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Introduction

A CHANGING YARDSTICK FOR EDUCATIONAL SUCCESS

Globalisation and modernisation are rapidly posing new and demanding challenges to individuals and societies alike. Increasingly diverse and interconnected populations, rapid technological change in the workplace and in everyday life, and the instantaneous availability of vast amounts of information are just a few of the factors contributing to these new demands. In this globalised world, people compete for jobs not just locally but internationally. The integrated worldwide labour market means that highly-paid workers in wealthier countries are competing directly with people with much the same skills but who demand less compensation in lower-wage countries. The same is true for people with low skills. The competition among countries now revolves around human capital and the comparative advantage in knowledge.

The effect of these developments is to raise wages in less developed countries and depress wages in the most industrialised countries. But these developments do not affect all workers equally. Job automation is proceeding even faster than the integration of the job market. If the work is routine, it is increasingly likely to be automated, although some jobs will always be done by human beings. The effect of automation, and more generally of the progress of technological change, is to reduce the demand for people who are only capable of doing routine work, and to increase the demand for people who are capable of doing knowledge work. This means that a greater proportion of people will need to be educated as professionals to do such knowledge-based work. High-wage countries will find that they can only maintain their relative wage levels if they can develop a high proportion of such knowledge workers and keep them in their work force. Increasingly, such work will require very high skill levels and will demand increasing levels of creativity and innovation.

This is not a description of one possible future, but of the economic dynamics that are currently in play. In the high-wage countries of the OECD, demand for highly-skilled people is increasing faster than supply (which the OECD indicators mirror in rising wage premiums for highly-skilled individuals) and demand for low-skilled workers is decreasing faster than supply (which the OECD indicators mirror in growing unemployment or declining wages for low-skilled individuals). Jobs are moving rapidly to countries that can provide the skills needed for any particular operation at the best rates. And the rate of automation of jobs is steadily increasing in both high-wage and low-wage countries.

These dynamics are increasing the pressure on governments to educate their citizens to earn a decent living in this environment and to offer their children an education that will ensure their life is at least as rewarding as their own. Governments need to create education systems that are accessible to everyone, not just a favoured few; that are globally competitive on quality; that provide people from all classes a fair chance to get the right kind of education to succeed; and to achieve all this at a price that the nation can afford. The aim is no longer just to provide a basic education for all, but to provide an education that will make it possible for everyone to become “knowledge workers”. Such education will need to build the very high skill levels required to solve complex problems never seen before, to be creative, to synthesise material from a wide variety of sources and to see the patterns in the information that computers cannot see, to work with others in productive ways, to lead when necessary and to be a good team member when necessary. This is what is required in today’s “flat” world where all work that cannot be digitised, automated and outsourced can be done by the most effective and competitive individuals, enterprises or countries, regardless of where they may be. The implication is that the yardstick for educational success is no longer simply improvement by national standards, but the best performing education systems internationally (Box 1.1).

OVERVIEW

This volume draws lessons from the education systems of a selection of top-scoring and rapidly improving countries as measured by the OECD Programme for International Student Assessment (PISA – described below). While this volume relates these lessons to the education reform agenda in the United States, they may have resonance for a wide range of countries and different types of education systems aspiring for excellence in educating their young people. This volume defines countries as high-performing if: almost all of their students are in high school at the appropriate age, average performance is high and the top quarter of performers place among the countries whose top quarter are among the best performers in the world (with respect to their mastery of the kinds of complex knowledge and skills needed in advanced economies as well their ability to apply that knowledge and those skills to problems with which they are not familiar); student performance is only weakly related to their socio-economic background; and spending per pupil is not at the top of the league tables. Put another way, this volume defines superior performance as high participation, high quality, high equity and high efficiency.



Box 1.1 **The pace of change in educational improvement**

Few countries have been able to capitalise more on the opportunities the ‘flat’ world provides than the United States, a country which can draw on one of the most highly educated labour forces of the industrialised nations (when measured in terms of formal qualifications).¹ However, this advantage is largely a result of the “first-mover advantage” which the United States gained after World War II by massively increasing enrolments. This advantage is eroding quickly as more and more countries have reached and surpassed the US’s qualification levels among its younger age cohorts. The OECD baseline qualification for reasonable earnings and employment prospects is a high school diploma. Among OECD countries, the average proportion of young adults with at least a high school diploma has now risen to 80%; in Germany and Japan, two of the benchmark countries chosen for this volume, this figure exceeds 95%. Over time, this will translate into better workforce qualifications in OECD countries. In contrast, changes in the graduation rates have been modest in the United States and, as a result, only 8 of the 34 OECD countries now have a lower high school graduation rate than the United States. Two generations ago, South Korea had the economic output equivalent to that of Afghanistan today and was 23rd in terms of educational output among current OECD countries. Today South Korea is one of the top performers in terms of the proportion of successful school leavers, with 94% obtaining a high school diploma. Similarly, Chile moved up by 9 rank order positions, Ireland by 8 and Belgium and Finland by 4 rank order positions.

