Worldwide Learning At Age 15
First Results from PISA 2000

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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 first survey was conducted in 2000 and will be repeated every three years. In PISA 2000, the focus was on reading skills. The following surveys will focus on: mathematical literacy and problem solving (2003), and scientific literacy (2006).

- 265,000 students from 32 countries took part. In Flanders 3,890 students from 124 different schools were assessed.

- PISA assesses 15-year-olds, regardless of their class or grade.

- 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.

- During 2 hours, students took paper and pencil assessments in their schools.

A new way of looking at student performance

- PISA assesses 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 assesses skills and competencies in reading, mathematical and scientific literacy.

- 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 is co-ordinated by the Departments of Education of participating countries, under the supervision of the Organisation for Economic Co-operation and Development (OECD).

- For each domain, international subject specialists and education experts have developed a test instrument that yields comparable results, no matter what national and cultural differences may characterise the participating countries.

- PISA fosters international exchange of relevant information about student skills. In this way, it provides participating countries with fixed performance criteria and regular updates on how well their students perform according to those criteria.
The countries taking part

In 2000, 28 OECD Member countries and four other countries carried out the first PISA survey:

| OECD members: | Australia, Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Japan, Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States. |
| Non-OECD members: | Brazil, Latvia, Liechtenstein, Russian Federation. |

A further 13 countries will conduct the same survey in 2002.

Countries in 2002: Albania, Argentina, Bulgaria, Chile, China, Hong Kong, Indonesia, Israel, Lithuania, Macedonia, Peru, Romania, Thailand.

In 2003, two OECD countries that did not take part in 2000 will participate in the second survey. These two countries are: Slovak Republic and Turkey.

The countries that take part in PISA are shown on this map:

This brochure does not aim to describe at length the results achieved by all PISA participating countries. For results concerning countries that may not be represented in the diagrams, please consult the OECD publication “Knowledge and skills for life - First results from PISA 2000”.

3
In this brochure, results from PISA 2000 – as they were reported in the international documents – will be discussed from a Flemish perspective. In the extensive OECD report “Knowledge and skills for life - First results from PISA 2000”, references to the Flemish Community of Belgium are scarce. The report mostly refers to Belgium and the values shown are the aggregated results of the Flemish and French Communities. Results achieved by Flanders are explicitly added to all figures and graphs in this brochure, which also comments results from a number of further specific analyses of the Flemish data.

...about student skills...

PISA 2000 investigates young people’s abilities to apply knowledge and skills to the Reading, Mathematics and Science domains. Those abilities are referred to as reading literacy, mathematical literacy, and scientific literacy.

PISA does not measure literacy as if it were a package that one does or does not possess. Much rather, it assesses each student by measuring literacy on a continuum. The score assigned to each 15-year-old reflects the level of the most difficult task s/he was able to perform successfully. Every PISA task corresponds to a given score point on the same literacy scale.

The literacy scale was designed to have a mean score of 500 points, with about two-thirds of students across participating OECD countries scoring between 400 and 600 points. For reading five levels of literacy are described, level 5 being the highest. Flemish students belong to the top group worldwide as regards reading literacy and mathematical literacy; they are just slightly below that group as regards scientific literacy.

Results are discussed per domain on pages 6-11.

...about differences between native and non-native or first-generation students...

The differences in school achievement between 15-year-old native students and non-native or first-generation students vary considerably across countries. In some countries, students who were not born in the country of assessment score significantly less than those who were (as in Flanders). In other countries, disparities between those two groups are minimal (e.g. Australia).

Findings on differences between native and non-native or first generation students are discussed on pages 14-15.

...about gender differences...

PISA results indicate that boys and girls perform differently. As in all other countries, Flemish girls achieve higher scores in reading literacy than their male peers.

Findings on differences between male and female students are discussed on pages 12-13.

...about the impact of family background on student performance...

The PISA results indicate that the relationship between a respondent’s family background and his/her performance also varies across countries. Performance is strongly associated with family background in some countries (as in Flanders) and less in others (e.g. Finland). The link between family background and level of performance is most salient in the mathematical literacy domain.

In Flanders, disparities between students who come from families with a higher or lower socio-economic status are relatively strong. Students from an underprivileged Flemish background do as well as comparable groups in other countries, but then students from Flemish families featuring a high socio-economic status perform unusually well.

Results concerning the impact of family background are discussed on pages 18-20.

...about the impact of school-related factors...

