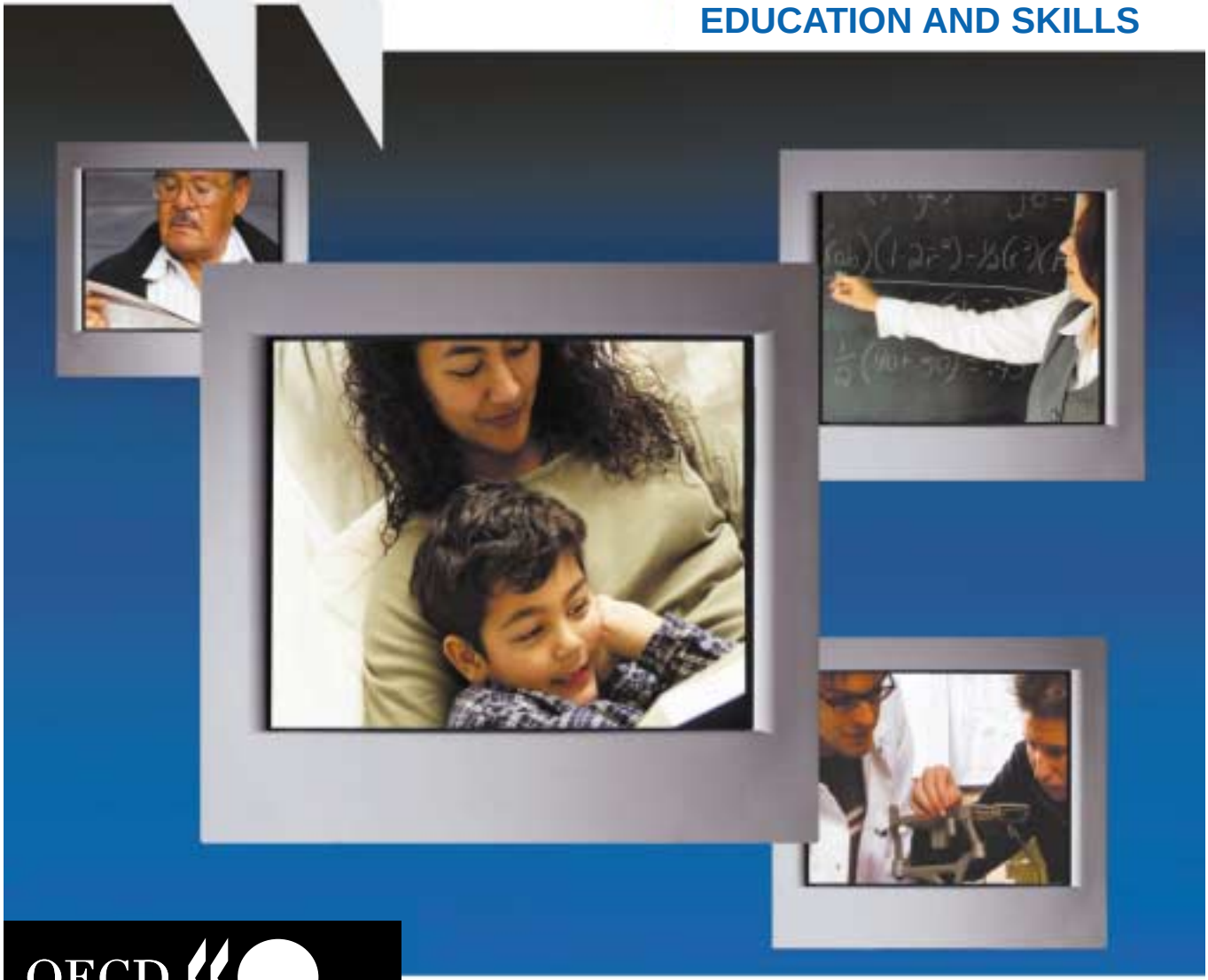
ORGANISATION FOR ECONOMIC CO-OPERATION AND DEVELOPMENT

EXECUTIVE SUMMARY

Knowledge and Skills for Life

FIRST RESULTS FROM PISA 2000

EDUCATION AND SKILLS



OECD

Programme for International Student Assessment

What is **PISA**? (Programme for International Student Assessment)

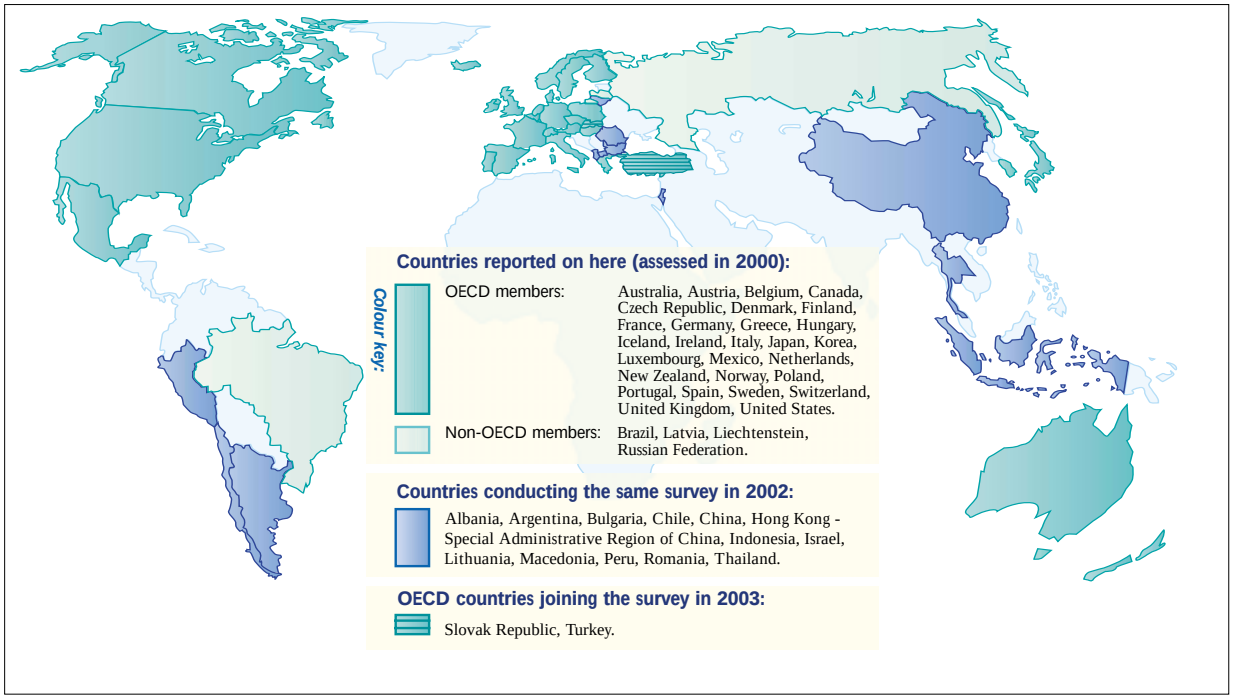
- A new three-yearly survey of the knowledge and skills of 15-year-olds in the principal industrialised countries.
- The survey, conducted first in 2000, will be repeated every three years.
- 265,000 students from 32 countries took part.
- Students sat pencil and paper assessments in their schools.
- Students and their principals also answered questionnaires about themselves and their schools. This allows PISA to identify what factors are associated with better and worse performance.

- A new way of looking at student performance.
- PISA assessed young people's capacity to use their knowledge and skills in order to meet real-life challenges, rather than merely looking at how well they had mastered a specific school curriculum.
- PISA assessed literacy in reading, mathematics and science.
- Students had to understand key concepts, to master certain processes and to apply knowledge and skills in different situations.
- Information was also collected on student attitudes and approaches to learning.

- A unique collaboration between countries to monitor educational outcomes.
- PISA was co-ordinated by governments of participating countries, through the Organisation for Economic Co-operation and Development (OECD).
- Leading international experts worked to develop an assessment whose results are comparable across different national and cultural contexts.
- PISA improves international information on student outcomes, giving countries benchmarks and regular updates on how students perform against them.

The countries taking part

In 2000, 28 OECD Member countries and four other countries carried out the first PISA survey. A further 13 countries will conduct the same survey in 2002, and the two OECD countries that did not take part in 2000 will participate in the second survey in 2003.



Results and findings - What PISA 2000 tells us…

This brochure summarises the results of PISA 2000 in terms of student performance, and wider findings about what lies behind these results. The full report, *Knowledge and skills for life – First results from PISA 2000*, can be obtained from the OECD (available in English, French and German) and further information can be found at www.pisa.oecd.org. See also back cover.

…about student literacies…

PISA 2000 assessed students' capacities to apply knowledge and skills in reading, mathematics and science. These capacities are referred to as reading, mathematical and scientific literacy and widely seen as essential prerequisites for students to be well prepared for adult life.

PISA does not measure literacy as an "all or nothing" set of knowledge and skills. Rather, each student receives a score on a continuous scale. The score obtained by a student indicates the most difficult type of task that the student is likely to perform correctly. Each PISA task is associated with a scale score.

The PISA scale for each literacy area was devised so that across OECD countries, the average score is 500 points, and around two-thirds of students achieve between 400 and 600 points.

For reading, five levels of literacy are described, Level 5 being the highest.

The results for reading literacy are summarised on pages 4-9.

The results for mathematical literacy are summarised on pages 10-11.

The results for scientific literacy are summarised on pages 12-13.

…about what students are like as learners…

Today's young people will need to go on learning in different ways throughout their lives. PISA looked at some aspects of what they are like as learners at age 15. It considered their motivation and engagement in learning, and aspects of their learning strategies.

The findings on what students are like as learners are summarised on pages 14-15.

