VIVIEN STEWART

A WORLD-CLASS EDUCATION

LEARNING FROM INTERNATIONAL MODELS OF EXCELLENCE AND INNOVATION

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A WORLD-CLASS EDUCATION

LEARNING FROM INTERNATIONAL MODELS OF EXCELLENCE AND INNOVATION

INTRODUCTION

Everything has changed, except the way we think. **—Albert Einstein**

The world is changing, and fast. The accelerating pace of globalization over the past 20 years—driven by profound technological changes, the rise of Asia (especially China and India), and the ever more rapid pace of scientific discovery—has produced a whole new way of life. Companies manufacture goods around the clock and around the world, ideas and events travel the Internet in seconds, a financial crisis in the United States affects the ability of farmers in Africa to borrow money for seed, and pollution in China affects the air in Los Angeles. The world in which today's students live is fundamentally different from the world in which we were raised. As never before, education in the United States must prepare students for a world where the opportunities for success require the ability to compete and cooperate on a global scale.

Technological, economic, and political trends have increased the demand for higher skills and reduced the demand for lower skills while intensifying the competition for quality jobs. Since 1990, more than 3 billion people in China, India, and the former Soviet Union have entered the global economy (Zakaria, 2008), and while these countries at first concentrated on creating low-skill jobs, they are increasingly aiming to

become competitive and dynamic knowledge-based economies. In fact, countries around the world are trying to raise people out of poverty and respond to increasing popular pressure to provide more economic opportunities for the next generation through expanding education. No country wants to be just the shoe manufacturer of the world.

The global economy is not a zero-sum game in which only one country can be prosperous. An expanding middle class in other countries provides an expanding market for U.S. goods and services, and companies from newly expanding economies may build plants and create jobs in the United States. But the competition for high-skill and high-income jobs is indeed escalating, and the United States cannot maintain its standard of living unless it provides its citizens with a world-class education system.

It is therefore all the more alarming that in December 2010, when the 2009 results from the Organisation for Economic Co-operation and Development's (OECD's) Programme for International Student Assessment (PISA) were released, U.S. students once again scored well below those in other developed countries on tests of reading, math, and science. These mediocre results followed similar scores from the previous rounds of PISA in 2000, 2003, and 2006, as well as from the Trends in International Mathematics and Science Survey (TIMSS) conducted by the International Association for the Evaluation of Educational Achievement. In fact, the United States has a high proportion of students who do not even reach baseline levels of proficiency on PISA.

As educators, we care a lot about excellence and equity, but viewed through the lens of international comparisons, American K–12 education seems neither excellent nor equitable. But are these comparisons valid? Why should we pay attention to international assessments? We don't need an international assessment to tell us that many of our schools are not doing well; we have plenty of our own testing to tell us that. Are they just one more stick to bash teachers with? What can we learn from international comparisons that we can't learn from our own research and experiences?

When the media reports on international assessment results like a horse race, with winners and losers, these are understandable

questions. However, they miss the point. In today's interconnected world, our students are not competing with students from the state or city next door, but with students from Singapore, Shanghai, and Stockholm. We owe it to our students to understand what is happening around the world. For their sake, we can't afford to give them an education that is lower in quality and less up-to-date than that which other countries are providing. Just as American businesses need to know what is happening in other countries if they hope be successful, we as educators need to understand global trends in education in order to create schools that equip our students for the world of tomorrow, not the world of yesterday.

Another reason for paying attention to international assessments is that, having now been implemented over a number of years, the results of these assessments have led to a growing body of research, observation, and discussion that goes beyond the numbers and rankings to help us understand why some systems are moving ahead rapidly and producing more equitable performance while others remain static and unequal. In the 20th century, the United States was the world leader in education. We were the first country to achieve universal secondary education and the first country to expand higher education beyond the elite class. However, in the 21st century, other countries are catching up and leaping ahead of us in high school graduation rates, in the quality and equity of performance in their K–12 education systems, and in the proportion of students graduating from college. Contrary to the beliefs of some pundits, American education has not gotten worse—but education in other parts of the world has gotten a lot better, a lot faster. How are countries that are outperforming our own K–12 education system doing it? What education policies and practices have they adopted? How do these differ from American educational practices? And are they relevant to the United States, or do they depend on a particular cultural context?

This book attempts to provide some answers to those questions by examining the following key issues:

- The major global trends that are transforming the skills needed and changing the shape of the global talent pool.

- How the U.S. education system compares with other education systems against the emerging world standards of excellence.
- How other countries have developed high-performing education systems and the lessons they hold for the United States.
- The common success factors that cut across these high-performing systems.
- Current international best practices in two key areas of education—*developing and maintaining a 21st century teaching and leadership profession* and *creating modern curriculum, instruction, and assessment systems.*
- How technology and international exchange can help the United States create a world-class educational system that is responsive to future challenges.

Let me stress at the outset of this book that there is no perfect education system. Globalization poses challenges for everyone. Every education system in the world struggles to some degree to keep up with the rapid pace of change. And countries face many similar challenges. For example, widespread internal and international migration have created more heterogeneous societies everywhere, placing new demands on educators as they respond to students and families from differing cultural and linguistic backgrounds. In addition to challenging schools to adapt to new populations, globalization also raises fundamental questions about whether the knowledge and skills needed by today's graduates will be significantly different from those that schools have provided in the past.

But other countries are demonstrating that large-scale educational acceleration is possible, even as our own educational performance has been flat for decades. Their success is not accidental, but the result of careful policy choice and effective implementation. Through combinations of national policies and leadership together with capacity building at the school level, these countries are achieving excellence in terms of student achievement, student retention, equity, and efficiency, and they are doing so at a lower cost than in the United States. Some may argue that the experiences of countries that are significantly smaller are not relevant to a country the size of the United States. But many of

these countries are the size of American states and could therefore be looked at as models for state-based education systems. In addition, we can learn from countries that are significantly larger than ours and still making giant strides, such as India and China.

High-performing or rapidly improving countries are also intently focused on becoming learning systems, constantly updating their assessment of whether their education system is preparing their students for the rapidly changing global knowledge economy. As leaders contemplate changes in particular policies and practices, whether in science and math, teaching and leadership development, or early intervention, they routinely compare their countries' methods against research and best practices from all over the world, including the United States. This strategy, known as "international benchmarking," has become a critical tool for governments and educators as they seek to develop world-class education systems. Some are sending not just their policymakers and researchers to scour the world for international best practice, but also their principals and teachers; in the United States, we rarely do this.

This book has its roots in my own experience. After growing up and being educated in England, I traveled to Africa, where I studied the relationships among education, economic development, and nation building. I then moved to the United States, where I worked for a number of years at Carnegie Corporation, directing its children, youth, and education programs. I was engaged in many efforts to improve American education, including implementing early childhood education, reforming urban schools, promoting healthy adolescent development, and improving the teaching profession. In the 1990s, my work with Carnegie Corporation also allowed me to see firsthand the changes in schools and universities in the former Soviet Union and Eastern Europe after the end of the Cold War. Later, in a stint as a senior education advisor at the United Nations, I worked on providing education to refugees around the world and restarting schools for children affected by war. Finally, in my eight years as the vice president for education of Asia Society, I witnessed the extraordinary rise of Asia, traveling extensively on that continent and conferring with many educators and political and

business leaders about the growth and challenges of Asian economies and education systems.

The privilege of being exposed to all these international experiences brought home to me just how dramatic the current global transformations are—comparable in scale and scope to the Industrial Revolution. The thirst for knowledge is universal, and education's importance to societies is now almost universally appreciated. Getting education right gives a country a powerful platform on which to build a healthy economy and a healthy society. Getting it wrong can hold back a country for years to come, especially in this new borderless knowledge economy, where human capital is the greatest asset most countries have.

As I have engaged in education efforts over the course of my career, I have tried to understand why, in the post–Cold War era, many countries have leaped ahead while the United States, once a world leader in education, has barely improved its performance over the past 20 years. What are the ingredients not just of *effective schools* but of *effective systems?* This book combines my own firsthand experience and observations of education systems in different parts of the globe with the small but growing research literature on these questions. My fundamental concerns are that the United States is being harmed economically and socially, as well as in terms of its ability to deal with the rest of the world, by its slow educational response to globalization, and that until very recently, our country has largely ignored the vigorous global conversation about educational performance and innovation.

There are many important initiatives underway to improve education in the United States on a wide range of fronts. We have many wonderful schools and "pockets of excellence," and our research and educational innovation are second to none, but this is not a book about those efforts, important as they are. Rather, its aim is to make educators aware of the new global context and standards of excellence by examining the experiences of countries that have surpassed or will soon surpass the United States educationally for the purpose of understanding what U.S. schools might do differently and better.

Chapter 1 examines the great transformation that is taking place around the world and the need for the United States to become more

internationally competitive. Chapter 2 describes the immense educational improvements made in recent years in Singapore, Canada, Finland, China, and Australia, and analyzes some key lessons. Education and political leaders in these countries did not pursue identical policies, but Chapter 3 draws out common themes and elements and suggests areas for reflection for those looking to improve education in the United States. Chapter 4 examines international lessons in building a high-quality teaching and school leadership profession. Chapter 5 proposes how curriculum, instruction, and assessment need to be modernized to give our students the knowledge and skills to prepare for the 21st century. Finally, Chapter 6 looks at what kind of efforts will be needed to create a world-class education system that will carry the United States into the future.