A number of different factors mediate the level of performance achieved by Flemish schools in the PISA domains. A key factor is that students with certain characteristics tend to go to certain schools and choose certain programmes. Differences between schools in terms of available resources and school policy are another important aspect.

Findings on between-school differences and the impact of enrolment in particular streams or study programmes are discussed on pages 21-27.
The results of Flemish 15-year-olds are described extensively per domain in the following pages. They are also summarised in the Table below. The Table shows that only one country performs significantly higher than Flanders on the reading literacy scale and no country achieves significantly better results than Flanders on the mathematical literacy scale. Flemish performance may not rank as high on the scientific literacy scale, but even in this domain our 15-year-olds do better than their peers in some neighbouring countries.

The Bonferroni method of adjustment for multiple calculation of statistically significant differences has not been incorporated in this table, which explains that minor differences may occur versus the OECD Report, in which all countries are drawn into the comparison.

The Netherlands is not mentioned in this Table and several other Tables in this brochure. The reason for this is that the Netherlands was not included in the OECD Report. The number of Dutch schools willing to participate in PISA was too low to give confidence that the sample results reliably reflect those of the population. Generally, however, it can be inferred from the data that Dutch results do not significantly differ from the Flemish results. For illustrative purposes, we shall list Dutch data whenever possible.
Student performance in reading literacy

Reading literacy is defined in PISA as:

"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".

In order to measure reading literacy a distinction is made between continuous texts (narration, explanation, argumentation, instruction) and non-continuous texts (forms, advertisements, charts, tables, diagrams) in four types of reading situations: reading for private use, reading for public use, reading for work, and reading for education.

Within the concept of reading literacy PISA distinguishes three subscales, each of them requiring different skills:

- **Retrieving information**: locating one or more pieces of information in a text
- **Interpreting** texts: constructing meaning and drawing inferences from one or more parts of a text
- **Reflection** and evaluation: relating a text to one's experience, knowledge and ideas

For each of these three subscales 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 table below). The division of the scales into levels of difficulty and of performance makes it not only possible to rank students' performance but also to describe what they can do (see table next page) Each successive reading level is associated with tasks of ascending difficulty, along the three reading literacy scales: 'retrieving information', 'interpreting texts', and 'reflection and evaluation'.

The table below also shows the percentage of students who are proficient at each level in the combined OECD area and in Flanders. These percentages reflect the combined score for reading performance.

<table>
<thead>
<tr>
<th>Level</th>
<th>(OECD average)</th>
<th>(Flanders)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level 5</td>
<td>10%</td>
<td>16%</td>
</tr>
<tr>
<td>Level 4</td>
<td>22% below 625 points</td>
<td>31% 553 to 625 points</td>
</tr>
<tr>
<td>Level 3</td>
<td>29% 481 to 552 points</td>
<td>29% 408 to 480 points</td>
</tr>
<tr>
<td>Level 2</td>
<td>22% 335 to 407 points</td>
<td>14% 208 to 334 points</td>
</tr>
<tr>
<td>Level 1</td>
<td>12% below 335 points</td>
<td>8% below 207 points</td>
</tr>
<tr>
<td>Below level 1</td>
<td>6% below 335 points</td>
<td>4% below 207 points</td>
</tr>
<tr>
<td>Level 5</td>
<td>RETRIEVING INFORMATION</td>
<td>INTERPRETING TEXTS</td>
</tr>
<tr>
<td>--------</td>
<td>------------------------</td>
<td>--------------------</td>
</tr>
<tr>
<td></td>
<td>Locate and possibly sequence or combine multiple pieces of deeply embedded information, some of which may be outside the main body of text. Infer which information in the text is relevant to the task. Deal with highly plausible and/or extensive competing information.</td>
<td>Either construe the meaning of nuanced language or demonstrate a full and detailed understanding of a text.</td>
</tr>
<tr>
<td>Level 4</td>
<td>Locate and possibly sequence or combine multiple pieces of embedded information, each of which may need to meet multiple criteria, in a text with unfamiliar context or form. Infer which information in the text is relevant to the task.</td>
<td>Use a high level of text-based inference to understand and apply categories in an unfamiliar context, and to construe the meaning of a section of text by taking into account the text as a whole. Deal with ambiguities, ideas that are contrary to expectation and ideas that are negatively worded.</td>
</tr>
<tr>
<td>Level 3</td>
<td>Locate, and in some cases recognise, the relationship between pieces of information, each of which may need to meet multiple criteria. Deal with prominent competing information.</td>
<td>Integrate several parts of a text in order to identify a main idea, understand a relationship or construe the meaning of a word or phrase. Compare, contrast or categorise taking many criteria into account. Deal with competing information.</td>
</tr>
<tr>
<td>Level 2</td>
<td>Locate one or more pieces of information, each of which may be required to meet multiple criteria. Deal with competing information.</td>
<td>Identify the main idea in a text, understand relationships, form or apply simple categories, or construe meaning within a limited part of the text when the information is not prominent and low-level inferences are required.</td>
</tr>
<tr>
<td>Level 1</td>
<td>Take account of a single criterion to locate one or more independent pieces of explicitly state information.</td>
<td>Recognise the main theme of author's purpose in a text about a familiar topic, when the required information in the text is prominent.</td>
</tr>
</tbody>
</table>
Flemish 15-year-olds can successfully perform more reading tasks than most of their European peers. If the participating countries were ranked according to the percentage of their students scoring at the two lowest levels of reading literacy, Flanders would be ranked sixth: Korea, Finland, Canada, Japan, and Ireland are the only countries with even less students performing at levels 1 and below. (Cf. Table below). In addition, Flanders belongs to the group of countries in which almost three-quarters of the 15-year-old students (74%) perform at reading proficiency level 3 or higher. This is significantly higher than the OECD mean (60%) and the Belgian results (64%).