…about gender differences in performance and engagement…

PISA's results show differences in performance between males and females. They also show differences in their engagement in school and their learning strategies.

The findings on gender differences are summarised on pages 16-17.

…about the relationship between student performance and family background…

Students with more advantaged family backgrounds tend to perform better educationally. PISA allows the strength of this link to be looked at more closely, showing how it differs between school programmes and between countries.

The findings on family background are summarised on pages 18-19.

…about the relationship between school differences and family background…

Can schools help to moderate the effect of family background? The answer depends partly on the degree to which students with different characteristics attend different schools, and on how much the results of these schools differ.

The findings on school differences are summarised on pages 20-21.

…and about the characteristics of schools where students do well

Schools differ in terms of resources, policies and classroom practices. PISA 2000 found that students do better, on average across countries, in schools with certain characteristics.

The findings on school effects are summarised on pages 22-23.

How students perform in **reading literacy**

Students taking part in PISA were asked questions based on a variety of written texts, ranging from a short story to a letter on the Internet and information presented in a diagram. They were assessed on their capacity to *retrieve* specified information, on whether they could *interpret* what they read, and on how well they could *reflect* on and *evaluate* it, drawing on their existing knowledge. For each of these three aspects of reading literacy, students were given a score based on the difficulty of the tasks that they could perform. A combined score shows their overall reading performance.

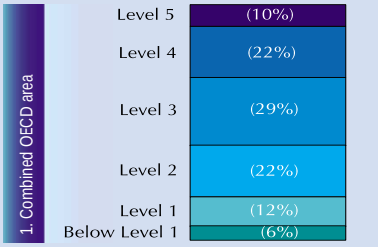
On the basis of these scores, each student was assigned to one of five reading levels (see legend on facing page). Examples of tasks at the different levels are given in the following pages.

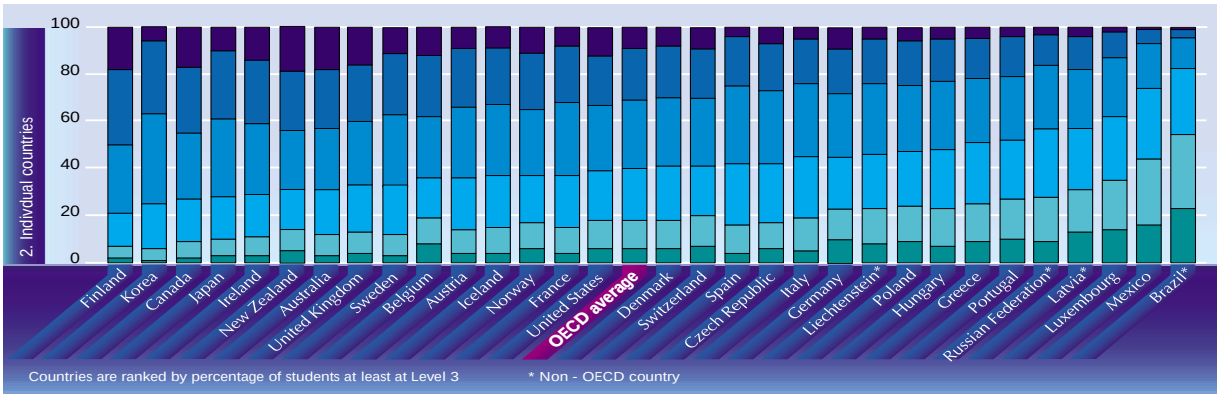
The figure (below) shows the percentage of students who are proficient at each level in the combined OECD area and in each country. Here, countries are ranked by the percentage of students who are proficient at Level 3 or above. About 60% of 15-year-olds in the combined OECD area can complete such tasks (see Page 7 for examples). But this fraction varies from above three-quarters in Finland and Korea, to below half in Brazil, Latvia, Luxembourg, Mexico, Portugal and the Russian Federation.

No single indicator can adequately summarise the performance of students in different countries. The figures on the following pages show different parts of the distribution of student performance.

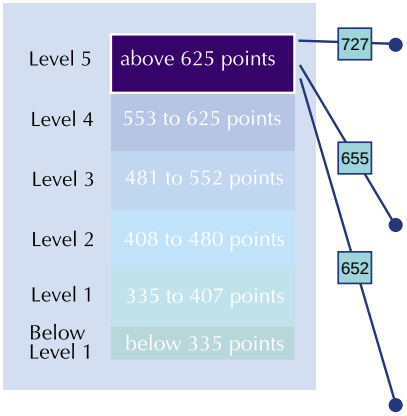
In general, within countries similar percentages of students are proficient at each level in the different aspects of reading literacy – retrieving, interpreting, and reflection and evaluation. However, in some countries significant differences exist between student performance in the more "routine" reading tasks of identifying information and interpreting it, and tasks requiring reflection and evaluation (see Tables 2.1b, c and d in the full report).

Percentage of students by highest level of reading proficiency





One in ten students completed **PISA's hardest reading tasks**....



For example

Students were shown a tree diagram of a country's working-age population, and descriptions of the labour force status of individual workers. They had to decide in which category of the diagram each worker belonged. They had to work out what criteria to use to classify workers from the structure and content of the diagram, drawing on information in footnotes and therefore not prominent. This task is associated with a score of 727 points on interpreting scale.

Students were shown a notice from a personnel department about a service that would help with job mobility. They had to work out the two ways in which this service could help people who lost their jobs – information that was stated indirectly and had to be distinguished from competing information that could easily be mistaken for the information required. Associated score: 655 points on the retrieving information scale.

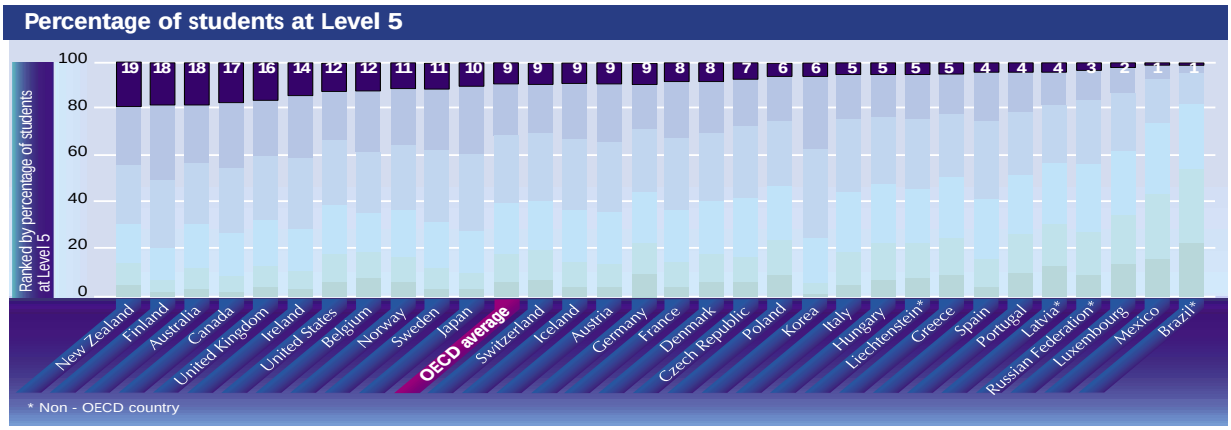
After reading a three-page story about a woman's adventure, students were asked to say whether they thought it had an appropriate ending, explaining why. To obtain full credit, they had to evaluate the ending in terms of its thematic completeness, by relating the last sentence to central relationships, issues or metaphors in the story. Associated score: 652 points on reflection and evaluation scale.

For the full sample items see www.pisa.oecd.org.

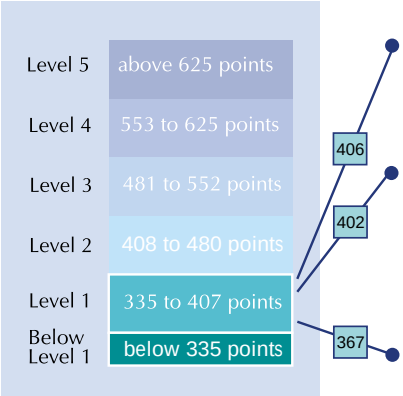
Students proficient at Level 5 on the combined reading literacy scale are capable of completing sophisticated reading tasks, such as:

- managing information that is difficult to find in unfamiliar texts;
- showing detailed understanding of such texts and inferring which information in the text is relevant to the task;
- evaluating critically and building hypotheses, drawing on specialised knowledge, and accommodating concepts that may be contrary to expectations.

Only 10% of 15-year-olds in the combined OECD area are proficient at Level 5 in OECD countries. The percentage ranges from over 15 per cent in Australia, Canada, Finland, New Zealand and the United Kingdom, to below 5% in Brazil, Latvia, Luxembourg, Mexico, Portugal, Spain and the Russian Federation (see Table 2.1a in the full report).



...One student in six could at most complete **the simplest tasks**...



For example

Students were shown a magazine article, written for young people, explaining the process and purpose of DNA testing. A multiple-choice task required them simply to recognise that the writer's main purpose was to inform, rather than to warn, amuse or convince. This task is associated with a score of 406 points on interpreting scale.