My visits to schools around the world have led me to ponder the key ingredients of successful school systems. Is it money? Is it culture? How do communities and countries move from having poor or highly unequal schools to good or even great schools? What are the political and economic contexts that drive reform? What education policies did governments pursue or not pursue? How did they assure quality? Equal opportunity? How did they ensure good teachers? My goal in writing this book is to add to the conversation about developing world-class schools in the United States and to engage more educators in considering the possibilities in international experience. What high-performing countries show is that performance does not have to be flat, that substantial improvement on a wide scale is possible, and that both excellence and equity are attainable. By looking at the lessons to be learned from countries that have effectively ramped up their educational performance and considering how they might be adapted in our national context, we can broaden the range of options under consideration and draw on a wider evidence base. Because international benchmarking in education is relatively new and the experiences of many countries and many educational issues have not yet been thoroughly researched, no book can yet be definitive about what can be learned from education systems around the world. However, just as a businessperson today cannot afford *not* to benchmark his or her industry against the best in

the world, we as educators cannot afford to isolate ourselves educationally. The yardstick for judging educational success is no longer national but international, and international benchmarking can be an important tool for improvement.

Learning goes both ways. Other countries have learned a great deal from the United States in the past, and I believe it is time for American educators to adopt a new worldview, to be open to others' practice, and to be willing to share our own experience. This is an enormously resourceful country with great assets. If we now engage with the world's knowledge about globalization and education, and if we build on and modernize our own assets more effectively, we can indeed have a world-class education system for our children and grandchildren.

1

GLOBALIZATION AND EDUCATION

> If Americans are to continue to prosper and to exercise leadership in this new global context, it is imperative that we understand the new global forces that we have both shaped and had thrust upon us. The alternative is to be at their mercy. **—Edward Fiske**

The World Transformed

We used to think that people who thought the Earth was flat were uneducated. But Thomas Friedman's best-selling book, *The World Is Flat* (2005), helped us to understand that if the world is not exactly flat, then it is deeply interconnected as never before. Friedman's book described how technology and the fall of trade barriers have led to the integration of markets and nations, and enabled individuals, companies, and nation-states to reach around the world faster and cheaper than ever before. We see evidence of this interconnectedness in our lives every day—from the food we eat to the coffee we drink to the clothes we wear. Sports teams recruit talent from around the globe, and the iPhones we use to communicate are manufactured in more than 19 different countries.

This transformation of the world has happened relatively recently and in a short period of time. The economic liberalization of China beginning in the 1980s, the development of democracy in South Korea

in 1987, and the fall of the Soviet Union and the development of free trade treaties in the early 1990s introduced 3 billion people, previously locked into their own national economies, into the global economy. Harvard economist Richard Freeman calls this the "great doubling" of the global labor force (National Governors Association, Council of Chief State School Officers, and Achieve, Inc., 2008, p. 9). In the late 1990s, the wiring of the world in preparation for the "millennium bug" unleashed another set of sweeping changes, as did the 2001 accession of China to the World Trade Organization and the 2003 economic liberalization of India, which jump-started that country's tremendous growth. The results have been staggering. Twenty years ago, bicycles were China's primary method of transportation, the G7 group represented the most powerful nations on earth, and the World Wide Web was just a proposal (McKinsey, 2011). Who at that time would have imagined the dramatic skyline of Shanghai today, that the G7 would become the G20, and that mobile web use would be growing exponentially around the world?

The effects of globalization have been far-reaching. While the living standards of the world are still highly uneven, 400 million people have moved out of extreme poverty since 1980—more than at any other time in human history. The growth and urbanization of a global middle class is creating huge new markets for goods and services of all kinds. Since 2000, despite frequent political and economic crises that cause it to dip temporarily, the global economy has been expanding (Zakaria, 2008). The world's economic center of gravity is also shifting: 50 percent of growth in gross domestic product (GDP) occurs outside the developed world, a fact that is fundamentally changing business models. Already, one in five U.S. jobs is tied to exports, and that proportion will increase (U.S. Census Bureau, 2004).

Globalization is often viewed as a zero-sum game in which one nation's economic growth comes at the expense of another. But the reality is more complicated than that. While manufacturing has largely moved out of the developed world into countries with lower labor costs, the exponential growth of the economies of India and China and the smaller-scale growth of other economies such as Russia and Brazil, have also created enormous demand for U.S. products—high-end industrial

goods, cars, luxury items, agricultural products, and so on—and have increased the numbers of tourists coming to the United States and the numbers of undergraduate and graduate students flocking to American universities. Large multinational companies from other countries are building plants and providing jobs in the United States, and the lower prices of consumer goods from abroad benefit the American consumer. Still, while the global integration of economies has created complex webs of capital, trade, information, currencies, services, supply chains, capital markets, information technology grids, and technology platforms that form a more intricate, multifaceted system than a model of simple economic competition among nations, the competition for industries and for high-skill, high-wage jobs has undoubtedly become more intense.

This intensified competition stems from several sources. First, automation has eliminated large numbers of lower-skill jobs—far more than outsourcing has, in fact. Second, the "death of distance" caused by the global spread of technology, which makes it just as easy to create a work team around the world as it is to create one across a company, has put American workers in direct competition with workers elsewhere. Work that can be digitized can now be done with the click of a mouse by anyone from virtually anywhere in the world. Jobs in medical diagnostics, architectural drawing, filmmaking, tax preparation, and call centers are some of the types of occupations that have been outsourced. American students today are therefore competing not just with students in the city or state next door but with students in Singapore and Shanghai, Bangalore and Helsinki.

As the economy has become not just more global but also more knowledge based, the skill mix in the economy has changed dramatically. The proportion of workers in blue-collar and administrative support positions in the United States dropped from 56 percent to 39 percent between 1969 and 1999, leaving a trail of rust-belt neighborhoods and cities. Meanwhile, the proportion of jobs that are managerial, professional, and technical increased from 23 percent to 33 percent during the same period (Levy & Murnane, 2004). Skill demands within jobs are increasing too. Jobs that require routine manual or cognitive

tasks are rapidly being taken over by computers or lower-paid workers in other countries, while jobs that require higher levels of education and more sophisticated problem-solving and communication skills are in increasingly high demand. The jobs that once supported a middle-class standard of living for workers with a high school diploma or less have substantially disappeared. These new economic realities and rapid shifts in the job market are fundamentally changing what we need from our education system.

The rapid increase in emerging markets also means economic growth and the need to prepare students for jobs that require new skill sets. According to the Committee for Economic Development (2006) "to compete successfully in a global marketplace, both U.S.-based multinationals as well as small businesses, increasingly need employees with knowledge of foreign languages and cultures to market products to customers around the globe and to work effectively with foreign employees and partners in other countries" (pp. 1–2).

And it is not just the economy that has become more global. The most pressing issues of our time know no boundaries. Challenges facing the United States—from environmental degradation and global warming, to terrorism and weapons proliferation, to energy and water shortages, to pandemic diseases—spill across borders. The only way to address these challenges successfully will be through international cooperation among governments and organizations of all kinds. As the line between domestic and international continues to blur, American citizens will increasingly be called upon to vote and act on issues that require greater understanding of other cultures and greater knowledge of the 95 percent of the world outside our borders.

In the 20th century the United States was "the most powerful nation since Imperial Rome" (Zakaria, 2008, p. 217), dominating the world economically, culturally, politically, and militarily. While the United States still remains a military superpower and supports the world's largest economy, the rapid economic growth and expansion happening in other countries show that a country's global position cannot be taken for granted. A great transformation is taking place around the world—and it is taking place in education, as well.

The Growing Global Talent Pool

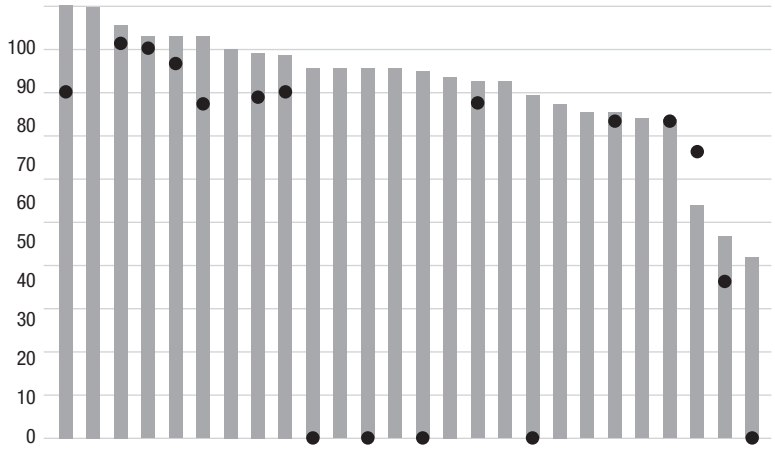
In the second half of the 20th century, the United States was indeed the global leader in education. It was the first country to achieve mass secondary education. And while European countries stuck to their elite higher education systems, the United States dramatically expanded higher education opportunities through measures like the G.I. Bill after World War II. As a result, the United States has had the largest supply of highly qualified people in its adult labor force of any country in the world. This tremendous stock of highly educated human capital helped the United States to become the dominant economy in the world and to take advantage of the globalization and expansion of markets.

