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Measuring student knowledge and skills

The PISA 2000 Experience

By Andreas Schleicher and Claudia Tamassia

How well do school systems perform in providing young people with a solid foundation of knowledge and skills, and in preparing them for life and learning beyond school? International comparisons of the outcomes of education systems have in the past been elusive. While it has been possible to compare basic structural characteristics of educational programmes and qualifications across countries, such as their entry requirements, their labour-market destination or typical patterns of student participation (see OECD, 1999b), there are no agreed standards that would allow to compare the level of content and quality of the underlying educational activities and services. It is thus difficult to make inferences regarding the knowledge and skills individuals have actually attained from such comparisons. Moreover, knowledge and skills are acquired not just through formal education but also, and increasingly, through formal and informal learning outside regular educational programmes. However, since 1997 governments of the OECD have been working on establishing a comparative framework to assess how well their education systems meet core objectives. The result has been the OECD Programme for International Student Assessment (PISA), the most comprehensive and rigorous international effort to date to assess learning outcomes and to identify the policy levers that may help improving the performance of education systems.

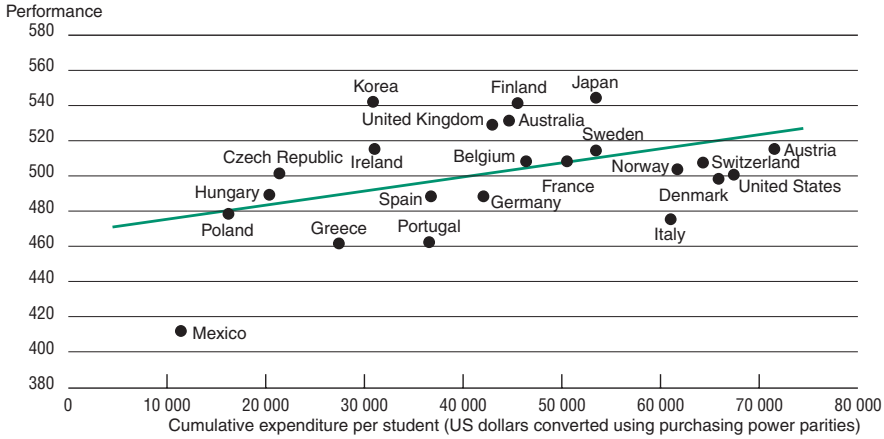
In this issue

What is PISA?

The first PISA survey was conducted in 2000 in 32 countries (including 28 OECD Member countries), with more than a quarter of a million sampled 15-year-olds taking internationally standardised tests in schools under independently supervised testing conditions. PISA 2000 surveyed reading, mathematical, and scientific literacy, with a primary focus on reading. The survey will be repeated every three years, with successive cycles psychometrically

Chart 1. **Student performance and spending per student**

Relationship between average performance across the combined reading, mathematical and scientific literacy scales and cumulative expenditure on educational institutions up to age 15



Source: *Knowledge and Skills for Life: First Results from PISA 2000*, OECD, 2001.

linked so as to allow for comparisons over time, and with the primary focus shifting to mathematics in 2003, science in 2006 and back to reading in 2009.

First results from PISA were published in 2001, showing how well 15-year-olds across the OECD can apply knowledge and skills in key subject areas and what they are like as learners. For some countries, these results were disappointing, showing that their students' performance lags considerably behind that of their counterparts, sometimes by the equivalent of several school years, and sometimes despite high investments in education, both in terms of government spending and student learning time (see Chart 1). Overall, however, the results provided encouraging insights: the performance of countries such as Finland, Japan and Korea suggests that excellence in education is an attainable goal, and at reasonable cost. Equally important, the results show that high performance standards do not have to come at the price of large disparities in student performance: six out of the eight countries with the smallest disparities in mathematics knowledge and skills – the most school-bound subject assessed by PISA – all performed well overall. Finally, the examples of Canada, Finland, Japan, Korea and Sweden, which combined high performance levels with an exceptionally moderate impact of social background on student performance, underline that poor performance in school does not automatically follow from a disadvantaged socio-economic background of students.

