, 2012; Tucker, 2011).

In order to make the job of analysis of other countries' practices and systems easier, researchers have chosen particular countries on which to focus. Almost all include Finland because of its consistency as a high scorer. Several Asian countries or economies are chosen and score high fairly consistently. South American countries are gradually improving their scores as are several in Europe. The ones chosen for exploration in this report are two jurisdictions in China, Shanghai and Hong Kong. The entire country of China is in the process of piloting assessments with the goal of covering the entire country in a few years. Singapore is another country in Asia, but it has a distinctly different history even as its trajectory toward the top in international assessments has been similar. Canada and Australia can be considered much more similar to the US, and they have high scores. Finland is the most studied of all the countries, and its distinctiveness makes it a solid contrast with the high-scoring Asian countries and the US.

The portraits of these countries or economies are loosely organized by a brief history of education initiatives, education governance, cultural views of education, preparation of teachers and leaders and, to an extent, curriculum and instruction. Pedagogy in these countries is extremely variable. The US may be known for student-centered learning, active learning, inquiry-based and cooperative learning; however, we know that those might not be the dominant methods in many schools or classrooms. Other countries are similarly eclectic in approaches used. Because of the interest generated by the results of the international assessments, many countries are encouraging experimentation in their schools with many methods considered characteristic of US schools (Zhao, 2011). What this means is that pedagogy is more varied within countries, indeed within schools, than it is across countries. Thus, pedagogy may be the least important element in a country's success as compared to such things as culture, quality of teachers, and attention to education by policymakers and citizens.

The discussion of each country will highlight what seems to be the consensus of scholars and analysts regarding why that country's students perform well on the international assessments and/or what they are doing that is strikingly different from what others, and particularly the US, are doing. For a sense of these countries or economies, the following table presents some statistics that compare these locations with each other and the US. An attempt was made to provide the most current data, but different sources provide different numbers.

As Table 3 indicates, China has the largest population, and Shanghai and Hong Kong have greater populations than either Finland or Singapore. The US has the highest percentage of young people; Finland has the highest number of citizens above 65. Singapore, Australia, and Canada have the highest growth rates. China and Shanghai have low per/capita incomes; the

other countries are somewhat similar to the US. The US has the highest unemployment rate and also has the highest expenditure for education compared to the other countries.

Table 3. Comparisons of Selected Countries on Demographic and Economic Variables

	Population/ 000s	% Pop Under 15	% Pop Over 65	Growth Rate	GDP/ Capita USD	Taxes on Average Worker	Expenditure/ Student Primary & Secondary Education	Un- employment Rate
Australia	22,684	18.8	14.2	1.6	45,016	22.9	9,139 (2009)	5.2
Canada	34,568	16.2	14.9	1.1	43,400	22.6	8,997 (2009)	7.2
China	1,353,914	18.8	8.8	0.4	9,095	NA	1,593 (2008)	NA
Hong Kong	7,182	11.3	14	0.39	52,300	NA	NA	3.3
Shanghai	23,900	8.9	11.9	-0.075	9,300	NA	NA	6.5
Finland	5,414	16.5	18.5	0.5	38,282	29.4	8,314 (2009)	7.7
Singapore	5,312	13.6	8.1	2.4	51,709	NA	8,736	2.0
US	313,914	19.5	13.7	0.7	51,689	22.7	11,831	8.1

Source: World Factbook (September 2013)

Australia

Australia's history and culture is tied to England and trade as a British colony. It contains a large land area with valuable resources but a small population, so Australia has had to make some hard decisions about its role in the global economy. Increasingly Australians are oriented toward Asia for immigration and trade even as Asian countries are its strongest competitors. It is a melting pot of great diversity, but still characterized by a practical, pioneering spirit open to learning from others and trying new approaches. Its demographic makeup is 92% white, 7% Asian, and 1% aboriginal and other (Center for International Educational Benchmarking).

In order to grow the economy, Australian government employees, labor leaders, and business people studied and visited other countries to determine how best to meet the country's needs and entrepreneurial focus for the future. International benchmarking led to a concentration on education and training. Citizens were engaged in reform commissions that developed academic and vocational standards that gained a broad consensus. These standards and the curriculum adopted to implement them required a more sophisticated teacher corps (McGaw, 2013).

There is a federal government in Australia, but education is primarily directed within the six states and two territories. Nevertheless, in 2008, a decline in international assessment scores compelled more reform and a national curriculum was created by practitioners and scholars. The National Assessment Programme was instituted in 2009 so that students are now tested at grades 3, 5, 7, and 9 in literacy and numeracy; other areas, including science, citizenship, and information and communications technology,

are assessed every three years. Transparency regarding results for all schools is highly valued.

The federal government is working with state ministries of education to continue to create assessments that match the standards and the curriculum, an important distinction, so that both excellence and equity are maintained (Stewart, 2013). As the reform initiatives continue, the government has spent increasing amounts of money, about \$67 billion from 2009-2012 (Center on International Benchmarking). In addition, recognizing the large performance gap in the country, even more money has been used to target underserved students and crumbling buildings. As well, partnerships to strengthen and retain teachers and enhance vocational preparation, especially in digital communications, are underway.

At the beginning of this decade, the Australian government, with the input of scholars and practitioners, developed a national curriculum to guide the states and territories in ensuring quality schooling for students from pre-primary through upper secondary school. The propositions make clear that the expectations as embodied in the assessments of learning are high and rigorous, but teachers and schools have flexibility in implementation in order to fit the needs of individual learners with special attention to special needs and English language learners. The intended educational outcomes for young Australians are:

- A solid foundation in knowledge, understanding, skills and values on which further learning and adult life can be built. The curriculum includes a strong focus on literacy and numeracy skills. It also enables students to build social and emotional intelligence and nurture student well-being through health and physical education in

particular. . . . As a foundation for further learning and adult life, the curriculum includes practical knowledge and skills development in areas such as Information and Communications Technology (ICT) and design, which are central to Australia's skilled economy and provide crucial pathways to post-school success.