Students were asked about a sentence in an article about sports shoes, discussing aspects of the shoe that can avoid damage to feet. A multiple-choice task required students to recognise the relationship between the two parts of the sentence: that the second part provided the solution to the problem stated in the first part (rather than illustrating, repeating or contradicting it). Associated score: 402 points on the reflection and evaluation scale

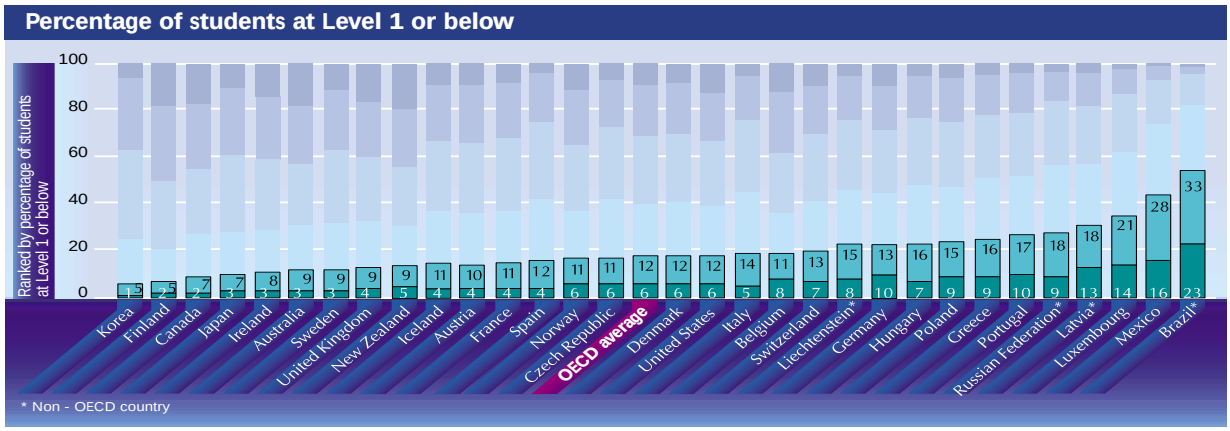
After reading a short adventure story, students were asked in a multiple-choice task what happened next after a brief quoted extract. The answer was stated explicitly in the narrative and was easy to locate from the information given in the task. Associated score: 367 points on the retrieving information scale.

For the full sample items see www.pisa.oecd.org.

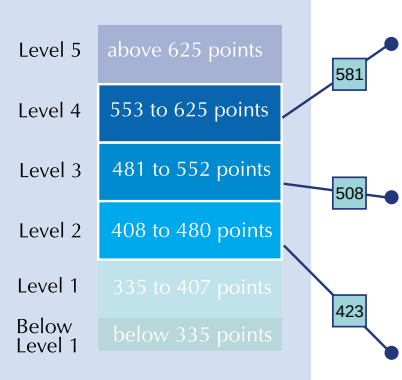
Reading literacy, as defined in PISA, focuses on the knowledge and skills required to apply "reading for learning" rather than on the technical skills acquired in "learning to read". In line with most contemporary views about reading, PISA focuses on measuring the extent to which individuals are able to construct, expand and reflect on the meaning of what they have read in a wide range of texts common both within and outside school. The simplest reading tasks that can still be associated with this notion of reading literacy are those at Level 1. Students proficient at this level are capable of completing only the least complex reading tasks developed for PISA, such as locating a single piece of information, identifying the main theme of a text or making a simple connection with everyday knowledge.

On average across OECD countries, 12% of 15-year-olds are proficient at this level but no higher. A further 6% could not perform these simple tasks. This does not mean that these students cannot read in a technical sense. Nonetheless, such students have serious difficulties in using reading literacy as an effective tool to advance and extend their knowledge and skills in other areas (see Table 2.1a in the full report).

In total, just over one student in six (18%) does not progress beyond Level 1 tasks. However, this percentage varies considerably between countries and it is noteworthy that every country has some students who could perform only at this level. Parents, educators and policy-makers in countries where this proportion is high need to recognise that significant numbers of students are not benefiting sufficiently from educational opportunities and may not be acquiring the knowledge and skills to do so in their further school careers and beyond. In only four countries, Canada, Finland, Japan and Korea, do 10% or less of 15-year-olds read at Level 1 or below. In three OECD countries, Luxembourg, Mexico and Portugal, more than 25% do so.



...**most students** have neither very high nor very low reading skills



For example

Students had to look at two letters posted on the Internet giving conflicting opinions about graffiti. They had to comment on which was written better, analysing writing style and structure of argument rather than just what the letters said. To do this, they had to draw on their understanding of what constitutes good writing. This task is associated with a score of 581 points on the reflection and evaluation scale.

Students had to use information in two diagrams, one about historic water levels in Lake Chad, the other about when various animals appear in cave paintings nearby, in order to recognise that certain animals disappeared after a period of falling water levels. Students had to combine information presented in two different ways. Associated score: 508 points on the interpreting scale.

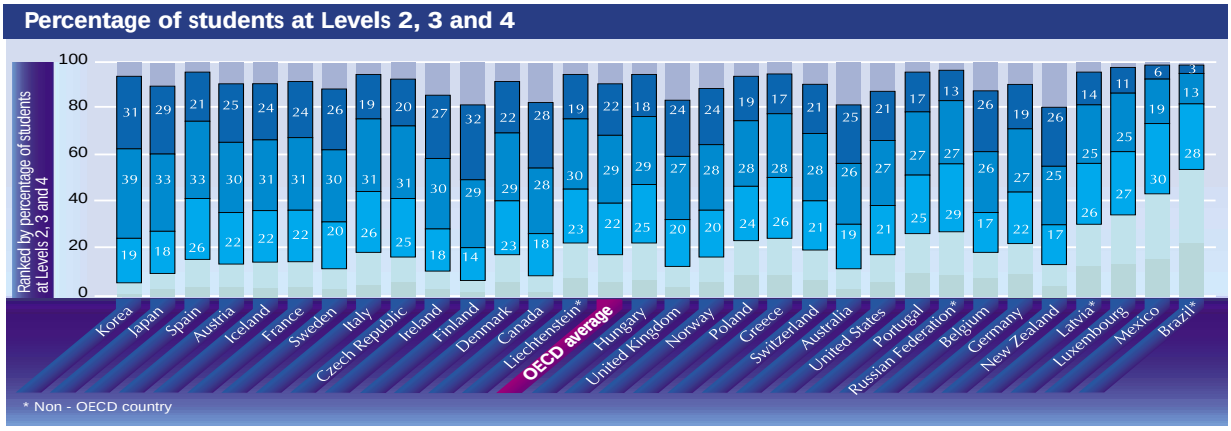
After reading a short extract from a play by Jean Anouilh, students had to work out what the play is about: one character is playing a trick on another. A multiple-choice task asked about the purpose of the trick. This required a low level of inference to work out the main idea in the text. Associated score: 423 points on the interpreting scale.

For the full sample items see www.pisa.oecd.org.

On average across OECD countries, nearly three-quarters of 15-year-olds are at Levels 2, 3 or 4. But in some countries the proportion falls to just over half and in others it rises to above eight in ten students (see Table 2.1a in the full report).

- Students proficient at Level 4 are capable of solving complex reading tasks, such as locating embedded information, construing meaning from nuances of language and critically evaluating a text.
- Students proficient at Level 3 are capable of solving reading tasks of moderate complexity, such as locating multiple pieces of information, making links between different parts of a text, and relating it to familiar everyday knowledge.
- Students proficient at Level 2 are capable of solving basic reading tasks, such as locating straightforward information, making low-level inferences of various types, working out what a well-defined part of a text means, and using some outside knowledge to understand it.

The figure below shows countries ranked by the percentage of students who are at these middle levels of proficiency. Leaving aside those countries with more than a quarter of students performing below Level 2 (Brazil, Latvia, Luxembourg, Mexico, Portugal and the Russian Federation), this gives some indication of how equally performance in each country is distributed. In Korea, as an illustration, 89% of 15-year-olds are at the middle levels, with few very high or very low performers. By contrast, in New Zealand only two-thirds are in the middle, with the remaining third split between students at Level 5 (three times as many as in Korea) and those at Level 1 or below (over twice as many as in Korea).



Mean reading literacy scores

The figure (below) shows the mean score on PISA's reading literacy scale in each country. Since PISA is a sample survey, the resulting estimates are associated with some level of uncertainty. The bar around the mean shows the range within which the mean lies with 95% confidence. For details on the comparison of mean scores between countries, see Figure 2.4 in the full report.

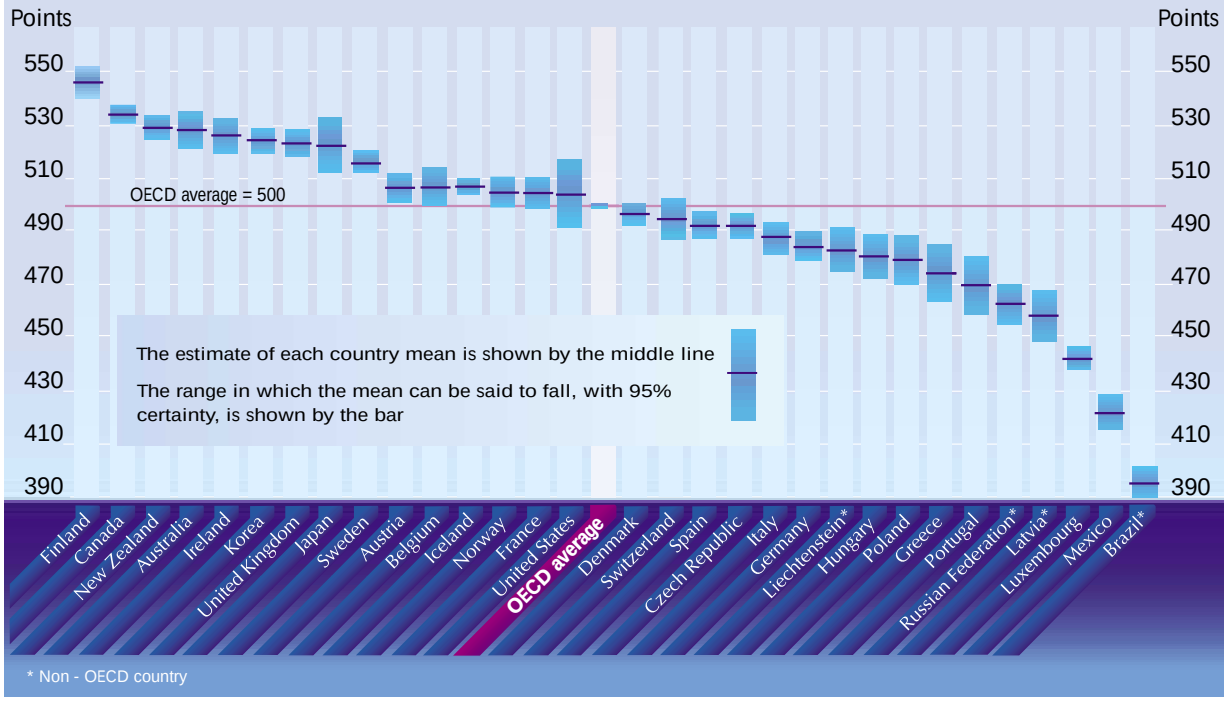
It is evident that because the mean scores of many countries are quite similar, the precise ranking of countries cannot always be determined: there is overlap in the bars showing the range in which each country's mean score can be said with confidence to fall. The table (right) shows the range of rank order positions within which each country's mean lies, with 95% probability.