The outstanding Flemish performance in reading literacy is confirmed when countries are ranked according to their overall mean student performance. The first column of the Figure on page 5 shows that Finland is the only country performing significantly higher than Flanders in reading literacy. Indeed, Flanders belongs to the top group of countries, which also includes Canada, New Zealand, Australia, Korea, Ireland, the United Kingdom, and Japan.

A closer look at Flemish reading literacy performance, more specifically by focusing on the domain’s three subscales, reveals that Flemish 15-year-olds do better on the Retrieving Information scale than on the Reflection and Evaluation scale. Few countries score significantly higher than Flanders on the Reflection and Evaluation scale. However, the average Flemish score drops as students are requested to do more than reading a text or document and locating information in it, i.e. when asked to develop an interpretation of the content or to reflect on the form or the content of the text.

Overall, Flanders features the biggest difference in performance levels between the Retrieving Information and the Reflection and Evaluation scales. Finland also displays a large gap, but the performance of Finnish students just weakens a bit on the Reflection and Evaluation scale. Flanders and the Netherlands show a gradual decline from Retrieving Information to Interpreting Texts to Reflection and Evaluation. (Cf. Figure on the following page.)
The gap between the reading literacy subscales is essentially attributable to the fact that 10 per cent less students attain the highest proficiency level on the Reflection and Evaluation scale than on the Retrieving Information scale. In other words, the lowest achievers are not those who cause this problem. Much rather, it is generated by those students who successfully perform the most difficult localisation tasks but fail to perform the most difficult reflection tasks. The majority of those attend general secondary education programmes (ASO-onderwijs).

Furthermore, such disparities within the Flemish reading literacy results should not overshadow the fact that Flanders does relatively well on the Reflection and Evaluation scale, e.g. significantly better than France, Germany, Luxembourg, the French Community of Belgium, Denmark, Norway, Spain, and the United States. In addition, Flanders scores significantly higher than Sweden and Austria on the combined reading literacy scale. In Flanders, differences in performance from one reading literacy subscale to the other remain within reading proficiency level 3.
Student performance in mathematical and scientific literacy

Mathematical literacy is defined in PISA as:

"the capacity to identify, to understand, and to engage in mathematics and make well-founded judgements about the role that mathematics plays, as needed for an individual's current and future private life, occupational life, social life with peers and relatives, and life as a constructive, concerned, and reflective citizen".

As with reading literacy, the definition revolves around wider uses in people's lives rather than simply carrying out mechanical operations. The term "literacy" is therefore used to indicate the ability to put mathematical knowledge and skill to functional use rather than just to master it within a school curriculum.

In the PISA definition, to "engage in" mathematics covers not simply physical or social actions (such as working out how much change to give someone in a shop) but also wider uses, including communicating, and relating to and appreciating things (such as having an opinion about the government's spending plans).

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.

For some sample items: see the table on the following page.

Scientific literacy is defined in PISA as:

"the 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 activity".