- Deep knowledge, understanding, skills and values that will enable advanced learning and an ability to create new ideas and translate them into practical applications. The curriculum enables students to develop knowledge in the disciplines of English, mathematics, science, languages, humanities and the arts; to understand the spiritual, moral and aesthetic dimensions of life; and to open up new ways of thinking. It also supports the development of deep knowledge within a discipline, which provides the foundation for interdisciplinary approaches to innovation and complex problem solving.
- General capabilities that underpin flexible and analytical thinking, a capacity to work with others and an ability to move across subject disciplines to develop new expertise. The curriculum supports young people in developing a range of generic and employability skills that have particular application to the world of work and further education and training. . . . Young people also need to develop the capacity to think creatively, innovate, solve problems and engage with new disciplines. (Australian Curriculum, Assessment and Reporting Authority, 2010, p. 16)

In addition to doubling funding for schools, with the aim of equal distribution of resources, the Australian Institute for Teaching and School Leadership was established in 2010 to promote excellence in both teaching and school leadership. Its actions include

developing national standards and accreditation based on the standards; ensuring high quality professional development; and collaborating with researchers, business and school communities, unions, and the Australian Curriculum, Assessment, and Reporting Authority (ACARA). Notably, these changes represent a move toward a national curriculum, though still controlled by the states, with an emphasis on curriculum before the development of assessments (Stewart, 2012).

On the whole, there is nothing that can be called the “Australian” approach to teaching. As noted, most teachers employ a variety of methods to engage students in learning. Like Canada, its system had developed from the British system, although the United Kingdom has had a national curriculum since 1988. Researchers have attributed Australia’s success on international assessments to several factors: the administration of education through its states, an infusion of significant financial resources, and the recent emphasis on education.

Canada

Although its population is considerably smaller, Canada is a logical country to compare with the US. It shares a somewhat similar history since both were British colonies with various other European countries influencing its population and development. It has proceeded along a similar economic path through agricultural, industrial, and now entrepreneurial and knowledge-economy focus even as it remains a large exporter of natural resources and manufactured goods. Like Australia, it had strong ties to British notions of education, from which it has detached over the years.

The US is a melting pot with large numbers of immigrants, but so is Canada. Its population is about 28% British in origin, 23% French, 15% other European, 2% native,

and 32% other. Twenty-four percent of the 15-year-old students who took the 2009 PISA test were immigrants. In the US, 19% were immigrants while in most other industrialized nations the percentage is about 10% (Cavanaugh, 2012). Nevertheless, the US has a higher proportion of children living in poverty (22%) than Canada's 15%. And therein lies a difference in how the national government sees its role in citizen welfare as well as the role of provinces in overseeing education.

After World War II, Canada started to change its method of financing education from local property tax revenues to monies from the provincial governments to ensure equity and efficiency in schooling. There is no federal department of education. The ten provinces and three territories have ministries of education that are responsible for overseeing education and determining education policy. Lately, roughly 65% of school funding comes from the province, 27% from local taxes, the rest from other sources such as fundraising and donations. Some provinces even set policy on local taxation for schools (Cavanaugh, 2012).

Today, about 65% of overall school funding in Canada flows from the provincial level, and just 27% comes from local taxation sources, primarily local property taxes. The rest comes from private sources, fundraising, and donations. Education is largely a provincial responsibility, so provinces will often consolidate locally-collected property tax revenues for education with provincial-level school funding, and set policy on local tax rates, according to its Centre for Education Statistics, a federal agency which provides school research and analysis.

The provincial ministries of education collaborate such that many of their policies and standards are very similar across the country. In fact, the Council of Ministers of

Education, Canada (CMEC) wrote the *Victoria Declaration* in 1999 that expressed their commitment to high standards and educational research. The entire CMEC is committed to a common curriculum within each province, selection of teachers who have strong qualifications on high school measures and earn university degrees, and assurances of equitable, quality education especially for poor and immigrant children (Council of Ministers of Education, Canada, 1999).

Ontario, the most populous province (13 million), is often showcased as a prime example of the success of the Canadian provincial education system although other provinces consistently score high too. Ontario has a total K-12 education budget of about \$21 billion and localities raise about \$6.6 billion. The province then provides \$14.4 billion to schools especially those with less income from taxes.

The political atmosphere in Ontario changed with a Liberal government that sought the engagement of educators in addressing the problem of educating poor and immigrant students to high academic levels. Realizing it had to work with the teachers in the system to improve teaching, even while improving teacher preparation at universities, Ontario joined with the teachers' unions to provide incentives and professional development to improve teaching across all schools (Stewart, 2013; Tucker, 2011). Capacity to fulfill expectations was a major challenge. A cadre of support teams was created called the Literacy and Numeracy Secretariat to help schools meet goals. The Student Success Strategy focused on developing various ways to stem the tide of dropouts in the province.

In Ontario, four school systems are publicly funded: the French public system, the French Catholic system, the English public system and the English Catholic system.

There are 4,000 publicly-funded elementary schools and 850 secondary schools. Four hundred twenty-five schools teach exclusively in French except for English language classes. The curriculum emphasizes literacy and numeracy in the early years with broader offerings in secondary schools to customize learning for individual needs (Ontario Ministry of Education).

China

The rise of the People's Republic of China (PRC) as a world power the last forty years tells the story of its improved education system and the performance of its students. The Cultural Revolution of Mao essentially dismantled China's education system, but Deng Xioping and the leaders who followed have rebuilt the education system and Chinese economy. There remains a rural/urban divide, but many people have come from the countryside to cities that have burgeoned into huge factory cities seemingly overnight. There are some key aspects to note of the turnaround from high illiteracy and little education to universal and compulsory primary and middle school with 80% of the population completing high school and 25% attending university.

After the end of the Cultural Revolution, China sent many people abroad to study in Western countries, but now the government has built universities to train teachers and offered priority admissions to those who would become teachers. Ninety percent of teacher preparation is in the disciplines they will teach. Pre-service teachers have a theoretical preparation at university, but they are expected to learn on the job with the guidance and support of veteran teachers. In Shanghai, new teachers are apprentices to master teachers for their first year where they essentially co-teach classes (Tucker, 2011).