The high performance standards achieved by some countries set ambitious goals for others. The question is what they can learn from them to help students to learn better, teachers to teach better, and schools to be more effective. While a cross-national survey such as PISA cannot show which policies or practices cause success, it does allow one to observe some common characteristics of students, schools and education systems, which do well. To this end, PISA 2000 also collected data that could be used to construct indicators pointing to social, cultural, economic and educational factors that are associated with student performance. These allow one to address differences:

- between countries in the relationships between student level factors (such as gender, motivation, and family context) and achievement;
- in the relationships between school level factors and achievement across countries;
- in the proportion of variation in achievement between (rather than within) schools, and differences in this value across countries;
- between countries in the extent to which schools moderate or increase the effects of individual-level student factors and student achievement;
- in education systems and national context that are related to differences in student achievement across countries; and,

PISA 2000 an internationally standardised assessment of 15-year-olds

Sample size	• 250,000 15-year-olds in the 32 participating countries were sampled.
	• 11 additional countries in 2002.
Coverage	• three domains: reading, mathematical and scientific literacy.
	• ability to use knowledge and skills to meet real-life challenges.
	• mastery of processes, understanding of concepts, and ability to function in various situations within each domain.
	• information on students' attitudes to learning.
Methods	• pencil-and-paper assessments, lasting two hours for each student.
	• multiple-choice items and questions requiring students to construct their own answers.
	• total of seven hours of assessment items included, with different students taking different combinations of the assessment items.
	• questionnaires on student background as well as learning and study practices.
	• school principals completed a questionnaire about their school.
Outcomes	• a profile of knowledge and skills among 15-year-olds.
	• contextual indicators relating results to student and school characteristics.
	• a knowledge base for policy analysis and research.
	• trend indicators showing how results change over time, once data become available from subsequent cycles of PISA.
Future assessments	• three-year cycles, next in 2003.

- in the future, changes in any or all of these relationships over time.

Through the collection of such information at the student and school level on a cross-nationally comparable basis, PISA adds significantly to the knowledge base that was previously available from aggregate national statistics.

Such new insights do, however, come at a cost. PISA is both a resource intensive and a methodologically complex undertaking. This Statistics Brief describes some of those methodologies, along with the features that have ensured that PISA provides high quality data that can support policy formation and review.[1]

Target population and samples

PISA 2000 was designed to provide an assessment of the cumulative yield of education and learning at a point at which most young adults are still enrolled in initial education. A major challenge for an international survey of this kind is to operationalise such a concept in ways that ensure the international comparability of national target populations.

Differences between countries in the nature and extent of pre-primary education and care, the age of entry to formal schooling, and the institutional structure of educational systems do not allow the definition of internationally comparable grade levels of schooling. Some previous international assessments have defined their target population on the basis of the grade level that provide maximum coverage of a particular age cohort. A disadvantage of this approach is that slight variations in the age distribution of students across grade levels often lead to the selection of different target grades in different countries, raising serious questions about the comparability of results across countries. In addition, because not all students of the desired age are usually represented in grade-based samples, there may be a more serious potential bias in the results if the unrepresented students are typically enrolled in the next higher grade in some countries and the next lower grade in others. This would exclude students with potentially higher levels of performance in the former countries and students with potentially lower levels of performance in the latter.

In order to resolve this problem, PISA 2000 uses an age-based definition for its target population, i.e. a definition that is not tied to the institutional structures of national education systems: PISA assesses students who are 15 years of age at the time of testing and are enrolled in an educational institution, regardless of the grade levels or type of institution in which they were enrolled, and of whether they were in full-time or part-time education. PISA 2000 thus makes statements about the knowledge and skills of a group of individuals who were born within a comparable reference period, but who may have undergone different educational experiences both within and outside schools. The precise composition of the population of 15-year-old students was dependent on the time of testing, which each country selected so as to yield comparable data across countries in terms of student ages.

All countries attempted to maximise the coverage of 15-year-olds enrolled in education in their national samples, including students enrolled in special educational institutions. The sampling standards used in PISA did, however, permit countries to exclude, under certain defined circumstances, up to a total of 5 per cent of the relevant population either by excluding schools or by excluding students within schools. The ceiling for population exclusions of 5 per cent ensures that potential bias resulting from exclusions is likely to remain within about one standard error of sampling.