Mean Reading Literacy

Range of rank order positions for each country based on sample (with 95% confidence)

Country	Rank	
	Highest possible	Lowest possible
Finland	1	1
Canada	2	4
New Zealand	2	8
Australia	2	9
Ireland	3	9
Korea	4	9
United Kingdom	5	9
Japan	3	10
Sweden	9	11
Austria	11	16
Belgium	11	16
Iceland	11	15
Norway	11	16
France	11	16
United States	10	20
Denmark	16	19
Switzerland	16	21
Spain	17	21
Czech Rep.	17	21
Italy	19	24
Germany	21	25
Liechtenstein	20	26
Hungary	21	26
Poland	21	27
Greece	23	28
Portugal	24	28
Russian Fed.	27	29
Latvia	27	29
Luxembourg	30	30
Mexico	31	31
Brazil	32	32

Mean reading literacy scores: country similarities and differences



One way to summarise the performance of each country is to compute the mean of student scores. The figure on the previous page shows the mean reading score for each country.

Some significant differences appear in the mean performance of students across countries, with 125 score points separating the lowest from the highest performing OECD country. To the extent that such differences are predictive of students' career paths, this raises questions about the future competitiveness of countries with large numbers of low performers (Table 2.3 in the full report).

The difference in the mean performance between some countries is large, but the variation in student performance within countries is generally much larger. This can be seen by considering the range of scores achieved by the middle half of the population: the gap between the 25th and the 75th student in a group of 100, ranked by performance. The greater the gap, the more unequal are the results within a country.

In all countries, the range of performances among the middle 50% of students exceeds the magnitude of one proficiency level (73 score points) and in Belgium, Germany and New Zealand twice this difference (OECD average 1.8 proficiency levels) (see Table 2.3a in the full report).

PISA shows that high mean performance and low disparities can go together. The three countries with the smallest range in the middle half of the population, Finland, Japan and Korea, are also among countries with the highest mean performance in reading literacy. By contrast, one of the three countries with the highest internal variation in performance, Germany, scores below the OECD average.

This shows that wide disparities are neither inevitable nor a precondition for countries to attain a high overall performance. On the contrary, the results suggest that public policy can promote equal opportunities and equitable learning outcomes for all students.

How students perform in **mathematical literacy**

The figure (below) shows the mean score for each country on PISA's mathematical literacy scale. Since PISA is a sample survey, the resulting estimates are associated with some level of uncertainty. The bar around the mean shows the range within which the mean lies with 95% confidence. For details on the comparison of mean scores between countries see Figure 3.2 in the full report.

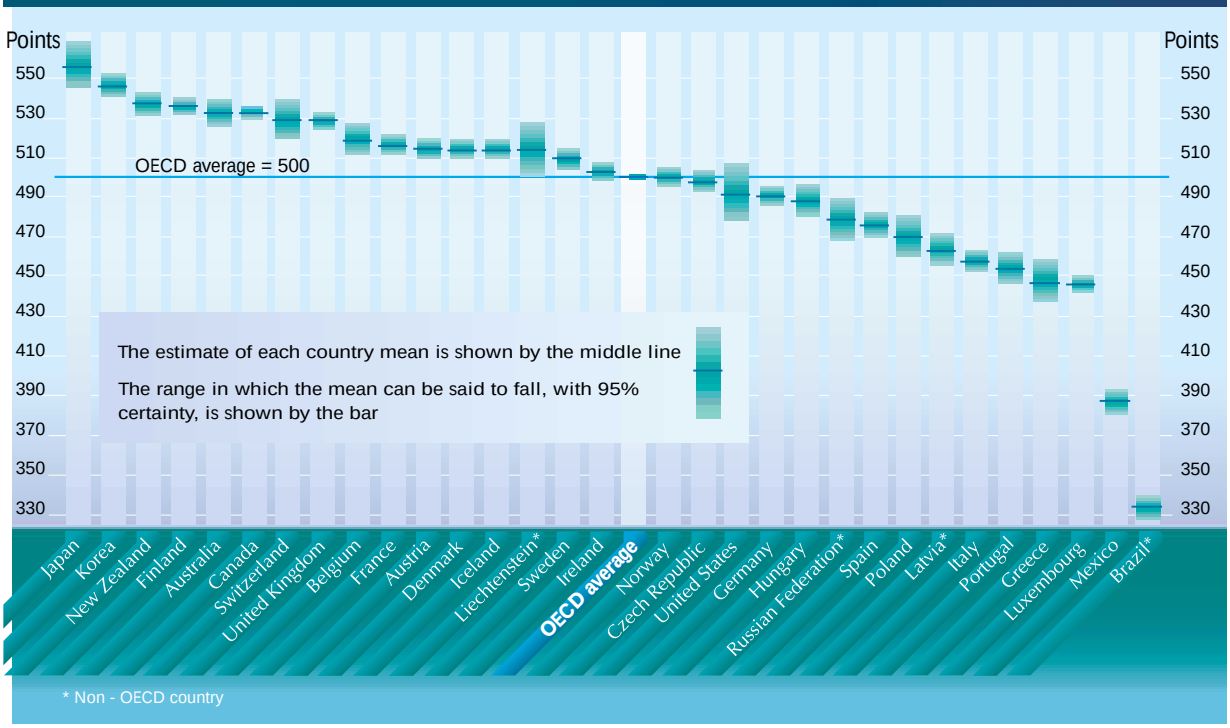
It is evident that because the mean scores of many countries are quite similar, the precise ranking of countries cannot always be determined: there is overlap in the bars showing the range in which each country's mean score can be said with confidence to fall. The table (right) shows the range of rank order positions within which each country's mean lies, with 95% probability.

Mean Mathematical Literacy

Range of rank order positions for each country based on sample (with 95% confidence)

Country	Rank	
	Highest possible	Lowest possible
Japan	1	3
Korea	2	3
New Zealand	4	8
Finland	4	7
Australia	4	9
Canada	5	8
Switzerland	4	10
United Kingdom	6	10
Belgium	9	15
France	10	15
Austria	10	16
Denmark	10	16
Iceland	11	16
Liechtenstein	9	18
Sweden	13	17
Ireland	16	19
Norway	17	20
Czech Rep.	17	20
United States	16	23
Germany	20	22
Hungary	20	23
Russian Fed.	21	25
Spain	23	25
Poland	23	26
Latvia	25	28
Italy	26	28
Portugal	26	29
Greece	27	30
Luxembourg	29	30
Mexico	31	31
Brazil	32	32

Mean mathematical literacy scores: country similarities and differences



Literacy in mathematics and science is important for understanding medical, economic, environmental and other issues that shape modern societies, which rely heavily on technological and scientific advances. PISA 2000 offers a snapshot of student performance in mathematical and scientific literacy but assessed them in less detail than reading literacy. Each was assessed on a single scale, without distinct literacy levels, with an average score of 500 points as with reading.

PISA looked at mathematics in relation to its wider uses in people's lives. Mathematical literacy in PISA is measured in terms of students' capacity to:

- recognise and interpret mathematical problems encountered in everyday life;
- translate these problems into a mathematical context;
- use mathematical knowledge and procedures to solve problems;
- interpret the results in terms of the original problem;
- reflect on the methods applied; and
- formulate and communicate the outcomes.

PISA mathematical tasks varied in difficulty according to several criteria, including:

- the number and complexity of computational steps involved;
- the need to connect and integrate material; and
- the need to represent and interpret material and reflect on situations and methods.

15-year-olds in Japan display the highest mean scores in mathematical literacy, but Japan's mean performance cannot be distinguished with statistical significance from that in Korea and New Zealand. Other countries that also score above the OECD average are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Iceland, Liechtenstein, Sweden, Switzerland and the United Kingdom (see Figure 3.2 in the full report).

Examples:

A difficult PISA mathematical literacy task

Students were presented with a diagram showing the pattern in which different trees would have to be planted in an orchard in order that conifers provide sufficient protection to apple trees. They had to work out which type of tree would increase faster in number as the orchard was enlarged – and explain why. This required them to notice that the number of apple trees increased in proportion to the square of the number of conifers. The task required students to think mathematically and recognise a general principle. This task is associated with a score of 723 points.