China is a centrally controlled government although, unlike some Communist countries, the local and regional party leaders make many decisions within the parameters of the central tenets of the national party. The government has organized a system of key schools that take the best students and prepare them for the top-graded universities. These schools are labs for teachers for professional development; teachers and principals are regularly moved from high performing schools to low performing ones, or vice versa, to improve schools or to improve practice. In addition, the government is known for watching measures carefully and quickly disseminating practices that prove fruitful.

In all of Asia, Confucianism is the philosophical foundation of the education system. For Confucians, education is not just an intellectual process; it is learning to be human. Its ultimate aim is the perfect embodiment of different virtues, the most important of which are humaneness, righteousness, propriety, knowledge, and integrity. Aside from being responsible for developing the intellectual capacity of students through imparting knowledge to students, traditional Chinese teachers also perform the important function of cultivating the moral character of students.

Another aspect of pedagogy is that teachers in much of urban China are organized into groups to collaborate and prepare the best lesson. During the school day, teachers of a particular subject or grade meet to consider the best way to teach a concept. They follow the notion of Japanese “lesson study,” wherein teachers contribute their ideas and then test out the lesson in real classrooms. Because of the competition for university placements and jobs, teachers are willing to work to find the best method for teaching a particular idea or concept. Furthermore, math is regarded so highly that it is 25% of all exams no matter the purpose (Center for International Benchmarking).

Through education and learning, people succeed. Thus, teachers are revered. By studying the ancient texts, Confucian scholars gradually gained a monopoly on education and acted as the meaning givers in China. The institutionalization of a Confucian canon as the major emphasis of civil service examination through which civil servants and government officials are selected secured Confucianism's enduring influence in Chinese civilization. Lately the government has tried to infuse new pedagogies into schools, like student-centered and inquiry-based learning, but there is much resistance on the part of teachers, school administrators, and parents because those methods are so different from the rote-learning that enables children to do well on examinations (Fong & Kim, 2011).

As noted previously, generalizing about pedagogy within a country is very difficult. In Asian countries though, rote-learning is perhaps still the most common method because of its tradition of ensuring students have memorized what they need to know for exams. It is also convenient for large classes where there are few resources to engage students in more active learning.

Testing is embedded in the culture to create a meritocracy. And the prevalence of tests for schooling and employment mean that studying and doing well on exams are key to China's success on international assessments. There are never enough positions in universities or jobs, so all members of an extended family devote time and money to helping students prepare and perform on exams. All students must learn English, so tutors and special classes keep students busy if their parents can afford them. Students work hard and the school year is long; they have more homework and take many extra classes outside of school than US students (Mackenzie, 2006; Stewart, 2013).

The National Center on International Educational Benchmarking in its overview of China says,

These features of the Chinese system—the ancient belief that education is the only path to success, the conviction that it is effort and not genes that determines success in education, the meritocratic nature of the Chinese education system, the very high priority accorded education by the post-Mao government of China, the care with which lessons are constructed, the fact that teachers’ work is not private but is the object of continual professional observation and critique, the determination of the Chinese people to match western educational benchmarks, the enormous efforts made by Chinese students and the amount of time they put into studying, the emphasis in Chinese education on the study of mathematics—would all lead the observer to expect the Chinese to do well in international comparisons of student achievement.

Shanghai, China. The benchmarking report goes on to describe how children in Shanghai have done incredibly well in international assessments. Shanghai, like three other Chinese cities, has the status of a province. It is the economic center of the country producing one-eighth of the country’s income. In 1988 the city gained the right to develop its own exams for entrance into its universities, which are unlike the traditional Chinese exams because they emphasize cross-disciplinary applications and problem solving. This approach veered significantly from the rote-memorization required for previous exams. Since then the ministry of education continues to make major changes in the education system.

Shanghai's population of 20 million is one-fifth migrants from the countryside. Rather than make them pay for their children's education or not attend school (in China, you are not allowed to attend a public school in a province where you live but from which you did not originate), Shanghai is working to provide free quality education for migrant children. Other reforms the Shanghai government has instituted include: movement toward inquiry-based, student-centered curriculum and teaching, extensive professional development for teachers, a core curriculum for all with electives chosen based on student interest, grading of schools based on structural and curricular quality, closing schools or providing new leaders and teachers for schools not up to standards, and forming consortia of schools for support and development of effective practice (Center on International Educational Benchmarking).

In addition to the apprenticeship model employed in Shanghai to ensure strong teaching from the outset, the government selects and then trains people to move into various teacher leadership and administrative leadership roles (Tucker, 2011). Tom Friedman concluded when he examined the Shanghai school system,

When you sit in on a class here and meet with the principal and teachers, what you find is a relentless focus on all the basics that we know make for high-performing schools but that are difficult to pull off consistently across an entire school system. These are: a deep commitment to teacher training, peer-to-peer learning and constant professional development, a deep involvement of parents in their children's learning, an insistence by the school's leadership on the highest standards and a culture that prizes education and respects teachers. (2013)

Shanghai, like Hong Kong, has made impressive changes in its schools and varies somewhat from the rest of the country in the magnitude of the changes and the ability to implement them because of its presence in global industry and finance. One should realize, however, how quickly the government of China can implement change as it is trying to do in K-12 schools just as it did in its university system a few years ago (Mackenzie, 2006).

Hong Kong, China. Hong Kong refers to a territory leased to the British in 1898 and returned to China in 1997 as a Special Administrative Region. Because Hong Kong developed as a global trade and service center separate from China, its education system is very different and is now something of a hybrid of British and Chinese approaches. In fact, Hong Kong was enrolled in PISA before any province in China and is still treated as a separate entity although its population is 94% Chinese.