Quality standards, procedures, instruments and verification mechanisms were developed for PISA that ensured that the national probability samples yielded comparable data and that the results can be compared with confidence. Data quality standards in PISA required minimum participation rates for schools as well as for students. In the case of countries meeting these standards, it can be assumed that any bias resulting from non-response will be negligible, i.e. typically smaller than the sampling error.

Content coverage and implementation

The most challenging stage in the development of PISA was to build consensus among OECD countries on the knowledge and skills that should be used as benchmarks for an assessment of the outcomes of education systems, and then to define and operationalise these in ways that are cross-nationally valid. Following much discussion, Member countries agreed to focus the first PISA assessment on reading, mathematical and scientific literacy.

A panel of renowned international experts led, in close consultation with OECD countries, the identification of the range of skills and competencies that were, in the three literacy areas, considered to be crucial for an individual's capacity to fully participate in and contribute to a successful modern society. Each assessment area was then defined to reflect: firstly, knowledge of a set of fundamental skills and understandings that are specific to the assessment area and secondly, a capacity to utilise those skills to address real-life issues and problems.

1. For further information, see the OECD, 2002b.

Performance of countries on the reading literacy scale

The figure below summarises the performance of countries on the reading literacy scale. It also indicates whether countries perform significantly higher or lower than the comparison countries as well as the estimated rank order position of each country. For example, Finland, with all triangles pointed up performed significantly better than all other countries while Canada performed significantly lower than Finland shown by a triangle pointed down, similarly to New Zealand, Australia, Ireland and Japan shown by a circle and significantly better than all other countries shown by a triangle pointed up.

Multiple comparisons of mean performance on the combined reading literacy scale

Countries		Finland	Canada	New Zealand	Australia	Ireland	Korea	United Kingdom	Japan	Sweden	Austria	Belgium	Iceland	Norway	France	United States	Denmark	Switzerland	Spain	Czech Republic	Italy	Germany	Liechtenstein	Hungary	Poland	Greece	Portugal	Russian Federation	Latvia	Luxembourg	Mexico	Brazil
	Mean	546	534	529	528	527	525	523	522	516	507	507	507	505	505	504	497	494	493	492	487	484	483	480	479	474	470	462	458	441	422	396
	SE	(2.6)	(1.6)	(2.8)	(3.5)	(3.2)	(2.4)	(2.6)	(5.2)	(2.2)	(2.4)	(3.6)	(1.5)	(2.8)	(2.7)	(7.0)	(2.4)	(4.2)	(2.7)	(2.4)	(2.9)	(2.5)	(4.1)	(4.0)	(4.5)	(5.0)	(4.5)	(4.2)	(5.3)	(1.6)	(3.3)	(3.1)
Finland	546 (2.6)		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Canada	534 (1.6)	▼		○	○	○	▲	▲	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
New Zealand	529 (2.8)	▼	○		○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Australia	528 (3.5)	▼	○	○		○	○	○	○	○	▲	▲	▲	▲	▲	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Ireland	527 (3.2)	▼	○	○	○		○	○	○	○	▲	▲	▲	▲	▲	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Korea	525 (2.4)	▼	▼	○	○	○		○	○	○	▲	▲	▲	▲	▲	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
United Kingdom	523 (2.6)	▼	▼	○	○	○	○		○	○	▲	▲	▲	▲	▲	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Japan	522 (5.2)	▼	○	○	○	○	○	○		○	○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Sweden	516 (2.2)	▼	▼	▼	○	○	○	○	○		○	○	▲	○	▲	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Austria	507 (2.4)	▼	▼	▼	▼	▼	▼	▼	○	○		○	○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Belgium	507 (3.6)	▼	▼	▼	▼	▼	▼	▼	○	○	○		○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Iceland	507 (1.5)	▼	▼	▼	▼	▼	▼	▼	○	▼	○	○		○	○	○	▲	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Norway	505 (2.8)	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○		○	○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
France	505 (2.7)	▼	▼	▼	▼	▼	▼	▼	○	▼	○	○	○	○		○	○	○	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
United States	504 (7.0)	▼	▼	▼	○	○	○	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲
Denmark	497 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	▼	○	○	○		○	○	○	○	▲	○	▲	▲	▲	▲	▲	▲	▲	▲	▲
Switzerland	494 (4.2)	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○	○		○	○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲
Spain	493 (2.7)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○		○	○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲
Czech Republic	492 (2.4)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○		○	○	○	○	○	▲	▲	▲	▲	▲	▲	▲
Italy	487 (2.9)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○		○	○	○	○	○	▲	▲	▲	▲	▲	▲
Germany	484 (2.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	▼	○	○	○	○		○	○	○	○	○	▲	▲	▲	▲	▲
Liechtenstein	483 (4.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○		○	○	○	○	▲	▲	▲	▲	▲
Hungary	480 (4.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	▼	○	○	○	○	○	○		○	○	○	▲	▲	▲	▲	▲
Poland	479 (4.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	▼	○	○	○	○	○	○	○		○	○	○	○	▲	▲	▲
Greece	474 (5.0)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○		○	○	○	▲	▲	▲
Portugal	470 (4.5)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○	○		○	○	▲	▲	▲
Russian Federation	462 (4.2)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○		○	▲	▲	▲
Latvia	458 (5.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	○	○	○		▲	▲	▲
Luxembourg	441 (1.6)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	○	○	○	○	▼		▲	▲
Mexico	422 (3.3)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲
Brazil	396 (3.1)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	
Possible ranks*	Upper	1	2	2	2	3	4	5	3	9	11	11	11	11	11	10	16	16	17	17	19	21	20	21	21	23	24	27	27	30	31	32
	Lower	1	4	8	9	9	9	9	10	11	16	16	15	16	16	20	19	21	21	21	24	25	26	26	27	28	28	29	29	30	31	32