Similar trends are visible in college education. Here the United States slipped from rank 2 to rank 13 between 1995 and 2008, not because its college graduation rates declined, but because they rose so much faster in many other OECD countries. These developments will be amplified over the coming decades as countries such as China and India raise their educational output at an ever-increasing pace.

Changes are not just observed in the quantitative output of education systems, but many countries have also shown impressive improvements in the quality of learning outcomes. Korea’s average performance was already high in 2000, but Korean policy makers were concerned that only a narrow elite achieved levels of excellence in PISA. Within less than a decade, Korea was able to virtually double the share of students demonstrating excellence in reading literacy. A major overhaul of Poland’s school system helped to dramatically reduce performance variability among schools, reduce the share of poorly performing students and raise overall performance by the equivalent of more than half a school year. Germany was jolted into action when PISA 2000 revealed below-average performance and large social disparities in results, and has been able to make progress on both fronts. Last but not least, countries such as Brazil, Chile, Indonesia and Peru have seen impressive gains catching up from very low levels of performance.

The remainder of Chapter 1 describes the framework of analysis for this volume, the PISA measures used in this volume, and the methodology for developing the country chapters and lessons.

Chapter 2 sets the stage by analysing in-depth the performance of the United States on PISA, contrasting its relative strengths and weaknesses with those of other countries.

The subsequent chapters of this volume present detailed analyses of education systems which are either high-performing or have seen rapid improvements in their performance. For each country, desk reviews and interviews with a range of experts in the field of education were conducted. Each chapter first reviews the country’s history and culture as context for understanding its education system. The chapters then go on to outline the main elements of the country’s education system and how these relate to the observed outcomes. These elements vary across the education systems described, but generally include standards, examination systems, instructional systems, school finance, teacher quality, accountability, student motivation, and so on. Recent policy developments are highlighted in the context of past reforms. Each chapter concludes by drawing wider lessons.

The last chapter draws together the threads of the preceding chapters to present some of the policy lessons that can be drawn.

[Part 1/1]

Table 1.1 Basic data on the countries studied in this volume

| | Quality | | | | | | | | Equity | Coherence | Efficiency | Income | Equality | | | | | | |
|------------------------|---------------------------------------------|------|---------------------------------------------|------|--------------------------------------------------------|------|-----------------------------------------------|------|---------------------------------------------|-----------|--------------------------------------------------------------------------------------------------|----------------------------------------------|---------------------------------------------------------------------------------------------------|------------------------------|-----------------------------------------------------------------------------------|---------|----------------|-------|------------|
| | PISA 2009 Results, ¹ Table V.2.1 | | PISA 2009 Results, ¹ Table V.2.1 | | PISA 2009 Results, ¹ Table V.2.1 | | PISA 2009 Results, ¹ Table V.3.1 | | PISA 2009 Results, ¹ Table V.3.3 | | PISA 2009 Results, ¹ Figure II.1.4b | PISA 2009 Results, ¹ Table II.5.1 | EAG, ² Table B1.2 | EAG, ² Table X2.1 | PISA 2009 Results, ¹ Table II.1.2 | | | | |
| | Mean PISA score on the reading scale 2009 | S.E. | Mean PISA score on the reading scale 2000 | S.E. | PISA score difference in reading between 2000 and 2009 | S.E. | Mean PISA score on the mathematics scale 2009 | S.E. | Mean PISA score on the science scale 2009 | S.E. | Percentage of the variance in student performance explained by student socio-economic background | % | Total variance between schools expressed as a percentage of the total variance within the country | % | Annual expenditure per student on educational core services (below tertiary) 2007 | USD PPP | GDP per capita | Value | Gini Index |
| Brazil | 412 | 2.7 | 396 | 3.1 | 16 ³ | 4.9 | 386 | 2.4 | 405 | 2.4 | 13.0 | 48 | 1 796 ⁴ | 10 770 | 0.57 | | | | |
| Canada | 524 | 1.5 | 534 | 1.6 | -10 | 3.4 | 527 | 1.6 | 529 | 1.6 | 8.6 | 22 | 7 609 | 36 397 | 0.30 | | | | |
| Shanghai-China | 556 | 2.4 | m | m | m | m | 600 | 2.8 | 575 | 2.3 | 12.3 | 38 | 42 064 ⁵ | 5 340 | 0.42 | | | | |
| Hong Kong-China | 533 | 2.1 | m | m | m | m | 555 | 2.7 | 549 | 2.8 | 4.5 | 42 | 32 896 ⁶ | 42 178 | 0.43 | | | | |
| Finland | 536 | 2.3 | 546 | 2.6 | -11 | 4.3 | 541 | 2.2 | 554 | 2.3 | 7.8 | 9 | 6 430 | 35 322 | 0.26 | | | | |
| Germany | 497 | 2.7 | 484 | 2.5 | 13 ³ | 4.5 | 513 | 2.9 | 520 | 2.8 | 17.9 | 60 | 7 072 | 34 683 | 0.27 | | | | |
| Japan | 520 | 3.5 | 522 | 5.2 | -2 | 6.8 | 529 | 3.4 | 539 | 3.4 | 8.6 | 49 | 8 012 ⁴ | 33 635 | 0.34 | | | | |
| Singapore | 526 | 1.1 | m | m | m | m | 562 | 1.4 | 542 | 1.4 | 15.3 | 35 | 23 699 ⁷ | 51 462 | 0.42 | | | | |
| Poland | 500 | 2.6 | 479 | 4.5 | 21 ³ | 5.8 | 495 | 2.8 | 508 | 2.4 | 14.8 | 19 | 3 784 | 16 312 | 0.32 | | | | |
| United States | 500 | 3.7 | 504 | 7.0 | -5 | 8.3 | 487 | 3.6 | 502 | 3.6 | 16.8 | 36 | 9 932 | 46 434 | 0.36 | | | | |
| United Kingdom | 494 | 2.3 | m | m | m | m | 492 | 2.4 | 514 | 2.5 | 13.7 | 29 | 7 032 | 34 957 | 0.34 | | | | |
| OECD average | 494 | 0.5 | 497 | 0.6 | -2 | 2.7 | 497 | 0.5 | 501 | 0.5 | 14 | 39 | 6 675 | 32 962 | 0.31 | | | | |