The British system with its examination schedules that emphasize rote learning was not deemed useful in Hong Kong, so recent reforms of education since the return to Chinese rule involved hearing from employers about their needs in a knowledge-based economy as well as parents and citizens regarding their understanding of the cultural and social needs of children (McGaw, 2006). In general, the previous system had been fairly elite, and education is still primarily in government-subsidized private schools. The Hong Kong government also studied the systems of many other countries to develop a design that fit them. They rolled out the plan and piloted it for several years to gain understanding and commitment from citizens. The result sounds as if it is directly lifted from what OECD and PISA advocate:

The planners embraced a constructivist view of the learning process, a focus on education for understanding rather than the accumulation of facts or the performance of procedures, the creation of learning experiences for students that would enable them to acquire and demonstrate understanding by applying what they were learning, and the use of real-life situations with actual effects as part of the instructional process. There was a new emphasis on the integration of knowledge as well as the development of analytical skills. (Center on International Education Benchmarking)

Lack of emphasis on exams and the assurance of education through secondary school are very different characteristics from Shanghai, as is the lack of government control of schools. The concern for education in Hong Kong now is the discrepancy in the performance of various schools that may lead to greater government intervention.

Finland

When much of the rest of the world is implementing more oversight of schools to assure teachers meet specific goals, lengthening the school day, toughening academic standards, and increasing homework, Finnish children continue to enjoy a relatively short school day, a broad curriculum, and a light homework load. In addition, Finnish children do not attend private tutoring sessions or spend any time preparing for standardized tests, as so many of their peers around the world must. Perhaps the most surprising part of the Finnish educational philosophy is the central role of play in children's lives, both in and out of school. Formal learning doesn't start before the first grade when children are seven years old.

Before that, children spend their time in play to develop a sense of independence and responsibility, and to learn about themselves and others. (Sahlberg, 2013)

Finland is the most discussed and most mystifying of all the international high performers. Its schooling appears so different from others, and its appearance on the international radar screen seemed to happen so suddenly. The education ministry in Finland has had to establish a separate office just to handle inquiries and visitors from the rest of the world.

Writers on Finland's success are quick to point out that the rise of this country to global attention was not the result of some phenomenal event or action; rather it came about slowly and steadily beginning after World War II when the country saw its relationship with the Soviet Union collapse (Darling Hammond, 2010; Sahlberg, 2013). As years went on, entrepreneurs made strategic decisions about where and how to invest in new technologies, and government officials and educators supported them by working hard to meet the needs of a highly-educated and flexible work force. Teachers are selected from the highest performing high school students and attend high status institutions for undergraduate work in a discipline. They then must get a master's degree studying and practicing pedagogy and completing a research thesis for pedagogy. "All of these policy positions are a measure of the high degree of trust that the Finns have in their teachers, but the high performance of Finnish students is a testament to the degree to which Finnish professionals hold each other accountable for the quality of their work and the effort they put into it" (Tucker, 2011, p. 32).

In the 1990s in response to high unemployment and a decision to apply to join the European Union, Finland realized it needed to build on the policies it had implemented,

like a national curriculum and restructured school organization, as the government transformed the economy into a telecommunications giant. Policies that carefully built the education system continue to be weighed and decided on as the country continues to grow and change. The previously massive school curriculum guidelines have been streamlined, and responsibility for oversight and assessment of learning has devolved to individual schools. In the last decade, policies that focused on teaching as a revered and selective profession and emphasis on math, science, and technology in schools, has underpinned the country's ability to continue to be strong in research and technological development.

Presently, its World Economic Forum Global Competitiveness Rank (2013) is three. Finland's economy is less than a third industry-based and the rest service-oriented. It is demographically and culturally homogeneous like the other Scandinavian countries although immigration is increasing. Educators are responsive and adaptive to changing needs just as they help their students to be, by concentrating on higher-order thinking skills, team work, creativity, problem solving, and interdisciplinary teaching and learning.

Visitors remark on how solidly the citizenry stands behind and believes in the government and the educational system as demonstrated by the respect citizens have for teachers. These are a very selective group of individuals who are highly educated even if their pay is relatively low compared to the rest of the West. The country abandoned traditional tests that were popular in the United Kingdom and other European countries in favor of emphasizing quality education based on standards for all students. The only mandated test now is the Matriculation Exam, open-ended tests developed by university

faculty taken by secondary school graduates as one measure of their aptitude for tertiary education.

Equity is a major thrust of Finnish society and schools. Students have free meals, health care, transportation, and counseling. Special services support learning to ensure that it reaches an acceptable level. Schools are generally small (about 300 students) and are resourced equally across the board. With more and more immigrants coming from the EU and other places, the country is developing plans to accommodate their needs (Center on International Education Benchmarking; Darling-Hammond, 2010).

Singapore

Singapore had been a sleepy island under British rule from 1819 to 1959 and then gained independence in 1965 from Malaysia. Since then it has become a world-class trade and financial center largely because of its first prime minister, Lee Kuan Yew. Policies for governance, finance, education, and social welfare mesh together to form an interwoven net of support for its people. Demographically it is 74% Chinese, 13% Malay, 9% Indian, and 3% other (OECD, 2013). The World Economic Forum ranks Singapore number two for global competitiveness (Center on International Education Benchmarking).

In spite of a turbulent past and the tensions fraught by mixtures of ethnicities, languages, and religions, the government carefully developed and implemented plans for a peaceful, productive, and educated society. Eighty percent of the population lives in government-built, but self-owned housing that mixes ethnicities to form communities that share high expectations for children and for themselves.

Care and control are key notions for this country and its social and educational systems. To promote literacy in the 1960s, schools for the different ethnic groups were brought together under a single education system where children learned English and their own language. From the 1980's to the mid-1990's, a new education system concentrated on reducing the number of school dropouts and providing various ways for all children to learn knowledge and skills that would help them become successful in the economy. Tracking or streaming of children even in elementary school still managed to garner the country high scores on the 1995 TIMSS. To adapt to the economic demands of a knowledge economy, the education system changed again to focus on innovation, creativity, and research (Center on International Education Benchmarking; OECD, 2013).

New initiatives, *Thinking Schools, Learning Nation* followed by the more recent *Teach Less, Learn More*, are still the mantra for the country's ongoing education reforms (Ng, 2013). These include: moving from rote learning to inquiry and concept-based learning; decentralizing education governance into geographic clusters that develop their own leaders and assess schools and students; selection of top achieving high school students for careers in education; careful mentoring and development of skills of teachers and leaders, attention to math, science, and literacy coupled with skills related to teamwork, fluency in multiple languages, and critical analysis. They have done away with tracking in favor of flexibility such that students choose their own pathway in secondary school depending on the kind of work they wish to do (Center on International Education Benchmarking; Darling-Hammond, 2010).