Source: *Knowledge and Skills for Life: First Results from PISA 2000*, OECD, 2001.

* Because data are based on samples, it is not possible to report exact rank order positions for countries. However, it is possible to report the range of rank order positions within which the country mean lies with 95 per cent likelihood.

A detailed operationalisation of the assessment areas – referred to as the assessment framework – was then developed and agreed at both scientific and policy levels.

On the basis of the framework, assessment tasks were then developed and piloted in a Field Trial in all participating countries before a final set of tasks was selected for PISA 2000. Each PISA task consisted of a stimulus (or multiple stimuli) and a set of one or more questions. The tasks included multiple-choice questions as well as open constructed-response questions that allowed for open individual responses and differing viewpoints. The latter usually asked students to relate information or ideas in the stimulus text to their own experience or opinions, with the acceptability depending less on the position taken by the student than on the ability to use

what they had read when justifying or explaining that position. Partial credit was often given for partially correct or less sophisticated answers, and all of these tasks were marked by hand.[2]

How did PISA ensure a fair assessment across OECD countries?

PISA devoted significant attention and resources to reflecting the national, cultural and linguistic variety among OECD countries. As part of this effort, the assessment included material contributed by participating countries. In addition, each participating country rated the cultural relevance and appropriateness of each of the assessment tasks in the national context and the results of this exercise were, together with the empirical results from the Field Trial, taken into consideration in the establishment of the PISA 2000 instruments.

Nevertheless, the use of an international assessment based on tasks drawn from a wide range of countries and cultural contexts raises the question for individual countries as to what extent its relative standing in the international comparisons might have been different if a task set had been used that reflected more closely the specific national educational, cultural and linguistic context.

Since participating countries had rated the appropriateness of each of the PISA 2000 assessment tasks, it was possible to explore how countries would have performed if the PISA assessment would have been based only on those tasks which each country considered most appropriate in the national context. Such an analysis was undertaken and showed a high degree of consistency between the results based on the international task set and those based only on the national preferred tasks. All but two countries (Korea and Norway) show either no differences at all or would have scored only one or two rank order positions higher if their national preferred task set had been used as the basis of comparison.

Another requirement was to administer PISA 2000 in 16 different languages. The challenge of making tests linguistically equivalent in each of these languages is a considerable one. PISA addressed this in several ways: first, PISA prepared and distributed all of its assessment materials in two source languages; second, participating countries developed national versions based upon independent translations from the two source versions, followed by a reconciliation of the resulting two national versions; and third, all national versions were verified against the English and French source versions by specially trained trilingual verifiers. The development of national versions derived from two different source languages is shown to have many advantages over other methods.