A medium PISA mathematical literacy task

From a mathematical representation of the dimensions and shape of a pyramidal barn roof, students had to calculate the area of its base. This required students to identify and perform a straightforward calculation, understanding the overall concepts of space and shape. Associated score: 492 points.

An easy PISA mathematical literacy task

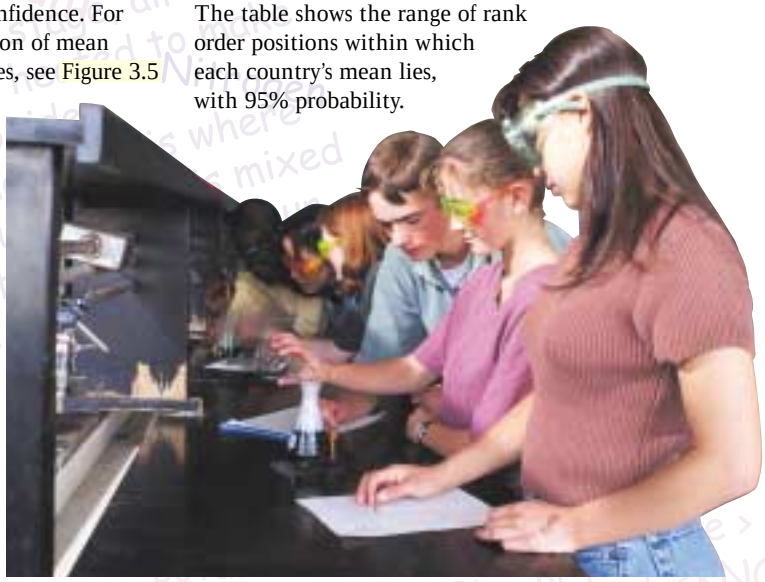
From a graph showing the speed of a racing car as it travelled round a track, students had to answer a multiple-choice task about where on the track the car went the slowest. This required only a simple observation and sufficient understanding of the concept of change to realise that the slowest speed would be shown at the lowest point of the plot on the speed graph. Associated score: 403 points.

For the full sample items see www.pisa.oecd.org.

How students perform in **scientific literacy**

The figure (below) shows the mean score for each country on PISA's scientific literacy scale. Since PISA is a sample survey, the resulting estimates are associated with some level of uncertainty. The bar around the mean shows the range within which the mean lies with 95% confidence. For details on the comparison of mean scores between countries, see Figure 3.5 in the full report.

It is evident that because the mean scores of many countries are quite similar, the precise ranking of countries cannot always be determined: there is overlap in the bars showing the range in which each country's mean score can be said with confidence to fall. The table shows the range of rank order positions within which each country's mean lies, with 95% probability.

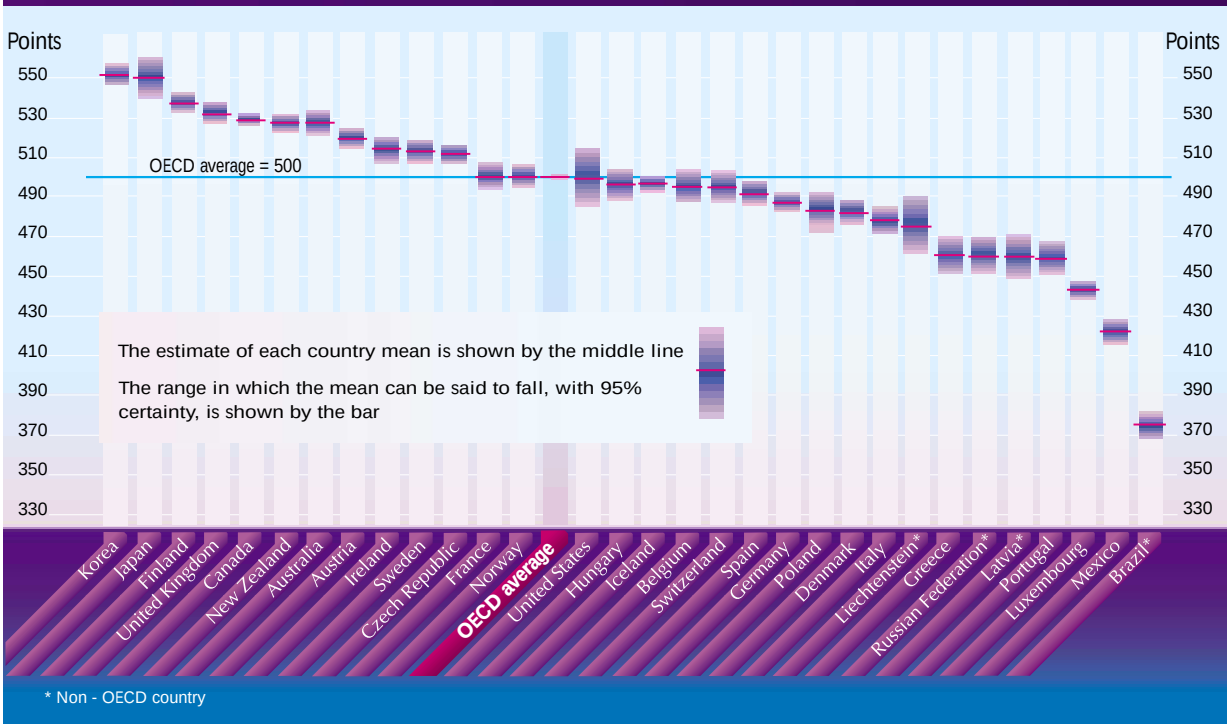


Mean Scientific Literacy

Range of rank order positions for each country based on sample (with 95% confidence)

Country	Rank	
	Highest possible	Lowest possible
Korea	1	2
Japan	1	2
Finland	3	4
United Kingdom	3	7
Canada	4	8
New Zealand	4	8
Australia	4	8
Austria	8	10
Ireland	9	12
Sweden	9	13
Czech Republic	10	13
France	13	18
Norway	13	18
United States	11	21
Hungary	13	21
Iceland	14	20
Belgium	13	21
Switzerland	13	21
Spain	16	22
Germany	19	23
Poland	19	25
Denmark	21	25
Italy	22	25
Liechtenstein	20	26
Greece	25	29
Russian Fed.	26	29
Latvia	25	29
Portugal	26	29
Luxembourg	30	30
Mexico	31	31
Brazil	32	32

Mean scientific literacy scores: country similarities and differences



Scientific literacy was scored on a scale measuring students' capacity to:

- use scientific knowledge;
- recognise scientific questions;
- identify what is involved in scientific investigations;
- relate scientific data to claims and conclusions; and to
- communicate these aspects of science.

PISA's scientific tasks varied in difficulty according to several criteria including:

- the complexity of the concepts used;
- the amount of data provided;
- the chain of reasoning required; and
- the precision required in communication.

Japan and Korea show the highest performance on the scientific literacy scale. Other countries that score statistically significantly above the OECD average are Australia, Austria, Canada, the Czech Republic, Finland, Ireland, New Zealand, Sweden and the United Kingdom (see Figure 3.5 in the full report).

Examples

A difficult scientific literacy task

Students were shown extracts from a 19th century scientist's diary, a table with his observations and a commentary, discussing the post-natal death from a particular fever of a large proportion of mothers in two wards of a hospital maternity clinic. Students had to indicate why the evidence did not support a contemporary belief that earthquakes caused the fever. This required them to explain the significance of different death rates in the two wards. This task is associated with a score of 666 points.

A medium scientific literacy task

After reading a text on the risks to the ozone layer and their implications, students were asked whether each of two questions could be answered by scientific research. To answer correctly, they needed, in particular, to recognise the difference between a question that requires a political choice and one that can be answered scientifically. Associated score: 529 points.

An easier scientific literacy task

Students were asked why washing hospital sheets in high temperatures helps reduce the risk that patients will contract a fever. In their answer they needed to apply their scientific knowledge to this real-world problem by referring, for example, to the killing of bacteria. Associated score: 467 points.

For the full sample items see www.pisa.oecd.org.

What are 15-year-olds like as **learners**?

Students need to leave school not just with sound subject-matter knowledge and skills, but also ready to continue learning throughout life. In order to do so, they must be able to manage their own learning, rather than solely relying on teachers. This means that students must, on the one hand, be interested and engaged in learning and, on the other hand, have strategies for learning effectively.

PISA looked at both – motivation and engagement as well as learning strategies, as reported by students. The results can be related to students' performance in reading, mathematical and scientific literacy in order to provide some idea of what kinds of learners show higher performance at age 15.

Key Findings

Given substantial investment in education and its importance to societies' and students' future well-being, it is disappointing that a significant minority of 15-year-olds display negative attitudes towards learning and a lack of engagement with school. In most countries, more than a quarter of all students say that school is a place they do not want to go – ranging from less than 20% in Denmark, Mexico, Portugal and Sweden to more than 35% of students in Belgium, Canada, France, Hungary, Italy and the United States (see www.pisa.oecd.org).

Student interest in reading and mathematics also varies widely and is closely associated with performance. About half of 15-year-olds are generally positive about reading. However, this varies across countries, with fewer than one-third of students in Belgium and Korea but around two-thirds in Denmark, Mexico and Portugal agreeing that reading is fun and that they would not want to give it up. Interest in mathematics varies even more between countries, with in most countries only a small proportion of 15-year-olds seeing mathematics as worth pursuing because they consider it relevant to their future (see Table 4.2 in the full report). Not only does lack of interest tend to be associated with poorer student performance (see Tables 4.1 and 4.2 in the full report), but other research shows that students who are disaffected with learning at school will also be less likely to engage in learning activities, either inside or outside school, in later life.