However, over the last two decades, countries around the globe have been focused on expanding education as the key to maximizing individual well-being, reducing poverty, and increasing economic growth. Under the Education for All initiative, one of the United Nations' Millennium Development Goals, nations have joined together with the goal of providing universal primary education in every country, especially the poorest countries, by 2015. Although there is still a long way to go to meet this goal, particularly in sub-Saharan Africa, among girls, and in war-torn areas, more than 33 million children were added to school rolls between 2000 and 2008 (UNESCO, 2010). Countries in the middle tier of economic development aspire to universal secondary school graduation. And the most developed countries have set the goal of greatly increased levels of college attendance.

Because of dramatic global educational gains, high school graduation—once the gold standard of educational excellence—has now become the norm in most industrialized countries. Other nations have ambitiously expanded their secondary school systems and raised their graduation rates so that the United States has fallen from 1st in the world to 10th in the proportion of young adults (ages 18 to 24) with a high school diploma or equivalent. This shift is not because U.S. educational performance has declined, but because graduation rates have risen so much faster elsewhere. And in 2008, the United States had fallen from 1st to 18th in high school graduation rates among the 24 OECD (Organisation for Economic Co-operation and Development) countries

with comparable data, with countries like Finland, Germany, Japan, and South Korea more than 15 percent ahead of the United States (OECD, 2009; see Figure 1).

Figure 1 **Percentage of Population Achieving High School Graduation or Equivalent**



■ 2005 ● 1995 *Note:* *EU19 = Average of countries in the European Union

Source: Chart A2.1, Upper secondary graduation rates (1995, 2007), OECD (2009), *Education at a Glance 2009: OECD Indicators*. Paris: OECD Publishing. http://dx.doi.org/10.1787/eag-2009-en. Used with permission.

The pace of change in high school graduation in some countries has been astounding. For example, two generations ago, South Korea had a similar economic output to Mexico and ranked 24th in education among the current 30 OECD countries. Today, South Korea has the highest secondary school graduation rate in the world, with 93 percent of the secondary school-age population obtaining a high school diploma, compared with 77 percent in the United States (Uh, 2008).

At the higher education level, the United States has a strong system that is admired around the world and is a world leader in research. According to the 2010 Times Higher Education World University

rankings, 18 of the top 20 universities in the world were in America. And the United States is among the world leaders in the proportion of 35- to 64-year-olds with college degrees, reflecting the enormous expansion resulting from the G.I. Bill and, subsequently, the large numbers of people in the baby boom generation who went to college. But the United States falls to 10th place in the rankings when it comes to the proportional of younger adults aged 25 to 34 who have an associate's degree or higher (National Center for Public Policy and Higher Education, 2008).

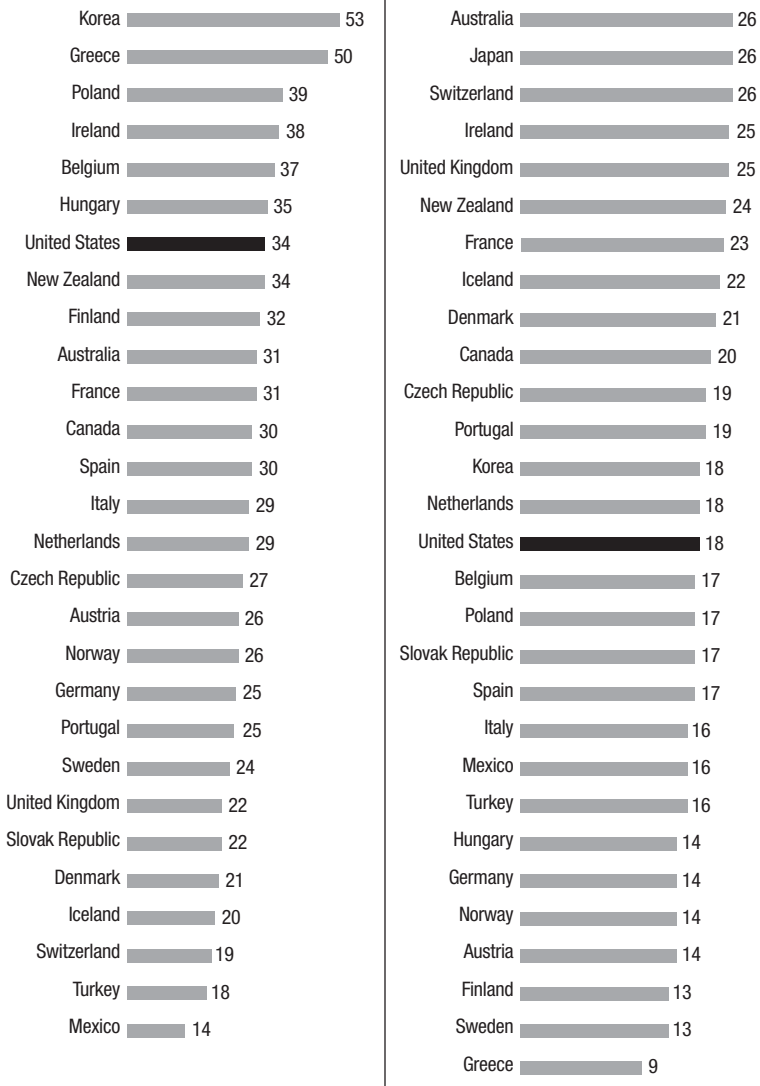
As recently as 1995, the United States tied for first in university and college graduation rates. But by 2008, it ranked 15th among 29 countries with comparable data, behind countries such as Australia, New Zealand, Japan, United Kingdom, Switzerland, and France. In the 1990s, when the importance of a highly educated workforce in the global economy was becoming ever clearer, other countries began to dramatically expand their higher education systems, as the United States had done in earlier decades. But during that period, there was almost no increase in the college-going rate in the United States. In addition, U.S. college dropout rates are high: only 54 percent of those who enter American colleges and universities complete a degree, compared with the OECD average of 71 percent. In Japan, the completion rate is 91 percent (National Center for Public Policy and Higher Education, 2008). Overall, the United States has lost ground in such international comparisons as the pace of higher education expansion has accelerated around the globe. While *older* generations of Americans are better educated than their international peers, many other countries have a higher proportion of *younger* workers with completed college degrees (National Center for Public Policy and Higher Education, 2008; see Figure 2).

This development of educated talent around the globe means that, going forward, the United States will not have the most educated workforce in the world as it has had in the past. Nowhere is this expansion of education more dramatic than in Asia.

The Challenge from Asia

The rise of Asia is one of the most critical developments of the late 20th and early 21st centuries. From 1980 to 1990, Japan boomed, with

Figure 2 College Attendance and Completion Statistics



The United States is a leader among OECD countries in the numbers of young adults enrolled in college, but ranks in the bottom half with regard to college completion.

Source: From *Measuring Up 2008: The National Report Card on Higher Education* (p. 8), by the National Center for Public Policy and Higher Education, 2008, San Jose, CA: Author. Available: http://measuringup2008.highereducation.org/print/NCPPHEMUNationalRpt.pdf

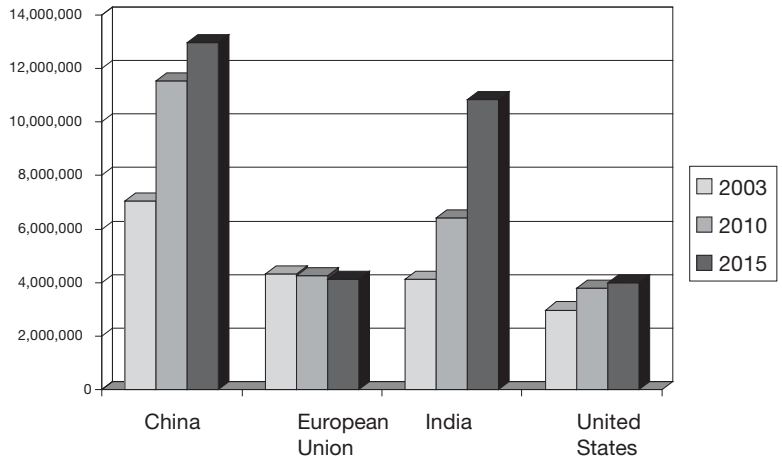
world-class companies like Sony, Honda, Toyota, and Nissan achieving great success in industries where the United States had once been dominant. The so-called "Asian tigers"—South Korea, Singapore, and Hong Kong—leapt forward and developed influential economies out of all proportion to their tiny size. China's GDP tripled between 1980 and 2003, increasing from USD$12 trillion to USD$36 trillion, making it the world's second-largest economy; it is expected to grow to USD$60 trillion by 2020 (Tierney, 2006). If current economic growth rates continue, it's only a matter of time before China overtakes the United States as the world's largest economy. Since India liberalized its economic policies in 2003, its economy, like China's, has been growing at a rate of 8 to 9 percent per year; by 2030, India is expected to overtake China as the nation with the largest population in the world, leading it to become a potentially even more significant player in the global market.

During this period, hundreds of millions of people have risen from poverty to form an enormous new middle class. But while Asia's extraordinary economic growth is the stuff of daily business headlines, less well-known is the region's equally remarkable educational trajectory. Of the 65 countries and provinces participating in OECD's 2009 Programme for International Student Assessment (PISA), the results of which were released in December 2010, most of the top performers were in Asia. Shanghai and Hong Kong led the way, followed by Singapore, South Korea, and Japan.