However: the concern in PISA is not to find out whether students can undertake scientific investigations for themselves, but rather whether their school experiences have culminated in an understanding of scientific processes and the ability to apply scientific concepts that enable them "to make decisions about the natural world and the changes made to it through human activity".

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.

For some sample items: see the table on the following page.
Flemish performances on the mathematical and scientific literacy scales were quite different.

The Figure on page 5 shows that no country scored significantly higher than Flanders on the mathematical literacy scale; and not a single Western European country equalled the Flemish mean score on mathematical literacy. The only countries to attain a higher mean were Korea and Japan.

The least impressive results achieved by Flemish 15-year-olds in PISA assessments were those recorded on the scientific literacy scale, although again the Flemish performance was significantly higher than the OECD average and also significantly higher than results achieved by Germany, France, Norway, Denmark, Spain, the United States or Switzerland. (Also cf. the Figure on page 5.)

The fact that, beside Asian countries, countries such as the United Kingdom, Canada, and New Zealand also perform very well in the scientific literacy domain is likely to be related to the way science is taught within their respective curriculum. In its definition of scientific literacy, PISA focuses on understanding a scientific text, interpreting it and reflecting on it, i.e. applying scientific formulas is not a key priority here. Therefore, countries where the curriculum focuses on interpreting scientific content and reflecting on it have an advantage over countries where the focus is on delivery and understanding.

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Examples of items according to literacy domain and difficulty

<table>
<thead>
<tr>
<th>Mathematical literacy</th>
<th>Scientific literacy</th>
</tr>
</thead>
<tbody>
<tr>
<td>&quot;difficult&quot;</td>
<td>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.</td>
</tr>
<tr>
<td></td>
<td>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.</td>
</tr>
<tr>
<td>&quot;easy&quot;</td>
<td>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. This task is associated with a score of 403 points.</td>
</tr>
<tr>
<td></td>
<td>Students were asked why washing hospital sheets in high temperatures helps reduce the risk that patients will contract a fever. In their answer they need to apply their scientific knowledge to this real-world problem by referring, for example, to the killing of bacteria. This task is associated with a score of 467 points.</td>
</tr>
</tbody>
</table>
Student-level differences - gender differences

In all countries, girls tend to score significantly higher than boys in reading literacy. This turns out to be the most striking difference between male and female students revealed by PISA 2000. Moreover, the disparities are far from negligible. The diagram below shows that girls from 7 countries perform over half a proficiency level higher than boys (i.e. there are more than 35 points difference). Finnish girls are the furthest ahead of their male peers, with a difference peaking at 51 points on the reading literacy scale.

A closer look at gender differences on the different subscales of reading literacy shows that such differences are the smallest on the Retrieving Information subscale and the largest on Reflection and Evaluation subscale. As shown in the Table below, this applies to OECD Member countries overall as well as to Flanders. This trend may be explained by gender differences pertaining to respective interests in reading: boys report that they read more comic strips, newspapers and information published on websites, while girls report reading more novels and fiction.

<table>
<thead>
<tr>
<th>Mean reading literacy scores (on subscales)</th>
<th>OECD average</th>
<th>Flanders</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Boys</td>
<td>Girls</td>
</tr>
<tr>
<td>Reading literacy - total</td>
<td>485</td>
<td>517</td>
</tr>
<tr>
<td>Subscale Retrieving Information</td>
<td>486</td>
<td>510</td>
</tr>
<tr>
<td>Subscale Interpreting texts</td>
<td>487</td>
<td>516</td>
</tr>
<tr>
<td>Subscale Reflection</td>
<td>480</td>
<td>525</td>
</tr>
</tbody>
</table>
Gender differences are less pronounced on the mathematical and scientific literacy scales than on the reading literacy scale. For mathematical literacy, male students across OECD countries score on average 11 points higher than their female peers. However, the difference is statistically significant in only one half of the countries. Statistically significant gender differences with regard to scientific literacy occur in only six countries: girls do better in three countries and boys in the three others.

In Flanders, gender differences in the mathematical and scientific literacy domains are rather small and generally not significant. (Cf. Figures below.)

The picture is somewhat different when the various types of education are taken into account. In general secondary education boys do significantly better than girls as far as science and mathematics are concerned, and the lead of female students is no longer significant for reading literacy.
Student-level differences - differences between native and non-native (or first-generation) students

The PISA contextual questionnaires included a number of questions designed to measure the effect on student performance of immigration on one hand and of the language spoken at home on the other. Students were asked whether they themselves and each of their parents were born in the assessment country or in another country. Furthermore, they were asked which language they speak at home most of the time.