1. OECD (2010a), *PISA 2009 Results, Volumes I-V*. OECD Publishing.2. OECD (2010b), *Education at a Glance 2010: OECD Indicators*. OECD Publishing.

3. Statistically significant.

4. Value for core and ancillary services.

5. Cumulative expenditure per student over the theoretical duration of primary studies (*PISA 2009 Results*).

6. Recurrent government expenditure on education, including primary, secondary and special education and departmental support (Hong Kong Annual Digest of Statistics 2010).

7. Cumulative expenditure per student for 6 to 15-year-olds (*PISA 2009 Results*).Source: OECD, *PISA 2009 Database*.StatLink  <http://dx.doi.org/10.1787/888932366617>

The high-performing education systems included in this volume are: Canada (Ontario), China (Hong Kong and Shanghai), Finland, Japan, and Singapore. The examples of rapidly improving systems that were chosen are Brazil and Germany. Table 1.1 compares these countries on relevant measures relating to learning outcomes, equity in the distribution of learning opportunities, spending on education and the economic context of the country. These countries were chosen to provide a variety of relevant policies and practices as well as a range of education structures and models:

- Canada has been among the top performers in PISA over the last decade. Given that Canada has a decentralised education system and shares a border with the United States, Canada's experiences raise questions about why the United States has so far not equalled the performance of its northern neighbour. Ontario, the most populous province, provides a window onto some key reforms.
- China is a country newly covered in PISA. This country report focuses on the performance of Hong Kong and Shanghai, two cities each with a population as large as or larger than some OECD countries. Hong Kong has long been a top performer on the PISA league tables; Shanghai was only assessed for the first time for PISA 2009, yet its first assessment already places it among the star performers. These two cities, despite being in the same country, have markedly different histories and school systems with very different governance arrangements. Contrasted they provide valuable insights on the impressive education accomplishments of a country now taking a prominent position on the world stage.
- Finland was the highest performing country on the first PISA assessment in 2000 and has performed consistently well on subsequent assessments.
- Japan, like Finland, is another country that ranked high on the initial PISA assessment and has maintained its standing on subsequent assessments.
- Singapore in its first PISA assessment in 2009 already scored near the top, having improved its education system in dramatic ways since its independence in 1965.
- Brazil is an example of a country that has managed to make considerable progress in recent years against substantial economic and social odds.
- Germany's early performance in PISA was far lower than Germans had expected. After recent reforms, Germany's performance on PISA 2009 shows how it has been able to recover a lot of the ground between its aspirations and its actual performance.



- Brief vignettes illustrate particular developments within three other countries. Poland shows how modification in its school structure appears to have made possible a significant change both in the level and distribution of student performance. England describes how a concerted effort to change teacher recruitment may have played a role in improving student learning.