In terms of scale, the challenge to the United States has only just begun. A fundamental shift in the global talent pool is under way. Looking ahead to 2020, the U.S. proportion of that global talent pool will shrink even further as China and India, with their enormous populations, rapidly expand their secondary and higher education systems (see Figure 3). In the Cultural Revolution of the 1960s in China, there were almost no students in school. Today, nine years of basic education are universal in all but the most remote areas, and China's goal is to have 90 percent of students in upper secondary school by 2020. If the U.S. high school graduation rate remains flat and China continues on its current path, China will be graduating a higher proportion of students from high school within a decade. And China has 200 million

students in elementary and secondary education, compared with our about 66 million.

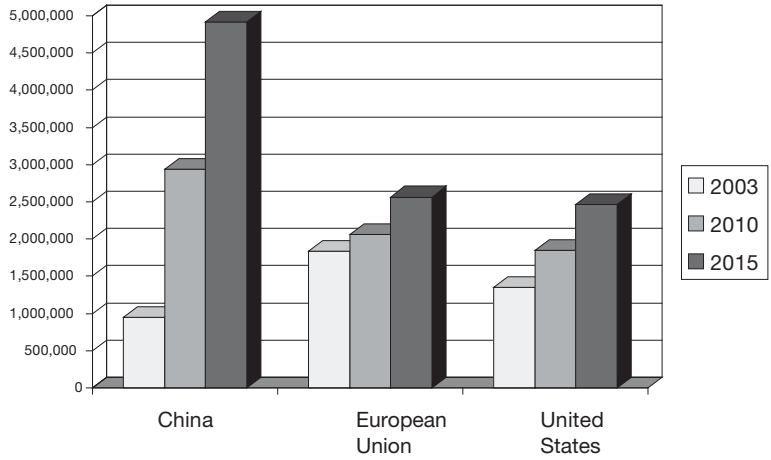
Figure 3 **Projected Future Supply of Secondary School Graduates**



Source: From "Education and the Knowledge Economy in Europe and Asia," by A. Schleicher and K. Tremblay, September 2006, *Challenge Europe*. Copyright 2006 by the European Policy Center. PERMISSION PENDING.

At the college level, according to the Chinese Ministry of Education, China has more than 82 million people who have received higher education, a small proportion of the population but still a number greater than America's 31 million college graduates. China expanded the number of students in higher education from 6 million in 1998 to 31 million in 2010, going from almost 10 percent to about 24 percent of the age cohort (Chinese Ministry of Education, 2010; see Figure 4). And many of these students are studying science and engineering. Harold Varmus, Nobel laureate, head of the National Cancer Institute, and cochair of the President's Council of Advisors on Science and Technology, observed, "In the 20th century, U.K. observers saw U.S. education as overtaking the United Kingdom. In the 21st century, arguably, China may soon be exceeding the United States in education" (Varmus, 2009).

Figure 4 **Projected Future Supply of College Graduates**



Source: From "Education and the Knowledge Economy in Europe and Asia," by A. Schleicher and K. Tremblay, September 2006, *Challenge Europe.* Copyright 2006 by the European Policy Center. PERMISSION PENDING.

India has been behind other countries in expanding secondary education; currently, only 40 percent of students of an age to be enrolled in secondary school actually are. But having succeeded in massively expanding primary education over the past two decades, India is now making major investments in secondary education, with the goal of universalizing lower secondary education by 2017 and sharply increasing enrollments in upper secondary school. The Indian government established a National Knowledge Commission (2006–2009) to make recommendations for policies that would help establish a "vibrant, knowledge-based society" based on research, technology transfer, and knowledge and skill development and, thus, strengthen India's competitive position in the global knowledge economy (National Knowledge Commission, 2009). According to Montek Singh, deputy chairman of the Indian Planning Commission, "India is on the threshold of launching a new secondary education program, where we will deliberate, among other things, on how to achieve world class standards in science, math,

and technology and how to build an education environment that fosters innovation" (Asia Society, 2008b, p. 6). At the higher education level, less than 10 percent of the age group is enrolled in postsecondary education, and many college courses are considered of low quality and relevance. However, India's elite Indian Institutes of Technology, modeled on the Massachusetts Institute of Technology and other premier scientific and technical institutions around the world, have produced graduates who have created software development and research and development companies from India to Silicon Valley, and who have catapulted into leading posts in global firms.

The United States Fails World Standards of Excellence and Equity

Not only is the United States falling behind in terms of education *quantity,* but there is also increasing alarm about the *quality* of its education. A range of international assessments reveal disturbing weaknesses in American K–12 students' performance compared to that of their peers in other countries.

Three different international testing programs measure student performance in reading, math, and science on a regular basis. Trends in International Mathematics and Science Survey (TIMSS), a test of science knowledge in 4th, 8th, and 12th grades, and the Progress in International Research on Literacy Study (PIRLS), a test of 4th grade literacy, are produced by the International Association for the Evaluation of Educational Achievement (IEA). The Programme for International Student Assessment (PISA), produced by OECD and administered every 3 years, measures performance in math, science, and reading for 15-year-olds. These tests are administered to a randomly selected sample of students within the countries they assess so that their results can be generalized to the larger population. After successive administrations, the results of these tests provide a picture of how countries are changing over time in various areas.

TIMSS

Beginning in 1995, with the most recent cycle of assessments taking place in 2007, TIMSS uses multiple-choice questions to assess learning of the science and math content commonly found in most countries' school curricula in particular grades. (A list of countries participating in TIMSS can be found online at http://nces.ed.gov/timss/countries.asp.). Students in the United States perform better on TIMSS than on PISA (see below), coming in 9th place in 8th grade math and 11th place in 8th grade science in 2007 (Quek et al., 2008), in part because not all of the higher-performing industrialized countries participate in TIMSS, and also because American students are used to multiple-choice tests that ask them to reproduce curriculum content. However, when the United States' TIMSS performance was compared with that of only the most developed nations in 2003, it ranked below the average of the 12 countries (Ginsburg, Leinwand, Anstrom, & Pollock, 2005).

PIRLS

The second cycle of PIRLS took place in 2006 in 40 countries (participants can be found at http://pirls.bc.edu/pirls2006/countries.html). PIRLS measures 4th grade reading and tries to determine how policies and practices in and out of schools relate to reading engagement and achievement. The United States tends to do better on international assessments of reading than of math and science. In fact, it ranked 18th out of 40 countries, above the average performance. However, whereas other countries showed significant improvement between the two cycles of PIRLS, U.S. performance remained flat.

PISA

The most widely used global student measures are the PISA assessments from OECD, which began in 2000 measuring performance in 43 countries and subsequently grew to include 60 countries and 5 non-national systems in its 2009 surveys. Together, these countries constitute 90 percent of the global economy. In 2009, a number of provinces in mainland China took part in the PISA surveys for the first time, and

India is planning to participate in future surveys. PISA truly has become a global education report card.

The PISA assessments, given to 15-year-olds, differ from TIMMS in that their goal is not primarily to measure subject matter knowledge but to determine how well students near the end of compulsory schooling apply their knowledge to real-life situations. The emphasis is therefore on understanding of concepts, mastery of processes, and real-world problem solving. PISA reports the average score for students in each country and identifies the top performers (levels 5 and 6) and poor performers (levels 1 and 2). The most recent United States performance on PISA (OECD, 2010b) is disappointing, to say the least, in all three subject areas (see Figure 5).

Science. In science, U.S. students ranked 17th among OECD member countries in 2009 (23rd among all nations and provinces taking the test). The U.S. score of 502 is average among OECD members. However, 18 percent of U.S. students did not reach level 2, considered the baseline level for being able to use science and technology in everyday life. This was an improvement from 24.4 percent in 2006. At the top end of performance, the United States has roughly the same proportion of high scorers as in 2006, with 10 percent of students reaching levels 5 and 6. Compare this figure with 28 percent in Shanghai, China, and 22 percent in Finland.

Math. In math, the United States ranks 25th among OECD member countries (31st among all nations and entities taking the test). The U.S. score of 487 is below the average for OECD member countries, with 23.4 percent of students not reaching baseline level 2. Only 12 percent of American students reach level 5 or 6, compared with 50 percent in Shanghai, China, and over 30 percent in Singapore and Hong Kong, China.

Reading. In reading, the United States ranks 14th among OECD member countries. The U.S. score of 500 is average for OECD countries and is unchanged since 2000. Eighteen percent of American students do not reach baseline level 2 in reading and are therefore unlikely to be able to cope with postsecondary education or training. However, with 11.5 percent of students reaching levels 5 and 6, the United States has an above-average share of the highest performers—though it still ranks below Australia, Canada, and Singapore (OECD, 2011b).