These questions do not make it possible to portray all types of situations featuring students from migrant families. The questionnaire does not ask, for example, how long the respondents have been living in the country where the assessment took place. The degree of similarity between the student’s mother tongue and the language of assessment is also not factored in. However, it is possible to conduct a set of investigative analyses based on a number of categories.

The students’ responses concerning their birthplace and that of their parents gave rise to three different categories of PISA respondents.

<table>
<thead>
<tr>
<th>Native students</th>
<th>Those students who were born in the country where the assessment took place and who had at least one parent born in that country.</th>
</tr>
</thead>
<tbody>
<tr>
<td>First-generation students</td>
<td>Those born in the country where the assessment took place but whose parents were born in another country.</td>
</tr>
<tr>
<td>Non-native students</td>
<td>Those born outside the country where the assessment took place and whose parents were also born in another country.</td>
</tr>
</tbody>
</table>

First-generation students amount to more than six per cent of the total PISA sample. However, their distribution varies widely across countries. (Cf. Figure below.)

In Flanders, the percentage of first-generation students and non-native students is relatively modest, totalling 7% of the sample. In comparison with the global figure for Belgium (11%) and with that of the French Community (18%), fewer non-native or first-generation students are schooled in the Flemish education system. This comparison also applies to the neighbouring countries. (E.g. the Netherlands 11%, France 14%, Germany 21% and Luxembourg as much as 30%).
A comparison of the overall performance in reading literacy of first-generation students with that of native students reveals comparatively large and statistically significant differences – in favour of native students – in ten countries. (Cf. Figure below.) In Germany, Denmark, Luxembourg, and the Netherlands, differences in performance exceed 70 points or approximately one full proficiency level, while they even rise above one and a half proficiency level in Belgium and Flanders.

Such results need to be put into perspective, particularly as regards the large differences observed between certain countries. When making comparisons between countries, one needs to account for variations in the international spread of a language and for the selective immigration policy in certain states. In English-speaking countries, being born in a foreign country (or having parents who were born in a foreign country) is a smaller disadvantage than elsewhere.

Taking into account the language and the number of non-native students attending Flemish schools, it would seem most relevant to compare Flanders with the Netherlands, Denmark, and Austria. The reading proficiency of first-generation students in Flanders compares to that of Denmark but is lower than that of the Netherlands or Austria.

When also drawing into the comparison the language spoken at home, one observes that two-thirds of first-generation students in the Netherlands speak Dutch at home versus only one third in Flanders. One could therefore expect that the difference between Flanders and the Netherlands would drop when comparing equivalent groups, namely first-generation students who speak a foreign language at home (excluding German or French as foreign languages for Flanders). Unexpectedly, the gap between Flanders and the Netherlands persists and even widens a little. (Flanders: 408; the Netherlands: 475.)

Students who do not speak Dutch at home are obviously at a disadvantage. The Flemish education system is not very successful in making up for that disadvantage.

The comparatively high scores obtained by non-native students from the Flemish sample are attributable to the relatively large proportion of students from that category who do speak Dutch at home (60%). It is likely that many of them are Dutch students (from the Netherlands) who live in Belgium (or not).
While a high average score in school achievement is a positive result for an education system as a whole, a good mean performance overall may conceal large disparities within a student population. It is desirable that the top and middle groups of students do not achieve their high performances at the expense of underachievers. For this reason, the distribution of scores is expressed in percentiles. The 50th percentile corresponds with the median score i.e. the score of the middle student when all students are ranked by their scores. Ten per cent of the students have a lower score than the 10th percentile or a higher score than the 90th percentile.

Belgium displays the second largest variation for reading literacy: only Germany has an even wider variation. In other terms, there is a very wide gap between the highest and lowest achievers in Belgium. This huge difference can, however, be explained by the differences between Belgian Communities– although the French Community, viewed on its own, also features big internal differences. The Flemish variation in performance is not very different from that of other countries. Finland and Korea are the only countries that succeed in combining (very) high reading literacy scores with only a narrow gap between highest and lowest performances. It can be said that, as far as reading literacy is concerned, the good mean performance does not come at the cost of greater inequalities. Differences between high and low achievers are not small, but they are as large as in other countries featuring considerably poorer performances.