Students who are engaged in reading beyond what is required for school tend to be better readers, but the relationship is not straightforward. In some countries the association is stronger than in others, and some countries with fewer keen readers still perform well, on average (see Table 4.3 in the full report).

Looking at various aspects of how students learn, PISA finds that:

The aspect most closely associated with performance is "controlling the learning process". Students were asked to what extent they:

- figure out exactly what they need to learn;
- work out as they go what concepts they still have not really understood;
- look for additional information when they do not understand;
- force themselves to check whether they remember what they have learned; and
- make sure they have remembered the most important things.

In every country, the quarter of students who say they adopt such strategies the most have reading scores significantly above the quarter that adopt them the least. In some countries, the gap is as much as a full proficiency level – for example, the difference between the average student with reading literacy at Level 2 and the average student at Level 3 (see Table 4.5 in the full report).

In assimilating new knowledge, students use both memorisation and elaboration strategies. (The latter refers to strategies to process new information, integrating it into a learner's prior knowledge base.) The results of PISA 2000 show that students who report placing emphasis on memorising information do not always achieve better results, while those who elaborate what they learn tend to do well (see Tables 4.6 and 4.7 in the full report).

Co-operative and competitive learning strategies both have their place in effective learning. Students who report adopting competitive learning strategies tend to do better than those who do not. Likewise, students who report that they learn co-operatively tend do better than those who do not. This finding suggests that co-operative and competitive learning can each help in certain situations: they are complementary rather than alternative strategies (see Tables 4.8 and 4.9 in the full report).

Without further analysis, it cannot be concluded that certain learning strategies cause better performance: it might simply be that students who do well for other reasons are more likely to adopt the most effective strategies. Nonetheless, the findings do show what kind of learning is associated with success. Schools and parents need to consider how to help students to adopt techniques that allow them to regulate their own learning effectively.

Reading for **enjoyment** and reading literacy

Students were asked how much they read for enjoyment. A substantial percentage in every country say not at all. The proportion varies from a majority of students in Japan, to below 20% in Brazil, Latvia, Mexico, Portugal and the Russian Federation, as shown in the first column of the table. Of those students who do read for enjoyment, most do so for under an hour a day. The second column shows how many – 11% on average across OECD countries - are keener readers, spending 1-2 hours a day reading for enjoyment.

Are keener readers also better readers? On average in each country, the answer is yes. For example, the final column of the table shows that students in Australia who read 1-2 hours a day for enjoyment score 92 points higher on average on the reading scale than those who do not read for enjoyment. This is equivalent to more than one proficiency level – for example, the difference between being able to perform Level 3 reading tasks and Level 4 reading tasks – see examples on page 7 above.

Country	Percent reading for enjoyment		Difference between average reading scores of students in a) and b)
	a) Not at all	b) 1-2 hours a day	
	%	%	More than one proficiency level
Australia	33	12	92
Germany	42	9	84
Switzerland	35	8	83
Finland	22	18	79
Canada	33	10	77
New Zealand	30	10	76
Iceland	30	7	73
Sweden	36	9	72
			Between half and one proficiency level
United Kingdom	29	9	70
Latvia	18	20	67
France	30	11	67
Norway	35	8	65
Ireland	33	12	65
Czech Republic	26	13	63
Austria	41	9	63
Portugal	18	12	62
United States	41	8	59
Belgium	42	9	59
Denmark	27	9	57
Spain	32	9	54
Hungary	26	13	53
Russian Fed.	19	17	49
Poland	24	16	49
Korea	31	12	41
Italy	31	13	41
Netherlands	43	6	40
			Less than half of one proficiency level
Japan	55	8	27
Luxembourg	38	12	25
Brazil	19	17	25
Greece	22	20	19
Mexico	14	12	6

However, it is important to note that:

- Whereas, within countries, there is a clear positive association between reading for enjoyment and performance, countries with fewer keen readers do not necessarily produce fewer good ones. As an illustration, Japanese students are least likely to read for enjoyment, but show high average reading performance. Conversely, in Latvia and Greece, with relatively many keen readers, mean performance remains below-average.
- It is not clear to what extent reading for enjoyment leads to higher reading literacy, or the other way around, or to what extent some other aspect of students' background contributes to both. Nevertheless, the association between engaging in reading and being good at it is an important one, indicating that it may be productive to encourage both.

Different results by **gender**

Policy-makers have, historically, given considerable priority to issues of gender equity in education, with particular attention to disadvantages faced by girls and women. PISA's results point to the success of many countries' efforts, but also to a growing problem for males, particularly in reading literacy. In mathematical literacy, there remains a measurable disadvantage for females in about half of the countries while in scientific literacy gender differences tend to average out.

A. Reading literacy: females do better in all countries

Females at least half a proficiency level ahead:

	Average score advantage (points), females
Latvia	53
Finland	51
New Zealand	46
Norway	43
Iceland	40
Russian Fed.	38
Italy	38
Czech Republic	37
Greece	37
Sweden	37
Poland	36

Females less than half a proficiency level ahead:

	Average score advantage (points), females
Germany	35
Australia	34
Belgium	33
Canada	32
Hungary	32
Liechtenstein	31
Switzerland	30
Japan	30
Netherlands	30
France	29
Ireland	29
United States	29
Luxembourg	27
Austria	26
United Kingdom	26
Denmark	25
Portugal	25
Spain	24
Mexico	20
Brazil	17
Korea	14

B. Mathematics: males do better in half of the countries

(in other countries, no statistically significant difference)

	Average score advantage (points), males
Austria	27
Brazil	27
Korea	27
Portugal	19
Spain	18
Luxembourg	15
Denmark	15
Germany	15
Switzerland	14
France	14
Ireland	13
Liechtenstein	12
Czech Republic	12
Norway	11
Canada	10

C. Science: Females do better in three countries

	Average score advantage (points), females
Latvia	23
Russian Fed.	14
New Zealand	12

C. Science: Males do better in three countries

	Average score advantage (points), males
Korea	19
Austria	12
Denmark	12

Key findings

In all countries, females are on average better readers than males. The most striking gender difference revealed by PISA 2000 is that females consistently outperform males in reading literacy. As the table shows, this difference is not small. In New Zealand, for example, the mean score of males is 507 points, close to the average for all students across OECD countries, but the mean score of females in New Zealand is 553 points, more than the mean for all students in any country (see Table 5.1a in the full report). Females score, on average across OECD countries, 45 points higher than males on the reflection and evaluation scale, compared with 29 points on the interpreting texts scale and 24 points on the retrieving information scale. These differences may be influenced by differences in reading interests: males report reading more comics, newspapers and web-pages, females more novels (see Table 5.1b in the full report).

In mathematical and scientific literacy, gender differences are smaller than in reading. For mathematical literacy, males perform on average 11 points higher across OECD countries, but in only half of the PISA countries was the difference statistically significant. In the case of scientific literacy there is a significant difference in favour of either males or females in only six (see Table 5.1a in the full report).

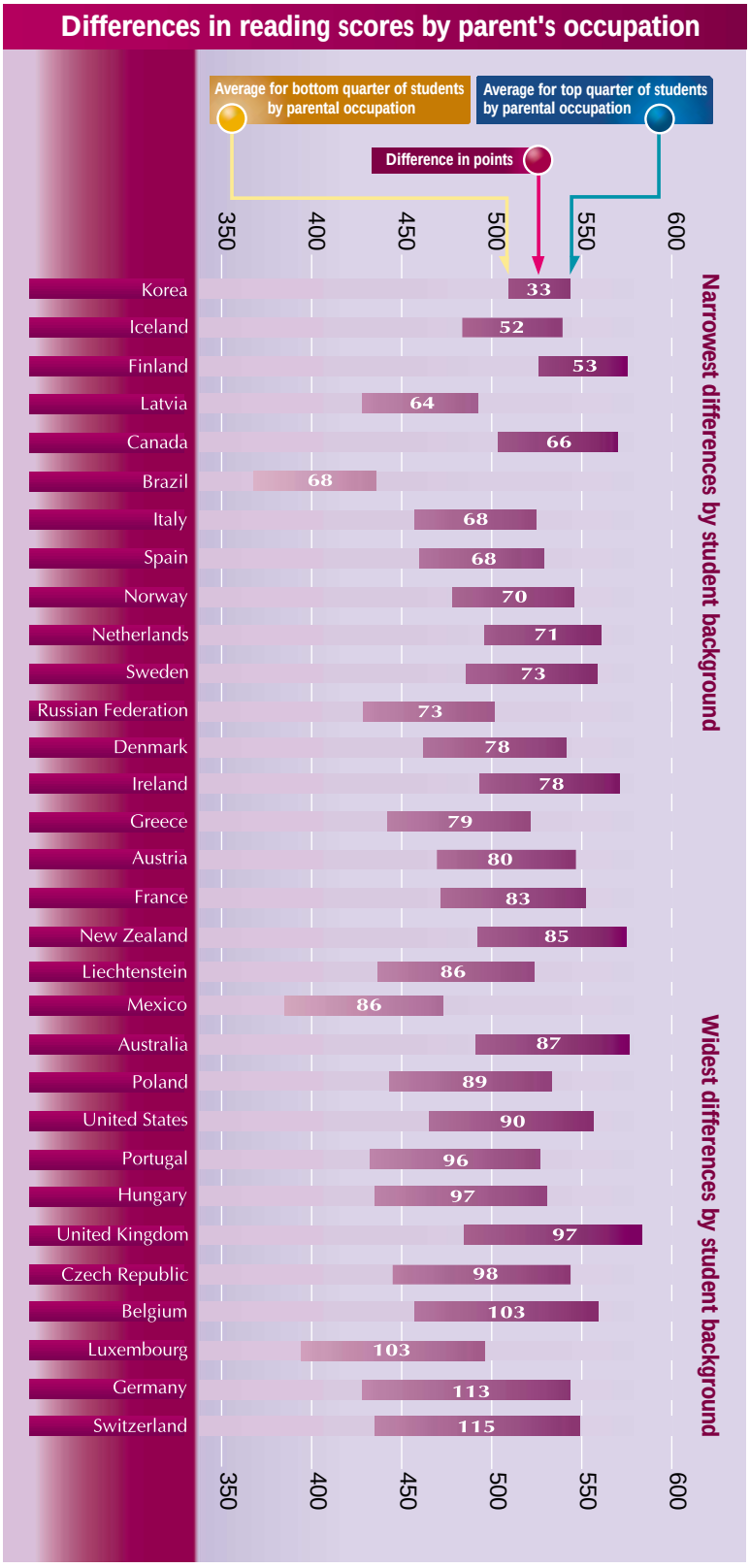
Males are more likely to under-perform in reading. But females are not more likely to underperform in mathematics. An important policy concern emerges from the large gender differences in reading literacy among the lowest performing students. In all participating countries, males are more likely than females to be at Level 1 or below in reading – in the case of Finland over three times as likely (see Table 5.2a in the full report). While males do, on average, better than females in mathematical literacy, much of this is attributable to there being more males among the better performers and the advantage of males disappears when comparing the number of low performers (see Table 5.2b in the full report). These findings suggest that the underachievement of males in reading is a significant challenge for education policy, in terms both of closing the gender gap and of reducing the proportion of students at the lowest levels of proficiency.