Figure 5 **Average Scores for Countries Ranking Above the United States in Reading, Mathematics, and Science on the 2009 PISA**

Reading		Mathematics		Science	
Country/Region	Score	Country/Region	Score	Country/Region	Score
Shanghai, China	556	Shanghai, China	600	Shanghai, China	575
Korea	539	Singapore	562	Finland	554
Finland	536	Hong Kong, China	555	Hong Kong, China	549
Hong Kong, China	533	Korea	546	Singapore	542
Singapore	526	Chinese Taipei	543	Japan	539
Canada	524	Finland	541	Korea	538
New Zealand	521	Liechtenstein	536	New Zealand	532
Japan	520	Switzerland	534	Canada	529
Australia	515	Japan	529	Estonia	528
Netherlands	508	Canada	527	Australia	527
Belgium	506	Netherlands	526	Netherlands	522
Norway	503	Macao, China	525	Chinese Taipei	520
Estonia	501	New Zealand	519	Germany	520
Switzerland	501	Belgium	515	Liechtenstein	520
Poland	500	Australia	514	Switzerland	517
Iceland	500	Germany	513	United Kingdom	514
United States	500	Estonia	512	Slovenia	512
		Iceland	507	Macao, China	511
		Denmark	503	Poland	508
		Slovenia	501	Ireland	508
		Norway	498	Belgium	507
		France	497	Hungary	503
		Slovak Republic	497	United States	502
		Austria	496		
		Poland	495		
		Sweden	494		
		Czech Republic	493		
		United Kingdom	492		
		Hungary	490		
		Luxembourg	489		
		United States	487		

Source: Comparing countries' performance in reading, mathematics, and science (Figures 2.16, 2.17, and 2.18). OECD (2011), *Lessons from PISA for the United States: Strong Performers and Successful Reformers in Education.* Paris: OECD Publishing. http://dx.doi.org/10.1787/9789264096660-en. Used with permission.

The United States is not among the top performers in any of the three subjects tested by PISA. Despite some improvements in science, U.S. performance is average at best and largely flat. While small differences in scores on the PISA scale matter little, the performance gap between the United States and top-performing nations is huge. American students lag a full year behind their peers in the countries that score highest in math. Factoring into the U.S. performance are large variations in scores by region and by socioeconomic status. In other nations, large enough samples of students take the test to enable comparisons among states or provinces. The United States' sample size is not commensurately large, but the sample does enable approximate regional estimates that show that states in the Northeast and Midwest do better than states in the West or South. U.S. average performance is also strongly affected by the high proportion of students achieving scores at the bottom two levels. This continuing class- and race-based achievement gap means that we are failing to prepare large numbers of our young people, especially those in our minority communities, for postsecondary education or training. But we also lack a high proportion of students who reach the top skill levels that are critical for innovation and economic growth. Even our best and brightest are not achieving the way they should be.

In sum, the results from the world's global education report cards show that American students are not well prepared to compete in today's knowledge economy. A host of developed nations are surpassing us in education. These results are especially disturbing in light of the fact that the United States reports the world's second-highest per-pupil expenditure.

What Can We Learn from International Comparisons?

How valid are these international assessments? Can we really use them to compare U.S. educational performance with that in other countries? Those who challenge the validity of using international assessments to compare educational systems do so based on a number of assumptions, all of which have largely turned out to be wrong:

1. *Other countries test a more select group of students than the United States does.* This was true for the early TIMMS assessments in the 1980s but is not, by and large, true today. According to Jim Hull, who examined international assessments for the National School Boards Association, "Since the 1990s, due to better sampling techniques and a move by more countries to universal education, the results represent the performance of the whole student population, including students who attend public, private, and vocational schools; students with special needs; and students who are not native speakers of their nation's language" (NGA et al., 2008, p. 20).

2. *Other countries are less diverse than the United States.* The United States is a diverse country, but so are most industrialized countries these days due to greatly increased international migration. While some countries that outperform the United States are culturally homogeneous, like Finland, many are not. In 2006, of the 11 other OECD countries that, like the United States, had a student population that was 10 percent immigrant, all performed higher that the United States in math and 9 performed higher in science. In addition, a lack of diversity is not a guarantee of educational success. Finland used to have relatively low-quality schools despite its cultural homogeneity. Its high performance today can be traced to education policies put in place over the past 20 years.

3. *The assessments favor test-oriented cultures like those in Asia.* The highest-performing countries or regions—Finland, Canada, Japan, Shanghai, Hong Kong, Singapore, Australia, and New Zealand—exist on four continents with different cultural backgrounds.

4. *Wealthier countries spend more on education than the United States does.* The United States is wealthier and spends more on education than most other countries. Among the 30 OECD countries, the United States has the highest GDP per capita and the second-highest educational expenditures. Only Luxembourg spends more per student.

5. *The United States' poor performance is due to high levels of poverty, not low levels of school quality.* In every country, students from higher-income backgrounds achieve at higher levels than lower-income

students. As the United States has a highly unequal income distribution, this is certainly a factor in U.S. performance. However, even America's most affluent students do not do as well as affluent students in other industrialized nations. Also, while the United States does not have a higher proportion of disadvantaged students than many other countries, the socioeconomic differences translate more strongly into student performance. In other words, the educational policies and practices of other countries do a more effective job of supporting lower-income students and equalizing educational opportunities.

There are clear limitations to these international assessments. One is that they only regularly measure three subject areas. It is possible that if other areas were measured, American students would perform better than students from other countries. For example, an IEA study of citizenship education found that American students perform relatively well compared with their international peers in their understanding of democratic institutions, an important goal of schooling (Torney-Purta, Lehmann, Oswald, & Schulz, 2001). However, they performed far less well in knowledge of other countries, an increasingly important need in the 21st century. And although there are no international assessments of proficiency in non-native languages, examining other countries' policies shows that most industrialized countries require study of a second language starting in elementary school and continuing for several years, whereas fewer than half of all American high school students take even one year of a foreign language, usually at the introductory level (American Council on the Teaching of Foreign Languages, 2010). What this means is that many of the students in high-performing countries who do well in math and science are also able to function professionally in another language.

It is also possible that international assessments do not capture characteristics of American schooling that may be very important in a global knowledge and innovation economy, especially the encouragement of creativity, independence of thought, and a wide range of talents through a broad curriculum and menu of extracurricular activities (Zhao,

2009). The breadth of the American school curriculum is traditionally one of its strengths (although the increase in high-stakes testing of a limited range of subjects is reducing that breadth). Clearly, international assessments do not measure everything. However, those areas they do measure—reading, math, and science—are certainly critical indicators of the quality of an education system. The PISA tests, in particular, are constructed to measure the kind of problem-solving and application skills that are essential to creativity and are increasingly being called for by educators, policymakers, and the business community.

What can we learn from international comparisons? Parents, teachers, and education policymakers are looking for information on how well schools are preparing their students for life. Most countries have national data and reports, such as the National Assessment of Educational Progress (NAEP), which allow states, for example, to compare the performance of their schools with other states. But international comparisons enable us to look at educational performance in a much broader context. In the past, such comparisons were largely of interest to academics, but the advent of a global knowledge economy has given us a critical "need to know." Today, PISA results show what is possible in education: that countries can achieve both excellence and equity. The repeated administration of these tests and the development of large-scale databases over time also allow us to see that significant change is possible and enable countries to gauge their progress against the most successful education systems in the world. Finally, they enable us to consider a wider range of policy options against a broader base of evidence as to "what works."

Countries also face common challenges. Societies everywhere are becoming more heterogeneous. And as skill sets change and people press for greater opportunities, governments everywhere experience similar difficulties in increasing quality, effectiveness, and accountability. There is a rich conversation to be had about approaches to new challenges. Other sectors of American life routinely study international trends in their fields; it is surprising that U.S. education has not been informed by international experience.

The High Cost of Low Educational Outcomes

How much impact does the educational quality of a nation's schools have on economic prosperity? This is a key question. Some people argue that the relationship is not that important, pointing out that despite the United States' mediocre performance on international tests since *A Nation at Risk* was published in the early 1980s (National Commission on Excellence in Education, 1983), the nation has still prospered economically. Although true in some respects, what this argument doesn't take into account is the time lag between the population's education levels and the country's economic output. In other words, America still enjoys a higher proportion of older adult workers with high school and college diplomas than its international counterparts. We have not yet seen the impact of a U.S. workforce that is less well educated than that of many other countries. Certainly, a nation's economic growth is influenced by more than its educational level, and the United States has a favorable economic climate in many other areas. Despite the excessive risk taking of American banks that led to the financial crisis of 2008, the United States' legal and financial systems, large supply of capital, research and technologies companies, and culture of entrepreneurialism are second to none and can, to some extent, compensate for a weaker K–12 education system. The United States is ranked fourth in the World Economic Forum's 2010–2011 Global Competitiveness Index precisely because of these factors (Schwab, 2010). However, the global competitiveness report also notes that America's costly but unproductive education and health systems constitute threats to its competitiveness and a reason for companies not to locate here. And despite the fact that the U.S. economy has grown overall in the last two decades, large sectors of the economy have moved to other parts of the world, where companies find not only cheaper labor but increasingly highly educated knowledge workers.

If the cost to society is significant, the monetary cost to an individual student of low educational performance is also extremely high. A high school dropout in 2005 had an average annual income of $17,299. If that student had graduated, he or she would have earned $26,933—a

difference of $9,634. Having an associate's degree raised the average income to $36,645, and a bachelor's degree brought in $52,671 (U.S. Census Bureau, 2006).

High school graduates also contribute more to the society through their increased purchasing power and taxes. They are less likely to become teen parents, they raise healthier children, and they are less likely to be in prison or rely on government food or housing programs. Dropouts not only earn less but also more likely to be unemployed. In the 2009 recession, the rate of unemployment for dropouts was 15.4 percent, compared with 9.4 percent for high school graduates and 4.7 percent for college graduates (U.S. Bureau of Labor Statistics, 2009). Princeton University researcher Cecelia Rouse calculated that each dropout costs society $260,000 (Rouse, 2005). If you multiply the number of dropouts by that amount over a 10-year period, the cost to society is on the order of $3 trillion (Alliance for Excellent Education, 2009). That is one measure of the economic cost of the United States' low global ranking in high school graduation rates.