Flanders recorded a high mean performance in mathematical literacy. Japan and Korea obtain even higher mean scores due to the relatively large number of Flemish students who underperform. This may in part be explained by the participation of special education schools in the PISA survey, but that cannot be the only explanation.

Flemish high achievers are among the best students worldwide. Low achievers perform about as well in Flanders as low achievers in the countries that belong to the middle group of participating countries. Just like in New Zealand and Switzerland, the gap between the high and low achievers is rather wide.

Mathematical literacy - distribution of scores
There are other countries with large disparities between high and low achievers, but they also have to face lower overall performances. This will, however, be a priority in the future. Is it not the task of the Flemish education system to ensure that poorer students can draw on the mathematics that they have learnt at school to cope with concrete situations? This does not mean that mathematics classes should merely be functional. It is necessary to be able to engage in wider mathematical thinking when it becomes relevant to do so.

As regards scientific literacy, variation in performance does not vary as widely across countries as for reading and mathematical literacy. The distribution of scores in Flanders is close to a typical “normal” curve i.e. with as many students above the median as below the median. The “low achievers” do relatively well on the scientific literacy scale in comparison with other countries and in comparison with the mathematical literacy scale.
Student-level differences - impact of the family background

It is generally accepted that students from families with a higher socio-economic status tend to perform better at school. PISA makes it possible to quantify this correlation and analyse its role in student-level differences in performance.

PISA assigns each participating student a value on International Socio-Economic Index of Occupational Status, known as ISEI and further referred to as socio-economic background index. This value is in part determined by the parents’ level of education and occupation and in part by the resources available in the student’s home. The relation between students’ (reading) performance and their score on the above-mentioned socio-economic background index can be represented as lines, referred to as socio-economic gradients. These lines are characterised by their height, their gradient (or slope) and their length.

<table>
<thead>
<tr>
<th>Height</th>
<th>~ the mean (reading) performance</th>
<th>The higher the gradient is located, the higher the mean (reading) performance achieved by students of that country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gradient (slope)</td>
<td>~ the differences in (reading) performance caused by socio-economic background</td>
<td>The steeper the gradient, the more significant the impact of socio-economic background on student performance i.e. steeper gradients reveal larger inequalities in student performance due to socio-economic factors.</td>
</tr>
<tr>
<td>Length</td>
<td>~ student-level differences in terms of their socio-economic background</td>
<td>The longer the gradient, the larger the disparities between students from (part of) a country in terms of their socio-economic background i.e. the bigger the variation within the student population of that (part of a) country.</td>
</tr>
</tbody>
</table>

The Figure on the following page shows the socio-economic gradients for Belgium, Flanders and a few neighbouring countries, in comparison with the international gradient for reading literacy.

The international socio-economic gradient for reading literacy (the dark blue line) is the line that best represents the overall relation between the reading performance of students and their socio-economic status across OECD countries. This line runs from the point where the 5% of students with the lowest values on the socio-economic background index are located to the point where the 5% of socio-economically most privileged students are located.

The Figure suggests that the link between the family background of students and their reading performance varies widely across countries. Besides the fact that some countries show a relatively high level of performance and others only attain a relatively low level, countries also significantly differ in the impact of socio-cultural background on their students’ performance.

The gradients plotted for a number of countries can globally be regarded as linear. (Cf. Finland, Ireland, United Kingdom, and France.) In such countries, progression on the socio-economic background index systematically goes along with parallel, constant progression on the reading literacy performance scale. Neither the Flemish nor the Belgian gradients follow this linear model. For Flanders and Belgium, the gradient is steeper at the lowest levels of the socio-economic background index than at its highest levels; and the slope weakens and evens out once it reaches higher levels of socio-economic status. This implies that socio-economic factors have a greater impact on the respondents’ reading performance if their socio-economic status is modest. In other terms, above a given level of socio-economic background, social differences are less likely to affect the capacity of students to perform PISA tasks; and whether the student comes from a family with a high or a very high socio-economic status is a less critical feature.
Furthermore, the Figure below shows how gradients tend to converge at higher levels of socio-economic background. The lines draw closer to each other on the right hand-side of the Figure. This configuration is particularly marked when the Flemish gradient is left aside. The difference represented is then at its highest and means that the socio-economic gradients of countries with a high mean performance on the reading literacy scale are generally less steep. This trend, however, does not apply to the Flemish situation: Flanders sports one of the highest mean performances in reading literacy but also shows one of the steepest gradient lines. This again confirms how much socio-economic factors affect reading performance in Flanders.