Finally, detailed guidelines contributed to a marking process of student responses that was accurate and consistent across countries. In each country, a sub-sample of test booklets was marked independently by four markers on the basis of precise guidelines and examined by the PISA Consortium (see glossary). In order to examine the consistency of this marking process in more detail within each country and to estimate the magnitude of the variance components associated with the use of markers, PISA conducted an inter-marker reliability study on a sub-sample of assessment booklets. Homogeneity analysis was applied to the national sets of multiple marking and compared with the results of the Field Trial. At the between-country level, an inter-country reliability study was carried out on a sub-set of tasks. The aim was to check whether the marking given by national markers was of equal severity in each country, both overall and for particular tasks.

The survey was implemented through standardised procedures. The PISA Consortium provided comprehensive manuals that explained the implementation of the survey, including precise instructions for the work of School Co-ordinators and scripts for the Test Administrators for use during the testing sessions. To minimise the burden on the participating schools, to establish the credibility of PISA as valid and as unbiased and to encourage uniformity in the administration of the testing sessions, independent Test Administrators conducted the assessment based on detailed and internationally agreed protocols.

National Quality Monitors appointed by the international PISA Consortium visited all national centres to review data-collection procedures. Finally, School Quality Monitors from the PISA Consortium visited a sample of 25 per cent of the schools during the assessment.

How did PISA measure student proficiency?

PISA 2000 required each sampled student to respond to a 120-minute test. Because a single 120-minute test is not sufficient to allow a representative coverage of the content to be assessed in reading, mathematics and science, a test rotation system was employed. In this system a total of 208 different reading, mathematics and science tasks were distributed around 9 two-hour booklets. By randomly assigning one of these 9 booklets to each student and employing item response scaling methods, it was possible to cover a wide-range of material within a two-hour testing period for each individual student. In these scaling methods, the tasks are described

2. For a sample of the tasks used see OECD, 2002a.

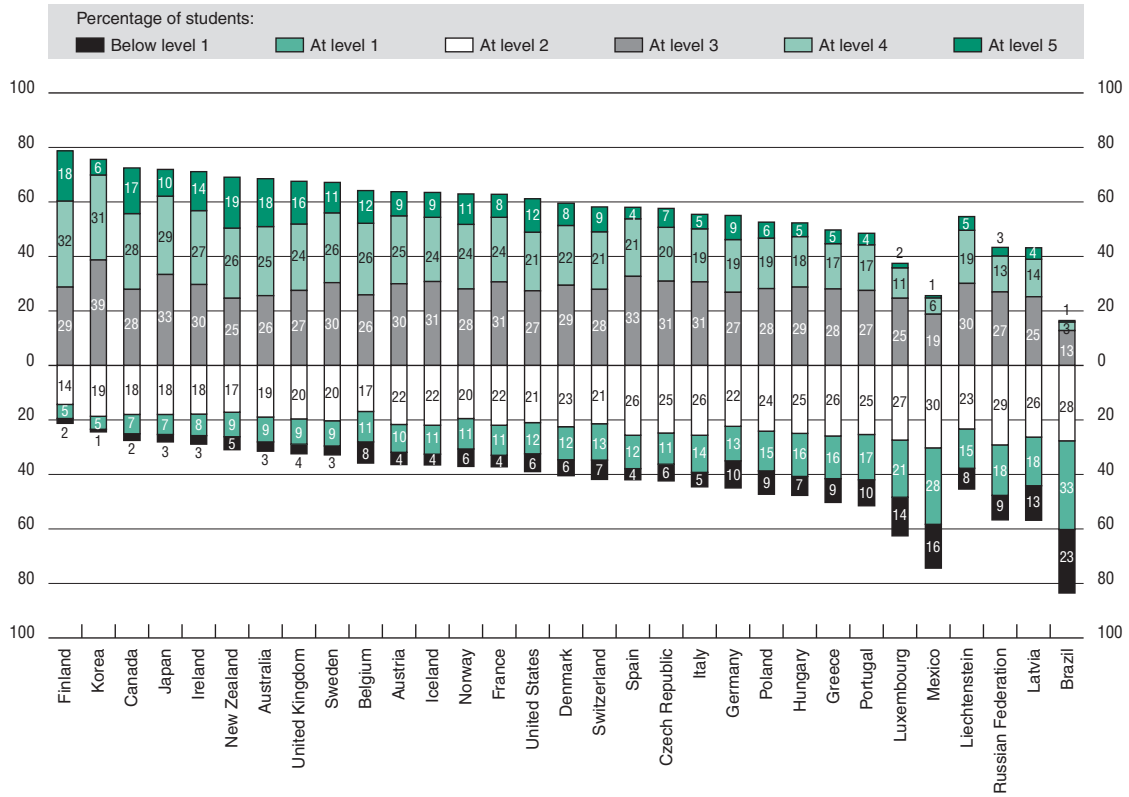
by a fixed set of unknown task difficulty parameters. The task difficulty parameters are then estimated through a model based on the combined international data set with countries given equal weight. On the basis of the international item difficulty parameters, estimates of student performance are then derived. For each of the PISA 2000 areas, the scale was standardised such that the student mean score across OECD Member-countries was 500 and the standard deviation was 100.