There are economic costs and benefits not only to the amount of education, as measured by high school and college graduation rates, but also to the quality of education. Drawing on research conducted over the past 10 years on why some countries have succeeded economically while others have not, the Hoover Institution's Eric Hanushek and the University of Munich's Ludger Woessman used economic modeling to relate cognitive skills as measured by PISA and other international assessments to economic growth of OECD countries. Their analysis showed that relatively small improvements in the skills of a nation's workforce can have a large impact. For example, if all OECD countries boosted their PISA scores by 25 points over the next 20 years, a growth surpassed by Poland between 2000 and 2006, there would be an aggregate gain of $115 trillion over the lifetime of the generation born in 2010. Bringing all countries to the average performance of Finland, one of the consistently top-performing countries on PISA, would result in gains of about $260 trillion (OECD, 2010a). This analysis also showed that it is the quality of learning outcomes, not the length of schooling, that makes the difference.

Naturally, there is uncertainty in these projections, and there are lively disagreements among economists about how to do economic modeling. However, even if these projected benefits are reduced to minimal estimates, the reports indicate that the costs of improving schools would be more than paid for by future economic growth. In the economies of the past, which were based on raw materials, primary production, or manufacturing, the role of human capital was less important. But in today's knowledge-based economies, human capital is a critical ingredient in economic growth, productivity, and innovation.

The Need to Become World-Class

For most of the second half of the 20th century, Americans believed—and rightly so—that ours was the best education system in the world. But the concern that the United States is losing its edge has been growing steadily more urgent. The warning salvo fired by *A Nation at Risk,* with its famous threat of the "rising tide of mediocrity," has grown to a barrage of unease in reports like *Rising Above the Gathering Storm* (National Academy of Sciences, 2005), which argues that the United States is losing its lead in science, and *Tough Choices or Tough Times* (National Center on Education and the Economy, 2006), which argues that the U.S. standard of living will fall without radical reforms to increase educational performance and innovation; books by individual scholars like Linda Darling-Hammond (2010a), which make the case that America must seriously commit to equity to succeed in the "flat" world; and films like *2 Million Minutes,* written by software entrepreneur Bob Compton, which focuses on the ambition and hard work of Indian and Chinese high school students. This issue weighs heavily on the minds of parents, too, who wonder if the United States can maintain an educational system and economy that will allow their children to have a good standard of living in a world that is completely transformed from the world in which they grew up.

Reflecting this escalating concern about the need for dramatic improvement in U.S. education, President Barack Obama said, "In a 21st century world, where jobs can be shipped wherever there's an Internet

connection, where a child born in Dallas is now competing with a child in New Delhi, where your best job qualification is not what you do, but what you know, education is no longer just a pathway to success; it's a prerequisite for success" (Obama, 2009). Arguing that the No Child Left Behind legislation, with its emphasis on closing achievement gaps in basic skills, was not ambitious enough, he went on to call for the development of a "world-class education system," reducing the high school dropout rate, and once again making the United States first in the world in college graduation rates.

A world-class education system should not just be defined by rates of high school and college graduation but also by the quality of its educational outcomes and whether the content and skills are adequately preparing students for a rapidly changing global environment. The education system in the United States has many strengths that should not be underestimated, but it also has major weaknesses. We cannot afford to rest on our past educational accomplishments. Over the past two decades, tectonic shifts have occurred in the economic and educational landscape of the world. The global context has changed, global educational standards have changed, and the skills needed to be successful in the global knowledge economy have changed. But while the world has altered so dramatically, our schools have not. Just as a market leader in the corporate world can get eclipsed by newer companies, the American school system has been overtaken in many areas. The future of the economy, jobs, and other national challenges is always unpredictable, but a good education is the best tool we have to prepare the next generation of Americans for the rapidly changing world.

The next chapter looks at how a number of countries, selected from many different parts of the globe, have successfully developed education systems that outperform the United States and produce more equitable outcomes at lower cost. It also considers the challenges that face these systems and presents takeaway lessons for American educators.

REFERENCES

Achieve, Inc. (2007). *Creating a world-class educational system in Ohio.* Washington, DC: Author. Available: http://www.achieve.org/files/World_Class_Edu_Ohio_FINAL.pdf

Achieve, Inc. (2010). *What states should know about international standards in science: Highlights from Achieve's analysis*. Available: http://www.achieve.org/next-generation-science-standards

ACT. (2011). *Affirming the goal: Is college and career readiness an internationally competitive standard?* Iowa City, IA: Author.

Adams, K. (2005). *The sources of innovation and creativity.* Paper commissioned by the National Center on Education and the Economy for the New Commission on the Skills of the American Workforce. Washington, DC: National Center on Education and the Economy.

Alberta Initiative for School Improvement (AISI). (n.d). Home page. Retrieved November 3, 2011, from http://education.alberta.ca/department/ipr/aisi.aspx

Alberta Ministry of Education. (2010). *Inspiring education: A dialogue with Albertans* Available: https://www.inspiringeducation.alberta.ca

Alberts, B. (2009). Restoring science to science education. *Carnegie Reporter*. New York: Carnegie Corporation of New York.

Alliance for Excellent Education. (2009, August). The high cost of high school dropouts: What the nation pays for inadequate high schools. *Issue Brief*. Washington, DC: Author. Available: http://www.all4ed.org/files/HighCost.pdf

Alliance for Excellent Education. (2011, May). A time for deeper learning: Preparing students for a changing world. *Policy Brief.* Washington, DC: Author. Available: http://www.all4ed.org/files/DeeperLearning.pdf

American Council on the Teaching of Foreign Languages (ACTFL). (2010). *National enrollment survey preliminary result.* Alexandria, VA: Author.

American Council on the Teaching of Foreign Languages (ACTFL). (2011). *Foreign language enrollment in K–12 public schools: Are students ready for a global society?* Alexandria, VA: Author.

Asia Society. (2006a). *Creating a Chinese language program in your school*. New York. Author.

Asia Society. (2006b). *Math and science education in a global age: What the U.S. can learn from China.* New York: Author.

Asia Society. (2008a). *Going global: Preparing our students for an interconnected world.* New York: Author.

Asia Society. (2008b). *New skills for a global innovation society: Asia-Pacific Leaders Forum on Secondary Education, India.* New York: Author.

Asia Society. (2010). *Meeting the challenge: Preparing Chinese language teachers for American schools*. New York: Author.

Asia Society. (2011). *Improving teacher quality around the world: The International Summit on the Teaching Profession*. New York: Author.

Asia Society & Council of Chief State School Officers. (2010). *International perspectives on U.S. policy and practice: What can we learn from high-performing nations?* Available: http://asiasociety.org/files/pdf/learningwiththeworld.pdf

Australian Curriculum, Assessment, and Reporting Authority (ACARA). (2011). *Australian curriculum*. Available: http://www.acara.edu.au/curriculum/curriculum.html

Australian Institute for Teaching and School Leadership (AITSL). (n.d.). Home page. Retrieved November 3, 2011, from http://www.aitsl.edu.au/

Barber, M., & Mourshed, M. (2007). *How the world's best-performing school systems come out on top.* Available: http://www.mckinsey.com/App_Media/Reports/SSO/Worlds_School_Systems_Final.pdf

Barber, M., Whelan, F., & Clark, M. (2011). *Capturing the leadership premium: How the world's top school systems are building leadership capacity for the future*. London: McKinsey. Available: http://www.mckinsey.com/clientservice/Social_Sector/our_practices/Education/Knowledge_Highlights/Capturing%20the%20leadership%20premium.aspx

Bishop, J. H. (2005). *High school exit exams: When do learning effects generalize?* (CAHRS Working Paper #05-04). Ithaca, NY: Cornell University, School of Industrial and Labor Relations, Center for Advanced Human Resource Studies. Available: DigitalCommons.ILR.cornell.edu/cahrswp/4

Boix-Mansilla, V., & Jackson, A. (2011). *Educating for global competence: Preparing our youth to engage the world*. New York: Asia Society; and Washington, DC: Council of Chief State School Officers.

Carmichael, S. B., Wilson, W. S., Finn, C. E., Jr., Winkler, A. M., & Palmieri, S. (2009). *Stars by which to navigate? Scanning national and international education standards in 2009.* Washington, DC: Thomas B. Fordham Foundation & Institute. Available: http://www.edexcellencemedia.net/publications/2009/200910_starsbywhichtonavigate/Stars%20by%20Which%20to%20Navigate%20-%20October%202009.pdf

Carnegie Corporation of New York. (2009). *The opportunity equation: Transforming mathematics and science education for citizenship and the global economy.* Available: http://carnegie.org/fileadmin/Media/Publications/PDF/OpportunityEquation.pdf

Chen, M. (2010). *Education nation: Six leading edges of innovation in our schools.* San Francisco: Jossey-Bass.

Cheng, K. (2010). China: Turning the bad master into a good servant. In I. C. Rotberg (Ed.), *Balancing change and tradition in global education reform* (pp. 3–14). Lanham, MD: Rowan & Littlefield Education.