FRAMEWORK FOR ANALYSIS

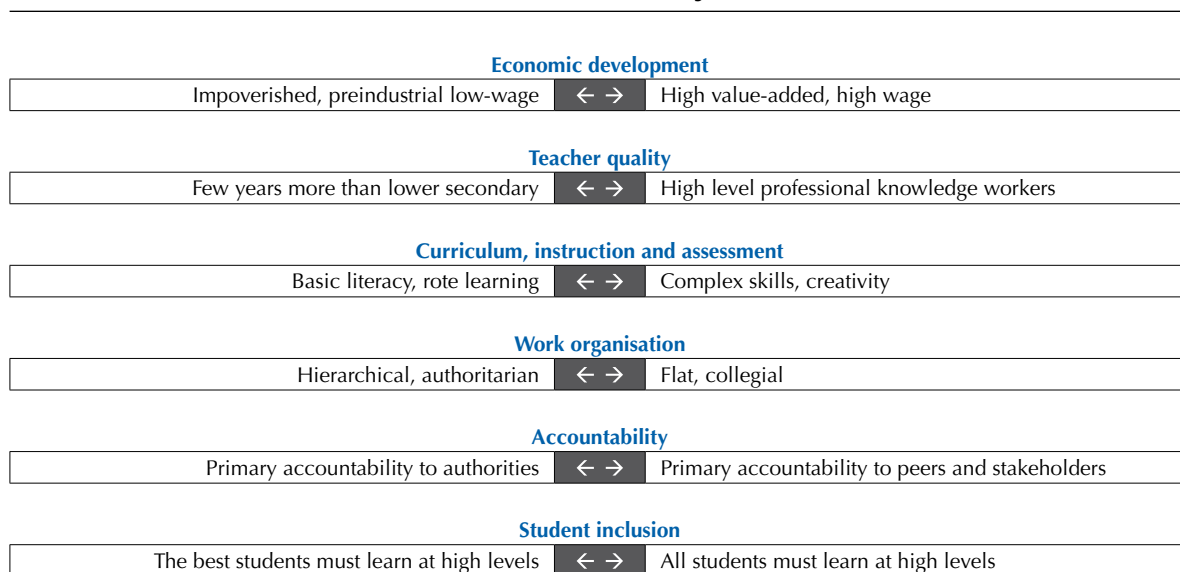
The analysis in this volume follows a framework of analysis which suggests a continuum of approaches to education reform linked, in part, to a country's economic advancement. Developing countries with few resources to invest in education are likely to have lower levels of literacy among both students and teachers. Governments of countries with such characteristics may therefore invest more heavily into educating well a small elite to lead the country's industries and government operations while allocating remaining resources for teachers with little training. When teacher quality is so low, governments may also prescribe to teachers very precise job requirements, instructing teachers what to do and how to do it. Such systems tend to rely on "Tayloristic" methods² of administrative control and accountability in an effort to achieve desired results.

As developing and transition economies become more industrialised, citizens and policy makers tend to converge on the idea that the best way to compete in the global economy is to provide all citizens with the type and quality of education formerly provided only to the elite. To provide high-quality education to the broader population, education systems must recruit their teachers from the top of the higher education pool. But top graduates tend to find Tayloristic workplaces such as school systems using bureaucratic command-and-control systems to be unappealing options. To attract the best graduates to the teaching profession, these systems need to transform the work organisation in their schools to an environment in which professional norms of control replace bureaucratic and administrative forms of control. Equally important, more professional discretion accorded to teachers allows them greater latitude in developing student creativity and critical thinking skills that are important to knowledge-based economies; such skills are harder to develop in highly prescriptive learning environments.

All countries lie somewhere along this economic continuum. As a country's goals move from the delivery of basic skills and rote learning to the delivery of advanced, complex skills, they increasingly need: more educated teachers, more professional forms of work organisation and accountability, and more developed forms of professional practice (Figure 1.1). These fundamental differences in education system design have important ramifications for every aspect of the education system.

▪ Figure 1.1 ▪

Framework of analysis



Progress along each of these dimensions can be made, at least to some degree, independently of the others – but not without some penalties. For example, nations attempting to promote complex learning and creativity without improving teacher quality will likely run into difficulties. Nations that try to improve teacher quality without professionalising their work organisation are also likely to face challenges. In this framework, there is nothing inevitable about the movement from left to right, nor is it necessarily the case that policy makers will see the need for coherence in the policies in play at any one time, but there is a price to be paid for lack of coherence. Adjusting only one or two dimensions at a time without concern for a more co-ordinated adaptation of the system as a whole risks tampering with the equilibrium that pervades successful systems.