To give substantive meaning to the numerical scale scores, levels of proficiency were constructed that were derived based on the skill requirements of the underlying tasks. Finally, a content-based interpretation for scores in each level was developed. Chart 2 presents the percentage of students performing at each of the proficiency levels on the PISA 2000 reading literacy scale.

How did PISA decompose variation in student performance?

The fact that PISA measures proficiency not at the aggregate country level, but at the level of individual students, makes it possible to also examine variation in student performance within countries. Such variation may result from the socio-economic backgrounds of students and schools, from the human and financial resources available to schools, from curricular differences, from selection policies and practices and from the way in which teaching is organised and delivered. Some countries have non-selective school systems that seek to provide all students with the same opportunities for learning and that allow each school to cater for the full range of student performance. Other countries respond to diversity explicitly by forming groups of students of similar performance levels through selection either within or between schools, with the aim of serving students according to their specific needs. In many countries, combinations of the two approaches occur. Even in comprehensive school systems, there may be significant variation between schools due to the socio-economic and cultural characteristics of the communities that the schools serve or to geographical differences (such as differences between regions, provinces or states in federal systems, or differences between rural and urban areas).

Chart 2. **Percentage of students performing at each of the proficiency levels on the combined reading literacy scale**



Source: *Knowledge and Skills for Life: First Results from PISA 2000*, OECD, 2001.

How do the policies and historical patterns that shape each country's school system affect and relate to the overall variation in student performance? The decomposition of the variation in student performance shown in Chart 3 provides some insights.

Chart 3 shows the extent of variation attributable to different factors in each country. The length of the bars indicate the total observed variation in student performance on the PISA reading literacy scale. The bar for each country is aligned in the figure such that variation between schools is represented by the length of the bar to the left of the vertical line down the centre of the figure (*e.g.*, 76.0 per cent for Belgium), and variation within schools is represented by the length of the bar to the right of that vertical line (*e.g.*, 50.9 per cent for Belgium). If the sum of the between and within-school variance components is larger than 100, this indicates that variation in student performance is greater in the corresponding country than in a typical OECD country. Similarly, a value smaller than 100 indicates below-average variation in student performance.

As shown, in most countries a considerable portion of the variation in student performance lies between schools. Further analysis of the data suggests that, in school systems with differentiated school types, the clustering of students with particular socio-economic characteristics in certain schools is greater than in systems where the curriculum does not vary significantly between schools.

PISA results suggest that the identification of factors explaining why some schools or some countries have better results than others is complex. Further research and analysis will be necessary to identify how these factors operate, interact with home background, and influence student performance.

Chart 3. **Variation in student performance between and within schools on the combined reading literacy scale**

Expressed as a percentage of the average variation in student performance in OECD countries

Source: *Knowledge and Skills for Life: First Results from PISA 2000*, OECD, 2001.

Glossary

Reading literacy: understanding, using, and reflecting on written texts, in order to achieve one's goals, to develop one's knowledge and potential, and to participate in society.

Mathematical literacy: capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgements and to engage in mathematics, in ways that meet the needs of that individual's life as a constructive, concerned, and reflective citizen.

Scientific literacy: capacity to use scientific knowledge, to identify questions and to draw evidence-based conclusions in order to understand and help make decisions about the natural world and the changes made to it through human capacity.

PISA Consortium: The implementation of PISA was the responsibility of an international consortium led by the Australian Council for Educational Research. The other partners in this consortium were the National Institute for Educational Measurement in the Netherlands, Westat and the Educational Testing Service in the United States, and the National Institute for Educational Policy Research in Japan.