Chinese Ministry of Education. (2010). *National plan for medium- and long-term education reform and development.* Available:http://www.moe.edu.cn/publicfiles/business/htmlfiles/moe/s3501/index.html

Christensen, C. M., Horn, M. B., & Johnson, C. W. (2008). *Disrupting class: How disruptive innovation will change the way the world learns.* New York: McGraw-Hill.

Cloud, J. P. (2010). *Educating for a sustainable future.* In H. H. Jacobs (Ed)., *Curriculum 21: Essential education for a changing world* (pp. 168–185). Alexandria, VA: ASCD.

Committee for Economic Development. (2006). *Education for global leadership: The importance of international studies and foreign language education for U.S. economic and national security.* Washington, DC: Author. Available: http://www.ced.org/images/library/reports/education/report_foreignlanguages.pdf

Compton, R. A. (Executive Producer), Raney, A. (Producer), & Heeter, C. (Producer/Director). (2009). *2 million minutes* [Film]. True South Studios LLC.

Conference Board. (2006). *Are they really ready to work?* Available: www.conference-board.org/topics/publicationdetail.cfm

Darling-Hammond, L. (2010a). *The flat world and education: How America's commitment to equity will determine our future.* New York: Teachers College Press.

Darling-Hammond, L. (2010b). *Performance counts: Assessment systems that support high-quality learning.* Washington, D.C.: Council of Chief State School Officers. Available: http://flareassessment.org/resources/Paper_Assessment_DarlingHammond.pdf

Darling-Hammond, L., & Rothman, R. (Eds.). (2011). *Teacher and leader effectiveness in high-performing education systems.* Washington, DC: Alliance for Excellent Education; and Stanford, CA: Center for Opportunity Policy in Education. Available: http://www.all4ed.org/files/TeacherLeaderEffectivenessReport.pdf

Day, M. (2011, June). *TDA approaches to improving teacher training*. Presentation at the OECD–Japan Seminar, Tokyo.

Fandel, L .L. (2008, December 7). Alberta keeps pushing to improve its schools. *Des Moines Register*. Available: http://www.desmoinesregister.com/article/20081207/OPINION01/812070309/Alberta-keeps-pushing-improve-its-schools

Federico, C., & Cloud, J. (2009). Kindergarten through twelfth grade education: Fragmentary progress in equipping students to think and act in a challenging world. In J. Dornbuch (Ed.), *Agenda for a sustainable America* (pp. 109–127). Washington, DC: ELI Press, Environmental Law Institute.

Friedman, T. L. (2005). *The world is flat: A brief history of the twenty-first century.* New York: Farrar, Straus and Giroux.

Fuchs, T., & Woessman, L. (2004). *What accounts for international differences in student performance? A re-examination using PISA data.* CESifo Working Paper 1235. Available: http://www.cesifo-group.de/portal/pls/portal/docs/1/1189152.PDF

Fullan, M. (2001). *The new meaning of educational change*. New York: Teachers College Press.

Ginsburg, A., Cooke, G., Leinwand, S., Noell, J., & Pollock, E. (2005). *Reassessing U.S. international mathematics performance: New findings from the 2003 TIMMS and PISA.* Washington, DC: American Institutes for Research. Available: http://www.air.org/files/TIMSS_PISA_math_study1.pdf

Ginsburg, A., Leinwand, S., Anstrom, T., & Pollock, E. (2005). *What the United States can learn from Singapore's world-class mathematics system: An exploratory study*. Washington, DC: American Institutes for Research. Available: http://www.air.org/files/Singapore_Report_Bookmark_Version1.pdf

Gladwell, M. (2008). *Outliers: The story of success*. New York: Little, Brown.

Goh, K. S. (1979). *Report on the Ministry of Education 1978*. Singapore: Singapore National Printers.

Goslin, D. A. (2003). *Engaging minds: Motivation and learning in America's schools.* Lanham, MD: Scarecrow Press.

Grubb, W. N. (2007, October). Dynamic inequality and intervention: Lessons from a small country. *Phi Delta Kappan, 89*(2), 105–114.

Hamburg, D. A. (1992). *Today's children: Creating a future for a generation in crisis*. New York: Random House.

Hanushek, E. (2008). Education and economic growth: It's not just going to school, but learning something there. *Education Next*, *2008*(2), 62–70.

Hargreaves, A., Halasz, G., & Ponti, B. (2007). *School leadership for systemic improvement in Finland. A case study*. Paris: OECD. Available: http://www.oecd.org/dataoecd/43/17/39928629.pdf

Hong, K. T., Mei, Y. S., & Lim, J. (2009). *The Singapore model method for learning mathematics*. Singapore: EPB Pan Pacific.

Hopkins, D. (2007). *Every school a great school: Realizing the potential of system leadership*. Maidenhead, UK: Open University Press.

Hoskins, B., & Fedriksson, U. (2008). *Learning to learn: What is it and can it be measured?* Luxembourg: Office for Official Publications of the European Communities. Available: http://publications.jrc.ec.europa.eu/repository/handle/111111111/979

Hull, J. (n.d.). *International assessments and student achievement.* [Archived online chat session]. Available: http://www.centerforpubliceducation.org/MainMenu/Evaluating-performance/A-guide-to-international-assessments-At-a-glance/Archived-chat-International-assessments-and-student-achievement.html

Hunt, J. B., & Tierney, T. J. (2006). *American higher education: How does it measure up for the 21st century?* San Jose, CA: National Center for Public Policy and Higher Education. Available: http://www.highereducation.org/reports/hunt_tierney/Hunt_Tierney.pdf

Iswaran, S, (2011, March 16). Remarks presented at the International Summit on the Teaching Profession, New York, NY.

Jacobs, H. H. (Ed.). (2010). *Curriculum 21: Essential education for a changing world.* Alexandria, VA: ASCD.

James B. Hunt Jr. Institute for Educational leadership and Policy. (2011). Higher ed and the common core standards. *Issue Brief.* Chapel Hill, NC: Author.

Jerald, C. D. (2009). *Defining a 21st century education.* Alexandria, VA: Center for Public Education. Available: http://www.centerforpubliceducation.org/Learn-About/21st-Century/Defining-a-21st-Century-Education-Full-Report-PDF.pdf

Kagan, S. L., & Stewart, V. (2005). A new world view: Education in a global era. *Phi Delta Kappan, 87*(3), 241–245.

Lee, S. K., Goh, C. B., Fredriksen, B., & Tan, J. P. (Eds.). (2008). *Toward a better future: Education and training for economic development in Singapore since 1965.* Washington, DC: World Bank.

Levin, B. (2008). *How to change 5000 schools: A practical and positive approach for leading change at every level.* Cambridge, MA: Harvard Education Press.

Levin, B., Glaze, A., & Fullan, M. (2008). Results without rancor or ranking: Ontario's success story. *Phi Delta Kappan, 90*(4), 273–280.

Levy, F., & Murnane, R. J. (2004). *The new division of labor: How computers are creating the next job market.* Princeton, NJ: Princeton University Press.

Longview Foundation. (2008). *Teacher preparation for the global age: The imperative for change.* Available: http://www.longviewfdn.org/files/44.pdf

McGaw, B. (2010). President's report: Transforming school education. *Dialogue, 29*(1). Available: www.assa.edu.au/publications/dialogue/2010_Vol29_No1.php

McKinsey. (2011, January). *What happens next? Five crucibles of innovation shaping the coming decade.* Presentation to Asia Society, New York.

McKinsey Global Institute. (2009). *Averting the next energy crisis: The demand challenge.* Available: www.mckinsey.com/mgi/reports/pdfs/next_energy

Mitra, S. (2010, July). *The child-driven education.* Available: http://www.ted.com/talks/lang/eng/sugata_mitra_the_child_driven_education.html

National Academy of Sciences. (2005). *Rising above the gathering storm: Energizing and employing America for a brighter economic future*. Report from the Committee on Prospering in the Global Economy of the 21st Century and Committee on Science, Engineering, and Public Policy. Washington, DC: National Academies Press.

National Academy of Sciences. (2007). *Taking science to school: Learning and teaching science in grades K–8*. Report from the Committee on Science Learning in K through Eighth Grade). Washington, DC: National Academies Press.

National Assessment of Educational Progress. (2011). *The nation's report card: Geography 2010.* Washington, DC: Author. Available: www.nationsreportcard.gov

National Center for Public Policy and Higher Education. (2008). *Measuring up 2008: The national report card on higher education*. Available: http://measuringup.highereducation.org/_docs/2008/NationalReport_2008.pdf

National Center on Education and the Economy. (2006). *Tough choices or tough times: The report of the New Commission on the Skills of the American Workforce.* San Francisco: Wiley.

National Commission on Excellence in Education. (1983). *A nation at risk: The imperative for educational reform: A report to the Nation and the Secretary of Education, United States Department of Education.* Washington, DC: Author.

National Governors Association, Council of Chief State School Officers, & Achieve, Inc. (2008). *Benchmarking for success: Ensuring U.S. students receive a world-class education.* Available: http://www.achieve.org/files/BenchmarkingforSuccess.pdf

National Institute of Education. (2009). *TE21: A teacher education model for the 21st century.* Singapore: Author. Available: http://www.nie.edu.sg/files/about-nie/TE21%20online%20version.pdf

National Knowledge Commission. (2009). *Final report.* Delhi: Author. Available at http://www.knowledgecommission.gov.in

National Research Council. (2007). *International education and foreign languages: Keys to securing America's future.* Report of the Committee to Review the Title VI and Fulbright-Hays International Education Programs. Washington, DC: National Academies Press.