Singapore, perhaps because it is a new country, has modern ways of doing things. (Its method of teaching math for conceptual understanding is known and used throughout

the world and has been adopted by some schools in Maine.) The government constantly analyzes the results of policies and plans ways to tweak their application. Government officials work closely with researchers and practitioners so there is little gap between policy and implementation. David Hogan who does research for the country's only educational preparation institution, the National Institute of Education (NIE), comments,

Singapore is a "tightly-coupled" system in which the key leaders of the ministry, NIE, and the schools share responsibility and accountability. Its remarkable strength is that no policy is announced without a plan for building the capacity to meet it. And while there is variation in performance within schools, there is relatively little variation between schools. By contrast, more loosely-coupled systems have a much harder time bringing about reform initiatives and are often typified by an endless parade of new, sometimes conflicting policies, without building the capacity to meet them. (quoted in OECD 2010, p. 166)

Granted Singapore's small size, more like that of a city than a country, makes close alignment possible; furthermore, the broad social safety net and the clear vision of an educated populace to meet technical as well as information-based needs make for complementary educational policy making that enhances the other pieces.

Singapore has diverse types of schools, and the government encourages them to concentrate on varied disciplines and to try innovative approaches to teaching and learning, even as they all share a vision for high quality results (Darling-Hammond, 2010). Inquiry for students is matched by research-focused teachers. Equity, here too, is highly prized in that there is a sliding scale for secondary school and university, based on

one's ability to pay. The government makes up the rest in any one school's budget so that equal opportunity is maintained.

Linda Darling-Hammond in her study of high-performing countries concludes her discussion of Korean, Finnish, and Singaporean educational systems with these shared commonalities of reform efforts:

- They funded schools adequately and equitably and added incentives for teaching in high-need schools.
- They eliminated testing systems that had previously tracked students for middle schools and restricted access to high school.
- They revised national standards and curriculum to focus learning goals on higher-order thinking, inquiry, and innovation, as well as integration of technology throughout the curriculum.
- They developed national teaching policies that built strong teacher education programs that recruit able students and completely subsidize their training programs . . . salaries are competitive with other careers . . . like engineering.
- They supported ongoing teacher learning by ensuring mentoring for beginning teachers and providing 15 to 25 hours per week to plan collaboratively and engage in analyses of student learning . . . to continually improve their practice.
(Note: Although teachers in other countries teach fewer hours than those in the US, their work days are longer because they are expected to collaborate with colleagues planning lessons as well as engaging in professional development.)
- They pursued consistent, long-term reforms, setting goals for expanding, equalizing, and improving the education system . . . managed by professional

ministries of education, which are substantially buffered from shifting political winds. (Darling-Hammond, 2010, pp. 192-3)

To a great extent, one could say the same about all the countries' school systems described in this report.

The Appendix contains tables providing data on different factors that impact education for the countries or economies in this report. Table 4 compares the average length of the school day for students and pupil/teacher ratios, which vary considerably among the countries. It also shows that several of the top-performing countries or economies have a national curriculum. Furthermore, Canada's provinces are responsible for and finance K-12 schools; the others are governed and financed by the country's government. The economic constituencies of China are still under the jurisdiction of the national government, but both Hong Kong and Shanghai have permission to organize and administer their own education systems.

Table 5 in the Appendix shows that teachers in the US spend more hours teaching than those in the other countries. As noted, though, that does not mean teachers in other countries spend less time in school. Table 5 also shows that teachers in the US generally earn more than teachers in other countries. The exception is Canada. In Canada, teacher pay is comparable to the US and it is also comparable to similarly educated individuals with post-secondary degrees. In the US, teacher pay is roughly 66% of what others similarly educated earn. In Australia, teacher pay is only about 9% less than similarly educated individuals. Finnish teacher pay is from 3 to 11% lower than similarly educated individuals, although in Finland upper secondary teachers' salaries are 10% higher than those with similar post-secondary education. Among OECD countries, teachers' salaries

are, on average, 11% lower than similarly educated individuals (OECD, 2013). Even though China is now an OECD partner, statistics on teacher pay are not available for that country. Singapore is not a member of OECD but, according to the Center for International Benchmarking, its teachers' salaries compare favorably to salaries of engineers in that country.

Some Lessons Learned from Top-Performing Countries

Before discussing the salient lessons from other countries, it makes sense to note a few of the policies and practices of contemporary American education that are not characteristic of the other countries examined.

- The US tests students on state standardized tests in grades 3-8 and once again in high school, which is required by NCLB (Darling-Hammond, 2010; Robelin, 2012; Tucker, 2011).
- The US depends heavily on multiple-choice tests made up by test companies and scored by computer.

Whereas these top-performing countries have placed a high value in their national policies on the mastery of complex skills and problem solving at a high level, the United States has in recent years emphasized mastery of basic skills [in reading and math] at the expense of mastery of more advanced skills. (Tucker, 2011, pp. 8-9)

- The US holds schools accountable for student progress, but does not put much emphasis on student accountability (Mackenzie, 2013; Robelin, 2012; Ripley, 2013). In all the other countries except Canada, there is a transition from high school examination that is a gateway to further study and work. It is a

compilation of meaningful tests, which are developed and scored by the people who have a stake in student performance: teachers, university faculty, and business representatives. Students have to do well on them in order to continue their education or get jobs, and they often have a limited number of times they can take the test.

- In the US we declare schools as “failing” based on testing data. In other countries, they differentiate their support for schools based on their performance data and help them with regard to intervention and identify common issues (Robelin, 2012).
- In the US, athletics are sponsored by the school and invested in financially and emotionally by parents, students, and citizens (Ripley, 2013; Stewart, 2013). In commenting on her observations of international students in the US and American high school students abroad, Ripley says of the United States,

We had the schools we wanted, in a way. Parents did not tend to show up at schools demanding that their kids be assigned more challenging reading or that their kindergartners learn math while they still loved numbers. They did show up to complain about bad grades however. And they came in droves, with video cameras and lawn chairs and full hearts, to watch their children play sports. (Ripley, 2013, p. 192)

- In the US, many teachers teach in fields for which they are not prepared and often take a “sink or swim attitude” toward new teachers in the field (Darling-Hammond, 2010; Tucker, 2011). In other countries, subject matter expertise is

the most important characteristic, even for elementary teaching. In fact, “we talk a lot about getting rid of the worst teachers, as if that was our biggest problem, but nothing about doing what is necessary to get better ones, thus accomplishing little but the destruction of teacher morale. We do all of this while talking a lot about teacher quality” (Tucker, 2011, p .22).