Proficiency level: The PISA proficiency scales are divided into five levels of knowledge and skills, describing what students can do. Students at a particular level not only demonstrate the knowledge and skills of that level but also the ones required at lower levels.

Further information

Access to the complete micro-level database for PISA as well as to relevant technical documentation and the PISA reports is provided through the website **www.pisa.oecd.org**.

- "Measuring Student Knowledge and Skills: A New Framework for Assessment", OECD, 1999a.

  Conceptual framework on which the PISA 2000 assessment is based, defining the domains of reading, mathematical and scientific literacy in terms of the content that students need to acquire, the processes that need to be performed, and the contexts in which knowledge and skills are applied.

- "Classifying Educational Programmes. Manual for ISCED-97 Implementation in OECD Countries", OECD, 1999b.

  Presents the educational structures of the OECD countries into a comparable international framework.

- "Knowledge and Skills for Life: First Results from PISA 2000", OECD, 2001.

  Presents evidence on student performance in reading, mathematical and scientific literacy, revealing factors that influence the development of these skills at home and at school, and examining what the implications are for policy development.

- "Sample Tasks from the PISA 2000 Assessment: Reading, Mathematical and Scientific Literacy", OECD, 2002a.

  Description of the instruments underlying the PISA 2000 assessment. It introduces the PISA approach to assessing reading, mathematical and scientific literacy with its three dimensions of process, content and context. It also presents a sample of PISA 2000 tasks, and explains how these tasks were scored and how they relate to the conceptual framework underlying PISA.

- "PISA 2000 Technical Report", OECD, 2002b, forthcoming.

  Report of all technical aspects related to the implementation of the PISA assessment including: test design and development; questionnaire design and development; sampling design; quality standards and quality monitoring procedures; weighting, scaling and error variance estimation procedures; scale construction; data processing and database preparation; and, questionnaire analysis.

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Editor in chief: Enrico Giovannini
Editor: Andreas Lindner
Editorial team: Benoit Arnaud, Eileen Capponi, Lydia Deloumeaux, Brian Finn, Joscelyn Magdeleine

For further information contact:
The Editor
STATISTICS BRIEF
Statistics Directorate
OECD
2, rue André-Pascal
75775 Paris France
email: STD.STATBRIEF@oecd.org

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OECD Worldwide

OECD NORTH AMERICA

OECD Washington Center
2001 L Street N.W., Suite 650
Washington, DC 20036-4922, USA
Toll free: +1 (800) 456-6323
Fax: +1 (202) 785-0350
General information:
+1 (202) 785-6323
E-mail: washington.contact@oecd.org
Internet: www.oecdwash.org

OECD JAPAN

OECD Tokyo Centre
Nippon Press Center Bldg., 3rd floor
2-2-1 Uchisaiwaicho, Chiyoda-ku
Tokyo 100-0011, Japan
Tel.: +81 (3) 5532 0021
Fax: +81 (3) 5532 0035
E-mail: center@oecdtokyo.org
Internet: www.oecdtokyo.org

OECD GERMANY

OECD Berlin Centre
Albrechtstrasse 9, 3. OG
10117 Berlin-Mitte
Tel: +49 30 288 8353
Fax: +49 30 288 83545
E-mail: berlin.contact@oecd.org
Internet: www.oecd.org/deutschland

OECD Bonn Centre
August Bebel Allee 6
53175 Bonn
Tel: +49 228 959 12 15
Fax: +49 228 959 12 18
E-mail: bonn.contact@oecd.org
Internet: www.oecd.org/deutschland

OECD MEXICO

OECD Mexico Centre
Av. Presidente Mazaryk 526
Colonia: Polanco
C.P. 11560
Mexico D.F., Mexico
Tel.: +52 52 81 38 10
Fax: +52 52 80 04 80
E-mail: mexico.contact@oecd.org
Internet: rtn.net.mx/ocde/

OECD PARIS

OECD Paris Centre
2, rue André-Pascal
75775 Paris Cedex 16, France
Tel: +33 1 45 24 81 67
Fax: +33 1 45 24 19 50
E-mail: sales@oecd.org
Internet: www.oecd.org/bookshop

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