National Research Council. (2011). *A framework for K–12 science education: Practices, crosscutting concepts, and core ideas.* Available: http://www7.nationalacademies.org/bose/standards

Ng, P. T. (2008a). Developing forward-looking and innovative school leaders: The Singapore Leaders in Education Programme. *Journal of In-service Education, 34*(2), 237–255.

Ng, P. T. (2008b). Educational reform in Singapore: From quantity to quality. *Educational Research for Policy and Practice, 7*(1), 5–15.

Oakes, J. (2005). *Keeping track: How schools structure inequality.* New Haven, CT: Yale University Press.

Obama, B. (2009, March 10). Remarks of the president of the United States to the Hispanic Chamber of Commerce.

Office for Standards in Education, Children's Services and Skills (Ofsted). (2010, September 10). *Finnish pupils' success in mathematics* (Report No. 100105). Available: http://www.ofsted.gov.uk/resources/finnish-pupils-success-mathematics

Organisation for Economic Cooperation and Development (OECD). (2008). *Improving school leadership*. Available: http://www.oecd.org/edu/schoolleadership

Organisation for Economic Cooperation and Development (OECD). (2009). *Education at a glance 2008: OECD indicators.* Paris: OECD Publications.

Organisation for Economic Cooperation and Development (OECD). (2010a). *The high cost of low educational performance: The long-run economic impact of improving PISA outcomes*. Available: http://www.oecd.org/dataoecd/11/28/44417824.pdf

Organisation for Economic Cooperation and Development (OECD). (2010b). *PISA 2009 results: Executive summary*. Available: http://www.oecd.org/dataoecd/34/60/46619703.pdf

Organisation for Economic Cooperation and Development (OECD). (2011a). *Building a high-quality teaching profession: Lessons from around the world.* Background report for the International Summit on the Teaching Profession. Available: http://www2.ed.gov/about/inits/ed/internationaled/background.pdf

Organisation for Economic Cooperation and Development (OECD). (2011b). *Lessons from PISA for the United States: Strong performers and successful reformers in education.* Paris: OECD Publications.

O'Toole, J., & Lawler, E. E. (2006). *The new American workplace*. New York: Palgrave Macmillan.

Partnership for 21st Century Skills. (2009). *Framework for 21st century learning.* Tucson, AZ: Partnership for 21st Century Skills. Available: http://www.p21.org/documents/P21_Framework.pdf

Patrick, S. (2010, November 16). *The online learning imperative*. Presentation to the 20101 Virtual School Symposium, Glendale, Arizona.

Pervin, B., & Campbell, C. (2011). Systems for teacher and leader effectiveness and quality: Ontario, Canada. In L. Darling-Hammond & R. Rothman (Eds.) *Teacher and leader effectiveness in high-performing systems* (pp. 23–33). Washington, DC: Alliance for Excellent Education; and Stanford, CA: Center for Opportunity Policy in Education.

Quek, G., et al. (Eds.). (2008). *TIMSS 2007 encyclopedia: A guide to mathematics and science education around the world.* Chestnut Hill, MA: TIMSS & PIRLS International Study Center, Boston College.

Reimers, F. (2009, September). Leading for global competence. *Educational Leadership, 76*(1) [online only]. Available: http://www.ascd.org/publications/educational-leadership/sept09/vol67/num01/Leading-for-Global-Competency.aspx

Rhodes, N. C., & Pufahl, I. (2009). *Foreign language teaching in U.S. schools: Results of a national survey.* Washington, DC: Center for Applied Linguistics.

Rotherham, A. J., & Willingham, D. (2009, September). 21st century skills: The challenges ahead. *Educational Leadership, 87*(1), 16–21.

Rouse, C. E. (2005, October). *The labor market consequences of inadequate education.* Paper prepared for the Symposium on the Social Costs of Inadequate Education, Teachers College, Columbia University, New York.

Sahlberg, P. (2011). *Finnish lessons: What can the world learn from educational change in Finland?* New York: Teachers College Press.

Schleicher, A. (2006). *The economics of knowledge: Why education is key to Europe's success* (Lisbon Council Policy Brief Vol. 1, No. 1). Brussels: Lisbon Council. Available: http://www.lisboncouncil.net/publication/publication/46-the-economics-of-knowledge-why-education-is-key-to-europes-success.html

Schleicher, A., & Stewart, V. (2008). Learning from world-class schools. *Educational Leadership, 66*(2), 44–51.

Schleicher, A., & Tremblay, K. (2006). Education and the knowledge economy in Europe and Asia. *Challenge Europe.* Brussels: European Policy Centre.

Schmidt, W. (2005). The role of curriculum. *American Educator, 23*(4). Available: http://www.aft.org/pubs/reports/american_educator/issues/fall2005/schmidt.htm

Schmidt, W. (2008, June 9). Comments at the Hunt Institute and National Governors Association Governors Education Symposium, Cary, North Carolina.

Schmidt, W. H., Houang, R., & Shakrani, S. (2009). *International lessons about national standards.* Washington, DC: Thomas Fordham Institute.

Schwab, K. (Ed.). (2010). *The global competitiveness report 2010–2011.* Geneva: World Economic Forum.

Sclafani, S. (2008). *Rethinking human capital in education: Singapore as a model for teacher development.* Washington, DC: Aspen Institute. Available: http://www.aspeninstitute.org/sites/default/files/content/docs/education%20and%20society%20program/SingaporeEDU.pdf

Segal, A. (2011). *Advantage: How American innovation can overcome the Asian challenge.* New York: Norton.

Singapore Ministry of Education. (2010). *Nurturing our young for the future: Competencies for the 21st century.* Available: www.moe.gov.sg/committee-of-supply-debate/files/nurturing-our-young.pdf

Smith, M. S. (2009). Opening education. *Science, 323*(5910), 89–93.

Stevenson, H. W., & Stigler, J. W. (2006). *The learning gap: Why our schools are failing and what we can learn from Japanese and Chinese education* (2nd ed.). New York: Simon and Schuster.

Stewart, V. (2007, April). Becoming citizens of the world. *Educational Leadership, 64*(7), 8–14.

Stewart, V. (2010/2011, December/January). Raising teacher quality around the world. *Educational Leadership, 68*(4), 16–20.

Stewart, V. (2010). A classroom as wide as the world. In H. H. Jacobs (Ed.), *Curriculum 21: Essential education for a changing world* (pp. 97–114). Alexandria, VA: ASCD.

Stewart, V. (2011a, June). *Comparing East Asian and Western education systems: What sets them apart and what can they learn from each other.* Presentation at the OECD–Japan Seminar, Tokyo.

Stewart, V. (2011b). Singapore: Rapid improvement followed by strong performance. In OECD, *Lessons from PISA for the United States: Strong performers and successful reformers in education* (pp. 159–175). Paris: OECD Publications.

Stewart, V., & Singmaster, H. (2010, December 13). Lifting standards for all: China and the US can teach each other about education. *South China Morning Post.*

Stigler, J. W., & Hiebert, J. (1999). *The teaching gap: Best ideas from the world's teachers for improving education in the classroom.* New York: Free Press.

Tierney, T. J. (2006, May). How is American higher education measuring up? An outsider's perspective. In J. B. Hunt Jr. and T. J. Tierney, *American higher education: How does it measure up for the 21st Century*? (pp. 7–12) (National Center Report No. 06-2). San Jose, CA: National Center for Public Policy and Higher Education. Available: http://www.highereducation.org/reports/hunt_tierney/Hunt_Tierney.pdf

Torney-Purta, J., Lehmann, R., Oswald, H., & Schulz, W. (2001). *Citizenship and education in twenty-eight countries: Civic knowledge and engagement at age 14.* Amsterdam: International Association for the Evaluation of Educational Achievement.

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

UNESCO. (2010). *Education for All global monitoring report: Reaching the marginalized.* Paris: UNESCO; and Oxford, UK: Oxford University Press.

U.S. Bureau of Labor Statistics. (2009). Table A-4: Employment status of the civilian population 25 years and over by educational attainment. Washington, DC: U.S. Department of Labor. Available: http://www.bls.gov/news.release/empsit.t04.htm

U.S. Census Bureau. (2004). Table 2: Exports from manufacturing establishments. Washington, DC: U.S. Department of Commerce.

U.S. Census Bureau. (2006). Table 8: Income in 2005 by educational attainment of the population 18 years and over. Washington, DC: U.S Department of Commerce.

U.S. Census Bureau. (2008, August 14). *An older and more diverse nation by mid-century.* Available: http://www.census.gov/newsroom/releases/archives/population/cb08-123.html

Uh, S. (2008). *How did Korea achieve the highest secondary education rate in the world?* Paper presented at meeting of Asia Society, New Delhi, India.

Utah Department of Education. (2011). *Utah's dual immersion programs.* Available: www.schools.utah.gov/CURR/dualimmersion

Varmus, H. (2009, November 5). Remarks at the City of New York and Alfred P. Sloan Foundation First Annual Awards for Excellence in Teaching Science and Mathematics, New York.

Wagner, T. (2008). *The global achievement gap.* New York: Basic Books.

Zakaria, F. (2008). *The post-American world.* New York: Norton.

Zhao, Y. (2009). *Catching up or leading the way: American education in the age of globalization*. Alexandria, VA: ASCD.

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