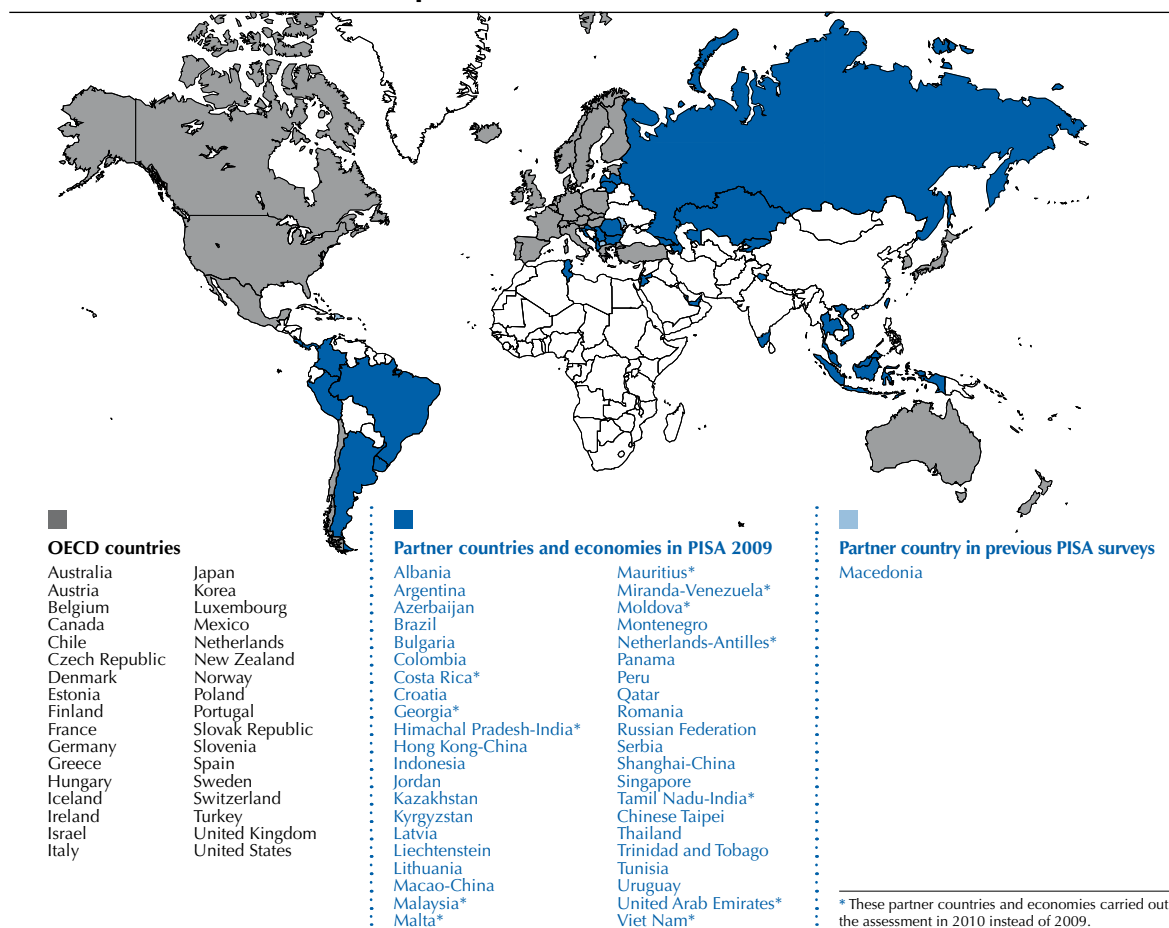
The description of successful education systems offered in this volume attempts to situate each system and its reform trajectory within this framework.

WHAT IS PISA AND WHAT CAN WE LEARN FROM IT?

Parents, students, teachers and those who run education systems are looking for sound information on how well their education systems prepare students for life. Most countries monitor their own students' learning outcomes in order to provide answers to this question. Comparative international assessments can extend and enrich the national picture by providing a larger context within which to interpret national performance. Countries inevitably want to know how they are doing relative to others, and, if other countries are outperforming them they want to know how they do it. Such assessments have gained prominence in recent years partly due to pressures from an increasingly competitive global economy that is evermore driven by human capital. As a result, the yardstick for judging public policy in education is no longer improvement against national educational standards, but also improvement against the most successful education systems worldwide.

■ Figure 1.2 ■

A map of PISA countries and economies





PISA involves extensive and rigorous international surveys to assess the knowledge and skills of 15-year-old students. PISA is the result of collaboration of more than 70 countries interested in comparing their own student achievement with the student achievement in other countries (Figure 1.2). Every three years, PISA compares outcomes for 15-year-old students on measures of reading literacy, mathematics and science (Box 1.2 for a summary of PISA 2009). PISA's assessments are designed not only to find out whether students have mastered a particular curriculum, but also whether they can apply the knowledge they have gained and the skills they have acquired to the new challenges of an increasingly modern and industrialised world. Thus, the purpose of the assessments is to inform countries on the degree to which their students are prepared for life. Decisions about the scope and nature of the PISA assessments and the background information to be collected are made by leading experts in participating countries. Governments guide these decisions based on shared, policy-driven interests. Considerable efforts and resources are devoted to achieving cultural and linguistic breadth and balance in the assessment materials. Stringent quality-assurance mechanisms are applied in designing the test, in translation, sampling and data collection. As a result, PISA findings have a high degree of validity and reliability.

Box 1.2 **Key features of PISA 2009**

Content

- The main focus of PISA 2009 was reading. The survey also updated performance assessments in mathematics and science. PISA considers students' knowledge in these areas not in isolation, but in relation to their ability to reflect on their knowledge and experience and to apply them to real-world issues. The emphasis is on mastering processes, understanding concepts and functioning in various contexts within each assessment area.
- For the first time, the PISA 2009 survey also assessed 15-year-old students' ability to read, understand and apply digital texts.