- In the US we say we have “local control” of schools. What that means varies from state to state, but it often means, as Tucker (2011) says, we have “no control” because there are so many vested interests even as we have a system where localities pay for much of school costs leading to inequities across the board (Darling-Hammond, 2010).

Almost all of the top-performing countries have been moving away from local control, if they ever embraced it, and toward systems designed to distribute resources in ways intended to enable all students to achieve high standards. That does not mean equal funding for all students; it means differential funding; it means unequal funding designed to come as close as possible to assuring high achievement across the board. (Tucker, 2011, p. 26)

Characteristics of Schooling and Education in Top-Performing Countries

- All the other top-performing countries are very aware of what other top performers are doing and how (Tucker, 2011). Benchmarking is common, and is now characteristic of what some states are doing (Sparks, 2012).

To benchmark another country’s education system is to compare broad goals, policies, practices and institutional structures as well as relative

standing on common measures, in order to understand what another country is trying to achieve, how they have gone about achieving it, what they would have done differently if they could have done so, what mistakes they made and how they addressed them, which factors most account for their achievements and so on. Benchmarking is a wide-ranging research program that never ends, because no country's education system stands still very long. (Tucker, 2011, p. 6)

- Across the board, the teaching profession is highly selective and enjoys a high status in the society (Darling-Hammond, 2010; Sawchuk, 2012; Stewart, 2013; Tucker, 2011). And there is less and less vertical accountability because, as professionals, teachers seek lateral accountability which, in fact, provides greater autonomy. Countries are doing this in different ways, some through high expectations in pre-service and others through apprenticeships and mentoring. Furthermore, other countries are working on ways to create career ladders for teachers that differentiate the work even while maintaining a strong and clear vision of the goals of the enterprise (Malone, 2013). Several countries use “select, then train” plans for developing school leaders, and all of them support mentoring for leaders as they begin and continue in various administrative leadership roles (Center on International Education Benchmarking).
- In other countries, there has been and continues to be ongoing discussions and research regarding education with a consensus, though, on educational goals. This means in the high-performing countries there is a defined curriculum with expectations for grade or age levels for all students. The goal is not to sort

students, but to help all students reach a high level every year, giving more support and quality teaching to students who are not doing well. Teachers are prepared with deep understanding of the curriculum and supported as they teach it (Darling-Hammond, 2010; Malone, 2013; Stewart, 2013; Tucker, 2011).

- Not only do other countries have high standards but they also have an aligned and coherent system for overseeing the implementation and assessment of policies and practices (Darling-Hammond, 2012; Stewart, 2013; Tucker, 2011). Several writers hold out hope for the Common Core Curriculum to provide the guidance needed for states to fulfill high learning standards (Gwertz, 2012; Stewart, 2013); others do not (Tucker, 2011; Zhao, 2013). Most often, it is the coherence part of the statement that seems to get the greatest traction for other countries. There must be an alignment of established goals and what happens in classrooms; coherent systems of policy-making, curriculum, instruction, assessment, and oversight are underpinned by a consensus on purpose and goals.

The “tight-coupling” of Singapore may be an extreme version of this, but coherence can be ensured in many ways. In many instances, schools in the study’s countries are smaller than they tend to be in the US (although not in Maine), and the principals are called “head teachers” implying their instructional leader role (Tucker, 2011). School inspections in several countries help to ensure clarity of focus on the expectations of the curriculum (Robelin, 2012). On the other hand, “Scaling up has to involve more than the spread of new materials, new ideas, or new strategies; it must also involve the spread of underlying beliefs, norms, and principles” (Harris, 2013).

There is no one way to run an effective national or state system of education. All systems must struggle with finding the right balance between top-down and bottom-up, between uniformity and diversity, between central control and local autonomy. . . . Success requires a clear vision of moral purpose, a guiding and persistent political coalition, ambitious standards and a commitment to quality, effective leadership at every level, a focus on building teacher capacity to make the needed improvements, engagement of students, and broader community support. (Stewart, 2013, p. 94)

- Ensuring equitable opportunities for schooling is a major theme running throughout all of the school systems in this report (Darling-Hammond, 2010; Malone, 2013; Stewart, 2013). Equity is a major concern of OECD as it seeks to support economic growth throughout the world (OECD, 2013). The US is the only country that disaggregates data by race, ethnicity, and socio-economic status (SES), but there is a collective sense that the US is not doing enough to provide funding that would equalize opportunities for students in schools. Our system of financing schools has already been noted as problematic when it comes to dealing with the variety of achievement gaps. In addition, because of the funding issues, the US has one of the highest correlations between low SES and low test scores in the world (OECD, 2013). What this means, generally, is that students and schools that need more support because of disadvantage receive more money and support in other countries.

Marc Tucker (2011) offers suggestions that states could adopt to bring them more in line with policies and practices in high-performing countries. Several of his recommendations for designing for equity and productivity are included here (in abbreviated form) because they are so specific and provide much food for thought:

➤ Move toward full state adoption of responsibility for school finance and toward implementation of a weighted pupil finance system, which would calculate the amount for each school entirely on the basis of a uniform state formula. Let parents and students choose among public schools, with the funding following the student. The formula would provide funding to any public school chosen by the parents and the student, with the same base funding behind all students in the state, but additional amounts going to students based on the cost of bringing that student up to the high state academic standards. Among the students bringing more money to the school would be those from low-income families, students from families that do not speak English at home and those with some form of disability.

➤ Make sure that schools have the same high expectations for all students and that they provide the additional supports required by students who need them to achieve those standards (which is why a weighted student formula for school funding is necessary).