Converging gradients also imply that between-student differences in reading performance are much smaller among students from families with a high socio-economic status than among students with a modest family background. As a consequence, various education reforms may affect respondents from underprivileged socio-economic backgrounds more than others.

The respective lengths of the gradients plotted for the different countries hardly vary at all and are quite similar to the length of the international socio-economic gradient. This suggests that between-student variation in socio-economic background is quite comparable across countries or parts of countries.
In addition to highlighting the significant impact of socio-economic factors on Flemish reading performance, the Figure shows that the mean reading performance of Flemish students lies far above the international mean. The Flemish gradient begins at proficiency level 3, while many other lines (including the Belgian gradient) begin at proficiency level 2. This means that Flemish students from families with a lower socio-economic status score significant above the international mean: their performance is comparable to that of Dutch or Irish students with a similar family background. (Finland is the only country to succeed in hauling its students from lower levels of socio-economic status to higher levels of reading proficiency.)

The high level at which the Flemish gradient begins also indicates that, on average, 15-year-olds in Flanders outperform many others and achieve a very high mean performance, which gives a measure of the mean level of performance of the Flemish education system. Based on this information, the Flemish education system can be deemed effective.

Data from the preceding Figure make it possible to rank PISA countries in several categories determined by their “overall quality” (in terms of mean reading literacy scores achieved by their students) and their “degree of equity” (measured in terms of impact of socio-economic background on reading performance i.e. the slope of the gradients). Also cf. Table below.

First, there is a group of countries that combine a relatively high reading performance (i.e. high overall quality) with relative equity between different socio-economic groups. The mean scores of those countries on the combined reading literacy scale are significantly higher than the OECD mean on the same scale, while their gradients are not as steep as the “international” gradient. Countries from that group (e.g. Finland) demonstrate that it is possible to achieve high quality while minimising inequality.

Another group of countries combine a high level of performance (i.e. a good quality standard) with a difference in reading performances between students from different socio-economic backgrounds that lies well above the corresponding international mean difference. In those countries, the mean score on the combined reading literacy scale is significantly higher than the international mean, but the slope of their gradients is also steeper than the “international” gradient. This indicates that the impact of socio-economic background on reading performance is stronger than the average international impact. Belgium, Flanders, the Netherlands and the United Kingdom belong to this group of countries.

<table>
<thead>
<tr>
<th>Countries according to combinations of 'average quality' and 'equality'</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Countries with mean performance statistically significantly above the OECD average</strong></td>
</tr>
<tr>
<td><strong>Below-average</strong> impact of socio-economic background on student performance (~ a gentle gradient)</td>
</tr>
<tr>
<td>Impact of socio-economic background not statistically significantly different from OECD average impact</td>
</tr>
<tr>
<td><strong>Above-average</strong> impact of socio-economic background on student performance (~ a steep gradient)</td>
</tr>
</tbody>
</table>
School-level differences - Results achieved by Flemish schools

124 Flemish schools participated in the PISA survey, of which 4 were schools for students with special education needs. A random sample of about 35 students aged 15 was drawn from each school.

The position of each school compared with both the Flemish and international gradients for each of the three assessment domains can be calculated on the basis of the mean performance of students and their score on the socio-economic background index. (Cf. pages 18-19). The schools can further be classified in eight groups according to the study programmes they provide.

Above-mentioned data were used to generate the three following Figures.

The first Figure refers to the reading literacy domain. The vertical axis accounts for the mean reading performance of the students of a school and the horizontal axis for the mean score of the students of a school on the socio-economic background index; the background consists of shades that represent the different proficiency levels.
The higher the school is positioned on the graph, the better its students perform in reading. When a school is positioned further right, it means that the average level of social background of its student population is higher.

In Flanders, both aspects converge with types of education: at the top right hand-side of the graph, one predominantly encounters schools that exclusively provide general secondary education (ASO) or general and technical secondary education (ASO-TSO). Conversely, schools that also offer special education and part-time vocational training will be positioned at the bottom left hand-side of the graph.

These trends generalise to the mathematical and scientific literacy domains, for which the same groups of schools are similarly located on the graph.

For mathematical literacy, however, schools are spread more widely across the graph than for the other two domains. Between-school differences tend to be more significant on the mathematical literacy scale, too.