Methods

- Around 470 000 students completed the assessment in 2009, representing about 26 million 15-year-olds in the schools of the 65 participating countries and economies. Some 50 000 students took part in a second round of this assessment in 2010, representing about 2 million 15-year-olds from 10 additional partner countries and economies.
- Each participating student spent two hours carrying out pencil-and-paper tasks in reading, mathematics and science. In 20 countries, students were given additional questions via computer to assess their capacity to read digital texts.
- The assessment included tasks requiring students to construct their own answers as well as multiple-choice questions. The latter were typically organised in units based on a written passage or graphic, much like the kind of texts or figures that students might encounter in real life.
- Students also answered a questionnaire that took about 30 minutes to complete. This questionnaire focused on their background, learning habits, attitudes towards reading, and their involvement and motivation.
- School principals completed a questionnaire about their school that included demographic characteristics and an assessment of the quality of the learning environment at school.

Outcomes

PISA 2009 results provide:

- a profile of knowledge and skills among 15-year-olds in 2009, consisting of a detailed profile for reading and an update for mathematics and science;
- contextual indicators relating performance results to student and school characteristics;
- an assessment of students' engagement in reading activities, and their knowledge and use of different learning strategies;
- a knowledge base for policy research and analysis; and
- trend data on changes in student knowledge and skills in reading, mathematics, science, changes in student attitudes and socio-economic indicators, and in the impact of some indicators on performance results.

Future assessments

- The PISA 2012 survey will return to mathematics as the major assessment area, PISA 2015 will focus on science. Thereafter, PISA will turn to another cycle beginning with reading again.
- Future tests will place greater emphasis on assessing students' capacity to read and understand digital texts and solve problems presented in a digital format, reflecting the importance of information and computer technologies in modern societies.

Inevitably, because PISA reports on the achievements of many countries against a common set of benchmarks, it stimulates discussion within participating countries about their education policies, with citizens recognising that their countries' educational performance will not simply need to match average performance, but that they will need to do better if their children want to ensure above-average wages and competitive standards of living. PISA assists this discussion by collecting a wide range of background information about each country's education system and about the perspectives of various stakeholders. This makes it possible to relate aspects of performance with important features of those systems.

Box 1.3 Reporting results from PISA 2009

The results of PISA 2009 are presented in six volumes:

- Volume I, *What Students Know and can Do: Student Performance in Reading, Mathematics and Science*, summarises the performance of students in PISA 2009. It provides the results in the context of how performance is defined, measured and reported, and then examines what students are able to do in reading. After a summary of reading performance, it examines the ways in which this performance varies on subscales representing three aspects of reading. It then breaks down results by different formats of reading texts and considers gender differences in reading, both generally and for different reading aspects and text formats. Any comparison of the outcomes of education systems needs to take into consideration countries' social and economic circumstances, and the resources they devote to education. To address this, the volume also interprets the results within countries' economic and social contexts. The volume concludes with a description of student results in mathematics and science.
- Volume II, *Overcoming Social Background: Equity in Learning Opportunities and Outcomes*, starts by closely examining the performance variation shown in Volume I, particularly the extent to which the overall variation in student performance relates to differences in results achieved by different schools. The volume then looks at how factors such as socio-economic background and immigrant status affect student and school performance, and the role that education policy can play in moderating the impact of these factors.
- Volume III, *Learning to Learn: Student Engagement, Strategies and Practices*, explores the information gathered on students' levels of engagement in reading activities and attitudes towards reading and learning. It describes 15-year-olds' motivation, engagement and strategies to learn.
- Volume IV, *What Makes a School Successful? Resources, Policies and Practices*, explores the relationships between student-, school- and system-level characteristics, and educational quality and equity. It explores what schools and school policies can do to raise overall student performance and, at the same time, moderate the impact of socio-economic background on student performance, with the aim of promoting a more equitable distribution of learning opportunities.
- Volume V, *Learning Trends: Changes in student Performance since 2000*, provides an overview of trends in student performance in reading, mathematics and science from PISA 2000 to PISA 2009. It shows educational outcomes over time and tracks changes in factors related to student and school performance, such as student background and school characteristics and practices.
- Volume VI, *Students On Line: Reading and Using Digital Information*, explains how PISA measures and reports student performance in digital reading, and analyses what students in the 20 countries participating in this assessment are able to do.

HOW CAN PISA BE USED TO HELP IMPROVE EDUCATION SYSTEMS?

On their own, cross-sectional international comparisons such as PISA cannot identify cause-and-effect relationships between certain factors and educational outcomes, especially in relation to the classroom and the processes of teaching and learning that take place there. However, they are an important tool to assess and drive educational change in several ways:

- PISA shows **what achievements are possible in education**. For example, PISA shows that Canadian 15-year-olds, on average, are over one school year ahead of 15-year-olds in the United States in mathematics and more than half a school year ahead in reading and science.³ They also show that socio-economically disadvantaged Canadians are much less at risk of poor educational performance than their counterparts in the United States.



More generally, whether in Asia (e.g. Japan or Korea), Europe (e.g. Finland) or North America (e.g. Canada), many OECD countries display strong overall performance in international assessments and, equally important, some of these countries also show that poor performance in school does not automatically follow from a disadvantaged socio-economic background. Some countries also show a consistent and predictable educational outcome for their children regardless of where they send their children to school. In Finland, for example, which has some of the strongest overall PISA results, there is hardly any variation in average performance between schools.