➤ Examine the total state budget for opportunities to make better tradeoffs between major budget elements in favor of higher productivity.

➤ Do what is necessary to redesign the state department of education so that it has the capacity and status needed to drive the state education system to excellence.

(pp. 42-42)

Many of the comparisons of the US with other countries describe the cultural values regarding education and the ways that shapes the experience of students in schools. But only Stewart's book (2013) includes student motivation as a key factor in bringing US schools in line with top performing countries. Among her recommendations for doing this are, "modify our belief in the importance of effort versus ability . . . and rebalance the time devoted to competing demands like televisions, social activities, or employment after school and studying" (p. 92). These sound like steps to a solution, but how people in the US view schooling and its purposes and how those notions spread throughout the ethos of schools and families are very different from other countries.

Perhaps embracing Ripley's (2013) depiction of the seriousness with which students, parents, and teachers in the other countries in her study act toward school is a possible approach. And then students might sense and absorb the attitude of seriousness if the other qualities of high performing countries were in place. It will take a concerted effort on the part of all citizens to take education seriously and to develop far-reaching and deep changes in the American approach to schooling.

Final thoughts

As noted, many of the researchers and writers on this topic make clear that it is very difficult to contemplate a country the size of the US taking the steps suggested or implied in looking across the analyses of top-scoring countries. States and their policymakers, though, are the right size generally and have more political will and leverage to act. An outstanding admonition from all the sources emphasizes that any actions have to be systemic and interwoven.

A starting place for a state like Maine might be to do some auditing of the state system as it is now. Where and how does it stack up against the characteristics of high-performing systems? What seem to be Maine's strengths and challenges in becoming world-class? What are areas to enhance and build on? What are policies and procedures that should be changed? What is the status of will and capacity to change? Then consider these recommended actions from Stewart's *A World-Class Education: Learning from International Models of Excellence and Innovation* (2012):

1. Engage the public in envisioning what knowledge and skills our students will need to be successful as adults in 2030, 2040, and beyond.
2. Create a broad leadership coalition across all sectors (K-12 and higher education, business, parents, students and community organization to bench-mark against high-performing systems and steer a change agenda over five years.
3. Develop a strategy for identifying, recruiting, and supporting high quality teachers and leaders and building instructional capacity for schools.
4. Design and monitor strategies to provide equity as a core part of the effort to provide world-class education. (p.159)

References

- Australian Curriculum, Assessment, and Reporting Authority. (2010). *The shape of the Australian curriculum*. Retrieved from www.acara.edu.au
- Cavanaugh, S. (2012). Canada musters resources to meet diverse student needs. *Education Week*, 31(16) 32-35.
- Center on International Education Benchmarking. Report retrieved from <http://www.ncee.org/programs-affiliates/center-on-international-education-benchmarking/top-performing-countries/>
- Council of Ministers of Education, Canada. (1999). *Victoria Declaration*. Retrieved from <http://www.cmec.ca/Publications/Lists/Publications/Attachments/250/victoria-declaration-1999.pdf>
- Cousins, C. (2013). Feds approve waiver of No Child Left Behind standards in Maine. *Bangor Daily News*. Retrieved from <http://bangordailynews.com/2013/08/12/politics/feds-approve-maines-request-to-waive-no-child-left-behind-student-measurement-standards/>
- Crotty, J.M. (2012). Why it's never mattered that America's schools lag behind other countries. *Forbes*. Retrieved from <http://www.forbes.com/sites/jamesmarshallcrotty/2012/09/17/why-its-never-mattered-that-americas-schools-lag-behind-other-countries/>
- Darling-Hammond, D. (2010). *The flat world and education: How America's commitment to equity will determine our future*. New York, NY: Teachers College Press.

- Fong, V.L. & Kim, S. (2011). Anthropological perspectives on Chinese children, youth, and education, In Levinson, B.A.U. & Pollock, M. (Eds.), *A Companion to the Anthropology of Education* (pp. 333-348). London: Wiley-Blackwell.
- Friedman, T. L. (2013). The Shanghai secret. *New York Times*. Retrieved from <http://www.nytimes.com/>
- Gewertz, C. (2012). US Common Core standards effort drew on ideas from abroad. *Education Week*, 31 (16), pp. 21-23. Retrieved from <http://www.edweek.org/>
- Hanushek, E. A. (2014) Why the US results on PISA matter. *Education Week*, 33 (15), 20-21, 24.
- Harris, A. (2013). Consolidation, not innovation: Successful educational reform at scale. International Perspectives on Education Reform Group. Retrieved from http://blogs.edweek.org/edweek/international_perspectives/
- Institute for Educational Statistics. (2012). US states in a global context: Results from the 2011 NAEP-TIMSS Linking Study. Retrieved from <https://nces.ed.gov/nationsreportcard/subject/publications/studies/pdf/2013460.pdf>
- Loveless, T. (2013). *The 2013 Brown Center Report on American Education: How well are American student learning?* Washington, D. C.: Brookings.
- Mackenzie, S. V. (2006). Learning about education in China: A reflection. *Schools: Studies in Education*, 3 (1), 55-75.
- Mackenzie, S. V. (2013). Schooling in Vietnam: Implications for schooling in the U.S. *Journal of Maine Education*, 23, 28-30.
- Malone, H. J. (2013). *Leading educational change: Global issues, challenges, and lessons on whole system reform*. New York, NY: Teachers College Press.