The results of the Flemish schools on the mathematical literacy scale in comparison to the Flemish and international socio-economic gradient for mathematics

The findings in this domain and in this graph are to some extent related to the large differences between high and low achievers in the mathematical literacy domain (see pages 16-17).
In the figures concerning the mathematical and scientific literacy domains, the background cannot be divided up into proficiency levels. The background is therefore split in two parts: above the OECD mean (set at 500 points for both domains) or below the OECD mean. The different colours reflect these dichotomous categories.

Schools that participated in PISA were given feedback on their students’ performance in the form of the Figures shown above. Each school received three diagrams on which its own position was shown in red and – per school – five other schools with similar study programmes on offer were selected as reference schools. Each reference school was shown on the graph in a different colour, which made it easy for the schools to position themselves in comparison with the five others. In this way, schools could compare their performances to those achieved by schools offering similar education packages, but without being able to identify the reference schools.

It was consistently ensured that participation in the PISA Survey would remain fully anonymous. Never were any identities of schools or students disclosed.
School-level differences - different streams and types of study programmes

The selection of the student sample in each school was randomised, i.e. the students were not selected according to the class or the stream they attended. In each school, a few students were selected from most of the study orientations or streams on offer in that particular school. The number of student from each stream that participated in PISA was in part the result of random sampling and varied widely. The maximum amount turned out to be 438 students (Economics/Modern Languages section). For quite a few streams (or study programmes), the number of students tested was insufficient to calculate representative, reliable mean scores. Moreover, the number of streams (or study programmes) represented varied according to the domains assessed.

Mean scores per type of study programme suggest large disparities between general secondary education, technical secondary education, and vocational training programmes. The difference is consistently equivalent to one proficiency level, as described for the reading literacy domain. However, such differences are artificial because results per stream or study programme indicate a more gradual progression. In particular, technical and general secondary education overlap to a certain extent, so that a given study programme in technical secondary education may not necessarily be outsored by a study programme in general secondary education.

For Reading Literacy, the spread of the education streams is wide while the different types of study programmes are outlined rather clearly, with the exception of Economics/Social Science. The latter performs below certain streams of technical secondary education. (Cf. Figure on the following page.)

For Mathematical Literacy, there seems to be a large gap between technical education and vocational training programmes on the one hand; and a very gradual progression from technical to general secondary education on the other. Technical education streams with a relatively advanced mathematics curriculum tend to outperform general education streams with a limited mathematics curriculum. (Cf. Figure on page 26.)

The profile for Scientific Literacy is similar, featuring relatively high scores for some technical education streams (e.g. mechanics), partly because science items assess technical insight. (Cf. Figure on page 27.)
### Fields of study – Mean scores

#### Mathematical Literacy

<table>
<thead>
<tr>
<th>Category</th>
<th>Code</th>
<th>Score</th>
</tr>
</thead>
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<tr>
<td>GR / LAT</td>
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</tr>
<tr>
<td>GR / WISK</td>
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Worldwide Learning At Age 15
First Results from PISA 2000

In this brochure, results from PISA 2000 (Programme for International Student Assessment) will be discussed from a Flemish perspective. Key findings will briefly be summarised and, for each finding, a link will be established with the Flemish situation or its implications for Flanders will be described.

PISA investigates the extent to which 15-year-old students already master the knowledge and skills required to actively participate in society. The survey provides a wealth of information on student performance in reading literacy, mathematical literacy, and scientific literacy in over 30 countries. In addition, it seeks to determine which factors influence the development of such skills; and identify policy-oriented conclusions that could be drawn from the findings.

The extensive report “Knowledge and skills for life - First results from PISA 2000” is available at the OECD (see box) in English, French or German. References to the Flemish Community of Belgium are scarce in the international report: on an international level, comparative analyses mostly use Belgian data, which are aggregated results of the Flemish and French Communities.

Both this brochure and the international report show that there are wide disparities in the knowledge and skills that 15-year-olds possess. There are important differences between students, between schools, and between countries. The extent to which family and socio-economic background of students and schools influence student performance also varies widely. Some countries succeeded in minimising the impact of socio-economic background, others were even able to combine this aspect with high mean performances. This is certainly a commendable accomplishment...

Further information and on-line ordering:
❖ To order the report
 www.oecd.org
 (OECD code : 96 2001 14 1 P 1)
❖ Data underlying the report
 www.pisa.oecd.org