- PISA is also used to **set policy targets in terms of measurable goals achieved by other systems and to establish trajectories for educational reform**. For example, the 2010 Growth Strategy for Japan sets the goal for Japan to achieve by 2020 a reduction in the proportion of low achievers and an increase of that of high achievers to the level of the highest performing PISA country and to increase the proportion of students with an interest in reading, mathematics and science to a level above the OECD average. Similarly, the Prime Minister of the United Kingdom set in 2010 the goal of raising the country's average student performance to Rank 3 on the PISA mathematics assessment and to Rank 6 on the PISA science assessment. This announcement was accompanied by a range of policies to achieve these targets. The Mexican President established a "PISA performance target" in 2006, to be achieved by 2012, which highlights the gap between national performance and international standards and allows to monitor how educational strategies succeed in closing this gap. The reform trajectory includes a delivery chain of support systems, incentive structures as well as improved access to professional development to assist school leaders and teachers in meeting the target.
- Some countries have systematically **related national performance to international assessments**, for example, by embedding components of the PISA assessments into their national assessments. For example, by linking its national assessment with PISA, Brazil is providing each secondary school with information on the progress it needs to make to match the average PISA performance level by 2021. Germany, Japan and the state of Oregon have embedded PISA items in their national/state assessments.
- PISA can help countries **gauge the pace of their educational progress**. Educators are often faced with a dilemma: if, at the national level, the percentage of students obtaining high score increases, some will claim that the school system has improved. Others will claim that standards must have been lowered, and behind the suspicion that better results reflect lowered standards is often a belief that overall performance in education cannot be raised. International assessments allow improvements to be validated internationally. Poland raised the performance of its 15-year-olds in PISA reading by the equivalent of well over half a school year's progress within six years, catching up with United States performance in 2009 from levels well below United States performance in 2000. It also reduced the proportion of students performing below the baseline level of reading performance from 23% in 2000 to 15% in 2009 (the proportion of bottom performers remained unchanged at 18% in the US during this time). Last but not least, Poland succeeded in halving performance differences between schools.
- PISA can help governments to optimise existing policies or consider more fundamental alternatives, when researchers combine **advanced forms of educational assessment with sophisticated survey research methods**. PISA collects reliable data on students' ability to apply high levels of knowledge and highly complex thinking to real-world problems. PISA's survey research also gathers a wide range of background data surrounding the education of the students being assessed. By relating these two bodies of data, and assuming that characteristic of students and principals about their educational contexts are predictive of students' long-term education experiences, one can associate certain patterns of students performance with a multitude of background data such as the qualifications of their teachers, how much those teachers are paid, the degree to which decisions are devolved from higher authorities to the school faculty, the socio-economic or minority status of the students, the nature of the assessments that students must take, the nature of the qualifications they might earn and so on, in great detail. In this way, while the causal nature of such relationships might not be established, an extensive web of correlations can be drawn between certain dimensions of student performance and a large range of factors that could conceivably affect that performance.

RESEARCH METHODS EMPLOYED FOR THE COUNTRY CHAPTERS

This volume complements the uses of PISA just described with a form of industrial benchmarking (Box 1.4). The aim of the research presented in this volume is to relate differences in student achievement between one country and another to certain features of those countries' education systems. Education is highly value-laden. Systems develop for historical reasons that reflect the values and preferences of parents, students, administrators, politicians and many others. Yet such values and preferences evolve and education systems must change to accommodate them. Decision makers in the education arena can benefit from benchmarking research in the same way as heads of firms, learning about the range of factors that lead to success, taking inspiration from the lessons of others, and then adapting the operational elements to the local context while adding unique elements that make their own education system one of a kind.



Box 1.4 **The approach of industrial benchmarking**

Industrial benchmarking gained currency at the close of the 1970s and the early 1980s when Japanese firms began to challenge large multi-national American firms globally. Many American firms did not survive that challenge. But many that did survive did so because of their use of the benchmarking techniques they employed.

The aim of the American firms was to learn enough from their competitors to beat them at their own game. To do this, they identified their most successful competitors. But they also identified the companies that led the league tables in each of their major business process areas (e.g. accounting, sales, inventory). They collected all the information they could possibly find concerning their direct competitors and the companies that led the league tables in the relevant business processes. Some of this information appeared in the business press, some in major academic studies usually conducted and published by business school faculty, some through papers presented by staff members of their competitors in industry journals. After they had learned everything they could possibly learn in this way, they did their best to visit their competitors' work sites, sending their own leading experts to examine product designs, manufacturing techniques, forms of work organisation, training methods, anything they thought might contribute to their competitor's success.