- Malone, H. J. (2013). Looking for school improvement ideas beyond our borders. *Education Week*. 33, (6), pp. 26-27. Retrieved from <http://www.edweek.org/>
- Martin, M.O. & Mullis, I.V.S. (2013) Relationships among reading, math and science achievement at the fourth grade—implications for early learning. Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.
- McGaw, Barry. (2013). Australian school improvement with transparent, fair comparisons. In Malone, H. J. (Ed.), *Leading educational change: Global issues, challenges, and lessons on whole system reform* (pp. 85-87). New York, NY: Teachers College Press.
- Meyer, H. D. (2013). OECD's PISA: A tale of flaws and hubris. *Teachers College Record*. Retrieved from <http://www.tcrecord.org>
- National Center for Education Statistics. (2013). *US States in a global context: Results from the NAEP-TIMSS linking study*. Washington, D.C.: Institute for Education.
- Ng, P. T. (2013). *Tensions and paradoxes in Singapore's education system*. International Perspectives on Education Reform Group. Retrieved from http://blogs.edweek.org/edweek/international_perspectives/
- OECD. (2011). *Lessons from PISA for the United States, Strong Performers and Successful Reformers in Education*, OECD Publishing.
doi:10.1787/9789264096660-en
- OECD. (2013). *Education at a Glance 2013: OECD Indicators*. OECD Publishing.
doi:10.1787/eag-2013-en
- OECD. (2013). *Lessons from PISA 2012 for the United States, Strong Performers and Successful Reformers in Education*. OECD Publishing.

doi:10.1787/9789264207585-en

OECD. (2013). PISA 2012 Results in Focus. PISA, OECD Publishing. Retrieved from www.oecd.org/pisa/keyfindings/pisa-2012-results-overview.pdf

OECD. (2014). PISA 2012 Results: What Students Know and Can Do – Student Performance in Mathematics, Reading and Science (Volume I, Revised edition, February 2014), PISA, OECD Publishing. doi:10.1787/9789264201118-

Ontario Ministry of Education. General information on website retrieved from <http://www.edu.gov.on.ca/eng/>

Ripley, A. (2013). *The smartest kids in the world: And how they got that way*. New York, NY: Simon and Shuster.

Robelin, E. (2012). Yardsticks vary by nation in calling education to account. *Education Week*. 31 (16), pp. 18-20. Retrieved from <http://www.edweek.org/>

Sahlberg, P. (2013). *The Finnish paradox*. International Perspectives on Education Reform Group. Retrieved from http://blogs.edweek.org/edweek/international_perspectives/

Sawchuk, S. (2012). Teacher quality, status entwined among top-performing nations. *Education Week*, 31 (16), pp. 12-16. Retrieved from <http://www.edweek.org/>

Sparks, S. (2012). Matching up states, countries offers fresh perspective. *Education Week*. 31 (16), pp. 36, 38. Retrieved from <http://www.edweek.org/>

Stewart, V. (2012). *A world-class education: Learning from international models of excellence and innovation*. Washington, D.C.: ASCD.

Tucker, M. (2011). *Standing on the shoulders of giants: An American agenda for education reform*. Washington, D.C.: National Center on Education and the

Economy. Retrieved from <http://www.ncee.org/wpcontent/uploads/2011/05/Standing-on-the-Shoulders-of-Giants-An-American-Agenda-for-Education-Reform>

Weintraub, R., & Weintraub, D. (2014). Why Arne Duncan's PISA comments miss the mark. *Education Week*, 33 (15), 20.

Zhao, Y. (2011). Handan Xuebu: What other countries can and should learn from other countries. *Teachers College Record*. Retrieved from <http://www.tcrecord.org>.

Zhao, Y. (2013). Directions of change: Why the US and China are moving in opposite directions. In Malone, H. J. (Ed.), *Leading educational change: Global issues, challenges, and lessons on whole system reform* (pp.16-19). New York, NY: Teachers College Press.

Appendix

Table 4. Comparison of Countries in the Study with the US Regarding Aspects of Education and Governance

	Compulsory Instruction Time in School Average Number of Hours 2011		Average Student/ Teacher Ratio 2011		Responsibility for Curriculum Guidelines and Decisions	Responsibility for Funding and Accountability for Education
	Primary	Lower secondary	Primary	Secondary	Level of government	Level of government
Australia	953	1009	15.6	12.0	National	National
Canada	919	923	14.4 across all (2008)^		Provincial	Provincial
China	855 (2008)+	965 (2008)+	17.1+	16.3+	National	National
Hong Kong	NA	NA	16**	NA	National + Hong Kong	National + Hong Kong
Shanghai	NA	NA	NA	NA	National + Shanghai	National + Shanghai
Finland	636	875	13.7	13.1	National	National
Singapore			19**	17.9*	National	National
US	934 !	1008 !	15.3	15.2	State guidelines/local discretion	Federal, state, local
OECD Average	770	890	15.4	13.6		

Sources: Education at a Glance OECD 2013 OECD indicators

*2009 http://en.wikipedia.org/wiki/Education_in_Singapore#Key_statistics

**2010 TIMSS NAEP Linking Study p.10

(based on 33 states that have established number of hours by law)

NA = Not Available

Table 5. Comparison of Countries in the Study with the US Regarding Teaching Time and Teacher Salaries

	Average Number of Teaching Hours per Year, 2011			Average Teacher Salaries in USD, 2011					
	Primary	Lower secondary	Upper secondary	Beginning primary w/min training	Top of scale primary w/min training	Beginning lower secondary w/min training	Top of scale lower secondary w/min training	Beginning upper secondary w/min training	Top of scale upper secondary w/min training
Australia	873	811	802	34,610	48,522	34,746	49,144	34,746	49,144
Canada	799	743	747	35,534	56,349	35,534	56,569	35,534	56,569
China	NA	NA	NA	NA	NA	NA	NA	NA	NA
Finland	680	595	553	30,587	40,160	34,008	45,900	34,008	45,900
Singapore	NA	NA	NA	NA	NA	NA	NA	NA	NA
US	1097	1068	1051	37,595	53,180	38,012	56,364	38,012	56,303
OECD Average	790	709	664	28,854	45,602	30,216	48,177	31,348	50,119

Source: OECD Education at a Glance 2013 p. 389 Table D3.1.; p.402 Table D4.2.

NA = Not Available

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Sarah Mackenzie is an associate professor of educational leadership at the University of Maine College of Education and Human Development. Her research primarily concerns teacher leadership and leadership development. Her interest in international education stems from trips to England, Kenya, China, and Vietnam where she visited schools, observed lessons, and spoke with teachers. Most recently in 2012, she worked at the University of Education of the Vietnam National University in Hanoi as a Fulbright professor. She taught courses and classes to all levels of graduate students, met with teachers and observed in schools, and collaborated on projects with Vietnamese professors. She has ongoing relationships with Vietnamese professors as they seek grant funding for future projects to improve education in Vietnam.