Some countries show that large gender differences are not inevitable. There is significant variation between countries in the size of gender differences. Indeed, the results of PISA 2000 suggest that some countries provide a learning environment or broader context that benefits both genders equally. By contrast, the enduring differences in other countries, and the widespread disadvantage now faced by many young males in reading literacy, require serious policy attention.

Females tend to express greater interest in reading, and males in mathematics. On average across OECD countries, approximately one-half of all males but only a quarter of females say that they read only when they have to (see Figure 5.4 in the full report). By contrast, females tend to have less interest than males in mathematics. The close interrelationship between subject interest and learning outcomes suggests that the different habits and interests of females and males may have far-reaching consequences for learning that education policy needs to address (see Figure 4.1 in the full report).

Males and females tend to adopt different learning strategies. Females are more likely to report that they take control of their own learning, which is a strategy that tends to be associated with learning success. However, females tend to be more likely to rely on memorisation strategies, which are less consistently associated with better performance than strategies relating new knowledge to existing knowledge, which males report that they prefer (see Tables 4.5, 4.6 and 4.7 in the full report).

The importance of **family background**



It is well established that students who come from more advantaged family backgrounds, in terms of factors such as parental education and occupation, and resources in the home, perform better at school. PISA was able to look internationally both at the strength of this relationship and at its importance in explaining overall differences in student performance.

Key findings

The association between family background and student performance differs greatly from one country to another. The figure illustrates this point in the case of average differences in reading scores according to parental occupation. PISA ranked occupations on an internationally recognised scale based on their measured economic value. On the figure, the left-hand end of each bar represents the mean reading score of the 25% of students in each country with the lowest-ranking parental occupations. The right-hand end shows the mean reading score of the 25% of students whose parents have the highest-ranking occupations. Thus, the length of each bar shows the mean difference in reading literacy between the least advantaged students and the most advantaged ones, based on their parents' occupations. In Korea, at one extreme, there is a relatively small difference of 33 score points between the top and bottom quarters, equivalent to less than half a proficiency level. In Germany and Switzerland, on the other hand, the difference is around 114 score points, or more than one proficiency level (see Table 6.1a in the full report).

Not all students from disadvantaged family backgrounds perform poorly. In some countries even the bottom quarter of students show medium rather than low performance scores. For example, ranked by parents' occupational status, students in the bottom quarter in Canada, Finland, and Korea score above the average for all students across the OECD (500) (see Table 6.1 in the full report).

PISA distinguished the effects of many specific aspects of family background. In addition to the effect of parental occupational status, shown opposite, it found that:

■ *Higher parental education and more social and cultural communication between parents and their children are associated with better student performance.* Students whose mothers have not completed upper secondary education have a particularly strong disadvantage with, on average across OECD countries, reading scores 44 points lower than those whose mothers have completed upper secondary education (see Table 6.7 in the full report). The impact of mothers' completion of tertiary education is weaker and less consistent across countries (see Table 6.7 in the full report). Parental education is closely interrelated with other family background factors. However, when other family background factors are equal, each additional year of parental education still adds almost 4.7 points to the reading scores of students (see Table 8.2 in the full report). PISA also asked students how they interact with their parents in aspects ranging from discussing books to eating meals together. Those interacting more have higher reading scores on average – cultural communication (e.g., discussing books) playing a greater role (on average across OECD countries 59 points between the top and bottom quarters, see Table 6.6) than social communication (on average 30 score points, see Table 6.5).

■ *Students from wealthier families tend do better, but the relationship with possessions relating to classical culture is stronger.* Students were asked about a range of possessions in their homes. Students from the wealthiest families typically do better than students from the least wealthy families, but the differences in performance are modest in many countries (see Table 6.2 in the full report). A stronger predictor of performance is whether students have items associated with "classical culture", such as literature and works of art, in their homes (see Table 6.3 in the full report). While possession of such "advantages" is related to other home background characteristics, its effects in isolation remain consistently strong (see Table 8.2 in the full report). The effects are higher in reading literacy than in mathematical and scientific literacy, emphasising the ways in which educational benefit accrues from home-based access to literature and other cultural possessions.

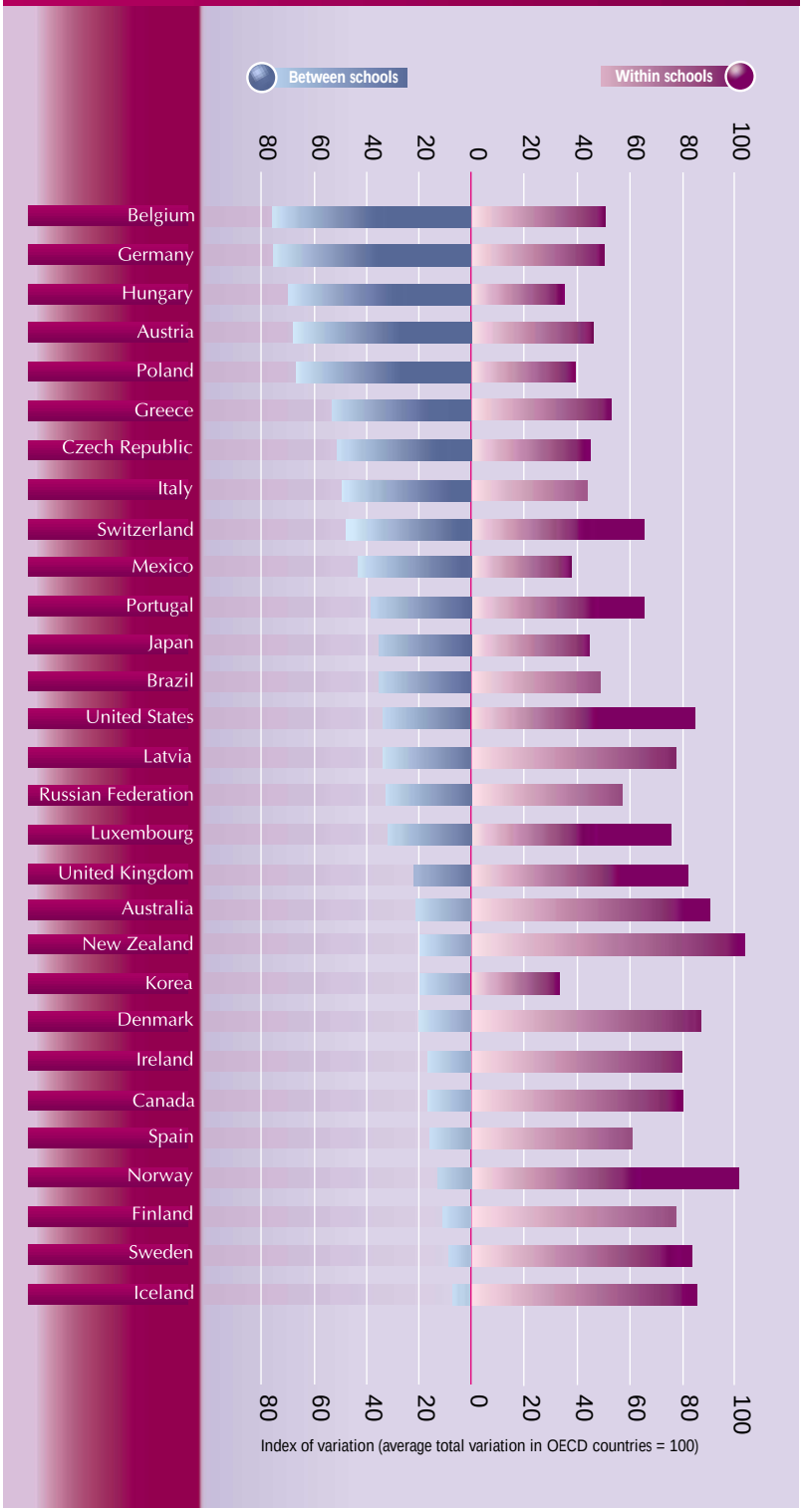
■ *Living with only one parent is, on average, associated with lower student performance.* On average across OECD countries, students who live with one parent score 12 points lower in reading literacy than students who live with two parents, all else being equal (see Table 8.2 in the full report). In some countries, there is not a significant difference. However, two of the countries where there is the widest difference, the United Kingdom and the United States, are also the two where the proportion of students living with only one parent is largest (see Tables 6.9 and 8.2 in the full report).