When this research was complete, they would analyse all the information and research they had gathered. Their aim was not to replicate anything they had seen, but to build a better mousetrap than any they had seen anywhere by combining the best they had seen in one place with the best they had seen in another, along with their own ideas, to make something that would be superior to anything they had seen anywhere.com

What they discovered, of course, was that the methods, protocols, techniques and strategies they had seen were all, in one way or another built to address a particular set of circumstances. The firm doing the research rarely faced the same set of circumstances. So the firm doing the research had no need to incorporate in their design some of the workarounds that another firm had had to invent to get around some particular challenge in their own environment that no one else faced. Of course, it was equally true that the firm doing the research might have to build their own workarounds to deal with problems that other firms did not face. The important point here is that firms doing the research were not interested in replicating anything both because they were trying to build something superior to anything they had seen, but also because they did not want to incorporate unnecessary workarounds in their own designs.

The dominant research methodology in education is not built on the industrial benchmarking model but rather on the clinical research model used in medical research. In that arena, the aim is to identify the most successful drug or procedure available for any particular presenting disease. The method typically used to do this research is experimental designs in which subjects are randomly assigned to treatments. This method is preferred in order to ensure that there are no systematic differences between the groups assigned to different treatments. That being so, the observer can attribute differences in results for the individuals to the different treatments they received. Treatment A can be said to have "caused" result B.

The intent of this volume is not to specify a formula for success. This volume does not contain policy prescriptions. Rather the objective is to describe the experience of countries whose education systems have proven exceptionally successful to help identify policy options for consideration. It is intended as a resource for decision making.

While quantitative analysis can be used to apportion the relative influence of a variety of factors in determining variations in student performance in PISA, the data collected by PISA alone leave many questions unanswered. For instance, it is not possible to determine from PISA results whether teachers in the schools of a particular country are using a very powerful instructional system that would be equally effective in another country with very different class sizes. PISA data do not reveal whether new political leadership reframed the issues in education policy in such a way that facilitated the introduction of new reforms. PISA data do not show how awareness of weak education performance can mobilise a country's education establishment to reform and radically improve its education outcomes. Nor do PISA data reveal how a country's industrial and educational institutions are able to work together to leverage a qualifications structure that produces incentives for high-level student performance.

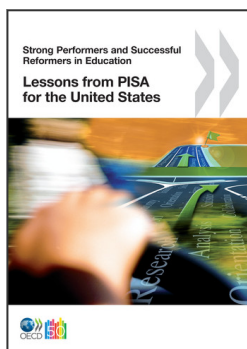


This volume provides complementary qualitative analysis of high-performing and rapidly-improving education systems to reveal possible contextual influences on education performance. The research undertaken for this volume entailed an enquiry of historians, policymakers, economists, education experts, ordinary citizens, journalists, industrialists, and educators that have allowed for an alternative benchmarking. The research began with a document review and was enriched by interviews with current and former leading policy makers and other education stakeholders in the countries and education systems concerned. The PISA data provided the basis for country selection as well as important clues for the points of investigation. The country studies have not only suggested some possible answers to interesting questions, but have also uncovered some new questions for consideration in future PISA assessments. The lessons suggested in this report emerge from instances in which PISA data and country analysis tend to converge.



Notes

1. The United States ranks third of OECD countries in terms of the proportion of adults aged between 25 and 64 with both high school education and college level/other tertiary qualifications (Tables A1.2a and A1.3a in the 2010 edition of OECD's *Education at a Glance*).
2. In the early 20th century an American mechanical engineer, Frederick Winslow Taylor, developed a scientific theory of management now known as Taylorism that was based on precise procedures and a high level of managerial control over employee work practices.
3. The progress students typically achieve over a school year was estimated as follows: Data on the grade in which students are enrolled were obtained both from the Student Questionnaire and from the Student Tracking Forms. The relationship between the grade and student performance was estimated through a multilevel model accounting for the following background variables: *i)* the *PISA index of economic, social and cultural status*; *ii)* the *PISA index of economic, social and cultural status squared*; *iii)* the school mean of the *PISA index of economic, social and cultural status*; *iv)* an indicator as to whether students were foreign born (first-generation students); *v)* the percentage of first-generation students in the school; and *vi)* students' gender. Table A2.1 in the PISA 2009 report presents the results of the multilevel model, which are fairly consistent across countries. Column 1 in Table A2.1 estimates the score point difference that is associated with one grade level (or school year). This difference can be estimated for the 28 OECD countries in which a sizeable number of 15-year-olds in the PISA samples were enrolled in at least two different grades. Since 15-year-olds cannot be assumed to be distributed at random across the grade levels, adjustments had to be made for the above-mentioned contextual factors that may relate to the assignment of students to the different grade levels. These adjustments are documented in columns 2 to 7 of the table. While it is possible to estimate the typical performance difference among students in two adjacent grades net of the effects of selection and contextual factors, this difference cannot automatically be equated with the progress that students have made over the last school year but should be interpreted as a lower boundary of the progress achieved. This is not only because different students were assessed but also because the content of the PISA assessment was not expressly designed to match what students had learned in the preceding school year but more broadly to assess the cumulative outcome of learning in school up to age 15.



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