■ *Educational disadvantage among children born outside the country varies greatly.* In several countries, non-native born students show much lower reading literacy scores than students who were born (as were their parents) in the country. They are at least 71 points behind native-born students in 10 out of the 15 countries with more than 3 per cent of immigrant students, but in some countries the gap is much smaller (see Table 6.10 in the full report). A significant difference, 26 points on average across OECD countries, remains even when other factors of family background are considered (see Table 8.2 in the full report). These students may be academically disadvantaged either because they are immigrants entering a new education system or because they need to learn a

new language in a home environment that may not facilitate this learning. In either case they may be in need of special attention. PISA finds a more mixed picture in the case of students born in the country but whose parents immigrated. In some countries, they do not perform significantly differently from native born students, but in four countries – Belgium, Germany, Luxembourg and the Netherlands – there is a gap of more than one reading proficiency level (see Table 6.10 in the full report).

Can schools compensate for socio-economic background?

Variation in student performance in reading



School systems aim to provide equality of opportunity, giving the same chances to children regardless of the family circumstances to which they were born. In practice, children with different backgrounds do not do equally well. To what extent is this because of home influences, and to what extent because of experiences at school? PISA provides some clues, in ways that can inform strategies to improve the performance of less advantaged students.

Key findings

Differences in the performance between schools account for much of the variation in student performance in some countries. As shown in the figure, there are wide differences in reading literacy performance among schools in countries such as Austria, Belgium, Germany, Hungary and Poland where these account for much of the variation in overall student performance. Conversely, in countries such as New Zealand and Norway, differences are mainly within schools. The countries with the greatest differences between schools tend to be those that send students to different kinds of secondary school, often on the basis of prior performance in school (see Table 2.4 in the full report).

■ *Varying amounts of within-school and between-school differences in performance are associated with socio-economic background.* Students in better-performing schools often come from more advantaged families. PISA also suggests that the effects of socio-economic clustering are larger in school systems with differentiated school systems than in systems in which the curriculum does not vary significantly among schools (see Table 8.3 in the full report).

■ *The socio-economic composition of a school's student population is an even stronger predictor of student performance than individual home background.* PISA shows, for example, that two students with the same family characteristics going to different schools - one with a higher and one with a lower socio-economic profile - could expect to be further apart in reading literacy than two students from different backgrounds going to the same school. Although this phenomenon has complex causes, it underlines the potential link between the socio-economic segregation of students in different schools and the polarisation of students by performance (see Figure 8.4 in the full report).

■ *Schools that have a more favourable climate and are better resourced tend, to varying degrees, to have more advantaged students.* In Belgium, Germany and Luxembourg, for example, schools with a more advantaged socio-economic background tend to employ a greater proportion of specialist teachers, often because such teachers are employed in the more advanced tracks leading to entry into university. Schools with a higher socio-economic intake also seem to have a better disciplinary climate, as reported by students, particularly in Italy, Japan, Spain, the United Kingdom and the United States. Finally, students in schools with low economic, social and cultural status also tend not to use school resources as regularly as students in better-off schools (see Figures 8.5 and 8.5a in the full report).

Policy implications

PISA's findings have important policy implications for education systems. In some countries, students are highly segregated in terms of socio-economic variables, in part because of residential segregation and economic factors, but also because of features of the schooling system. Educational policy in such countries might attempt to moderate the impact of home background on student performance by reducing the extent of segregation along socio-economic lines, or by allocating resources to schools differentially. In these countries, it is important to understand how the allocation of school resources within a country is related to the socio-economic intake of its school.

In other countries, there is relatively little socio-economic segregation; that is, schools tend to be similar in their socio-economic intake. Educational policy in these countries might aim to moderate the impact of home background through measures designed to improve school resources and to reduce within-school segregation in accordance with the economic, cultural and social status of students. In the end, of course, what will matter most is how effectively those resources are used.

What can schools do to make a difference?

Home background influences educational success, and schools' socio-economic status may reinforce its effects. Equally important, PISA also identified several things that schools can do that are associated with student success. In identifying a constellation of factors that interact to influence performance, this first report does not claim to provide causal links between what schools do and how their students perform. Nonetheless, the initial findings offer some clues about the conditions in schools that are most closely associated with success. The following findings consider the separate effect of each factor identified, after associations with the other observed school and home background factors have been taken into account. The findings presented below tend to be similar for reading, mathematical and scientific literacy.

Students' use of school resources is more closely associated with student performance than is the physical infrastructure of schools. Students were asked about their use of their school's library, computers, calculators, laboratories and Internet connection. In schools where usage is relatively high, mean reading scores tend to be higher, even when other factors are discounted (see Table 8.5 in the full report). Deficiencies in the quality of the school's physical or material infrastructure, as reported by the principal, tend to have a much weaker impact than students' use of these resources (see Tables 7.10, 7.11 and 8.5 in the full report).

Qualified teachers are among a school's most valuable resources. PISA asked school principals to indicate the percentage of teachers with a university-level qualification in their respective subject area. Having more of these teachers is associated, on average across OECD countries, with better student results. For example, in reading, a 25 percentage point increase in the proportion of teachers with a university-level qualification in the relevant subject domain is associated with an advantage of 9 points on the reading literacy scale, on average across OECD countries, the other school factors measured by PISA being equal (see Table 8.5 in the full report).

The ratio of students to teaching staff matters most where it is relatively high. Among schools where the number of students for each member of the teaching staff exceeds 25, the mean performance of students is markedly lower, the higher the ratio. In the more typical range, between 10 to 25 students per teacher, there is a much weaker association with performance in reading literacy. Schools with fewer than 10 students per member of the teaching staff actually score slightly below the OECD average which may be because many such schools serve students with special needs (see Table 8.5 in the full report).

Some aspects of school policy and practice tend to be associated with better student performance. Three such factors, as perceived by school principals, show, on average across OECD countries, a positive and statistically significant association with student performance (see Table 8.5 in the full report). These include:

- teacher-related factors affecting school climate, such as teacher expectations of students;
- teacher morale and commitment; and
- school autonomy.

Some aspects of classroom practice are associated with better student performance. Three such factors, as perceived by students, show a positive and statistically significant association with student performance:

- teacher-student relations;
- disciplinary climate of the classroom; and
- the extent to which teachers emphasise academic performance and place high demands on students.

The first two of these factors are stronger than the third (see Tables 7.2, 7.3 and 8.5 in the full report).

■ *Successful students are more likely to do homework*. The other school factor with a close association with student success is homework. Within countries, students who do more homework are, on average across countries, likely to perform better in reading literacy. The quarter who do the most homework score on average 44 points higher than the quarter doing the least. This association is strongest in countries where students do more homework on average (see Table 7.6 in the full report).

Further research is needed

Overall, the combined influence of this set of school-level factors explains 31 per cent of the variation in reading literacy performance among schools within countries, and 21 per cent of the variation among countries.

Together with home background factors, the factors explain 72 per cent of the variation among schools within countries and 43 per cent of the variation between countries (see Table 8.5 in the full report).

These findings give a first indication of PISA results. Much further research and analysis will be needed to identify how each school factor operates, interacts with home background and influences school and student performance. Further thematic reports in 2002 and 2003 will seek to understand in more detail why some countries and schools perform better and achieve more equitable learning outcomes than others.

Knowledge and Skills for Life

FIRST RESULTS FROM PISA 2000

Are students well prepared to meet the challenges of the future? Are they able to analyse, reason and communicate their ideas effectively? Do they have the capacity to continue learning throughout life? These are questions that parents, students, the public and those who run education systems continually ask.

Knowledge and Skills for Life, the report summarised in this brochure, provides some answers. It assesses how far students near the end of compulsory education have acquired some of the knowledge and skills that are essential for full participation in society. It presents evidence on student performance in reading, mathematics and scientific literacy, reveals factors that influence the development of these skills at home and at school, and examines what the implications are for policy development.

The report shows considerable variation in levels of knowledge and skills between students, schools and countries. The extent to which the socio-economic background of students and schools affects student performance varies. Some countries have managed to mitigate the influence of social background and some have done that while achieving a high overall mean performance. This is a noteworthy achievement. Will other countries take up the challenge?

The OECD Programme for International Student Assessment (PISA) is a collaborative process among the 30 Member countries of the OECD and some non-OECD countries, bringing together scientific expertise from participating countries and steered jointly by their governments on the basis of shared, policy-driven interests. PISA is an unprecedented attempt to measure student achievement across all OECD countries and some non-OECD countries, as is evident from some of its features:

The literacy approach: PISA aims to define each domain (reading, mathematics and science) not merely in terms of mastery of the schools curriculum, but in terms of the knowledge and skills needed for full participation in society.

A long-term commitment: Over the decade to come, it will enable countries regularly and predictably to monitor their progress in meeting key learning objectives.

The age-group covered: By assessing 15-year-olds, i.e. young people near the end of their compulsory education, PISA provides a significant indication of the overall performance of school systems.

The relevance to lifelong learning: PISA does not limit itself to assessing students' knowledge and skills but also asks them to report on their own, self-regulated learning, their motivation to learn and their preferences for different types of learning situation.

Further information and on-line ordering:

- To order the Report (OECD code: 96 2001 14 1 P 1) *www.oecd.org*
- Data underlying the Report *www.pisa.oecd.org*
- All OECD books and periodicals are now available on-line *www.SourceOECD.org*

OECD