INDICATOR A4

# WHAT 15-YEAR-OLDS CAN DO IN MATHEMATICS

This indicator examines the mathematics performance of 15-year-old students, drawing on 2003 data from the OECD's Programme for International Student Assessment (PISA). It describes mathematical proficiency in each country in terms of the percentage of students reaching one of six competency levels as well as in terms of the mean scores achieved by students on the overall mathematics scale and on different aspects of mathematics. It also examines the distribution of student scores within countries.

## *Key results*

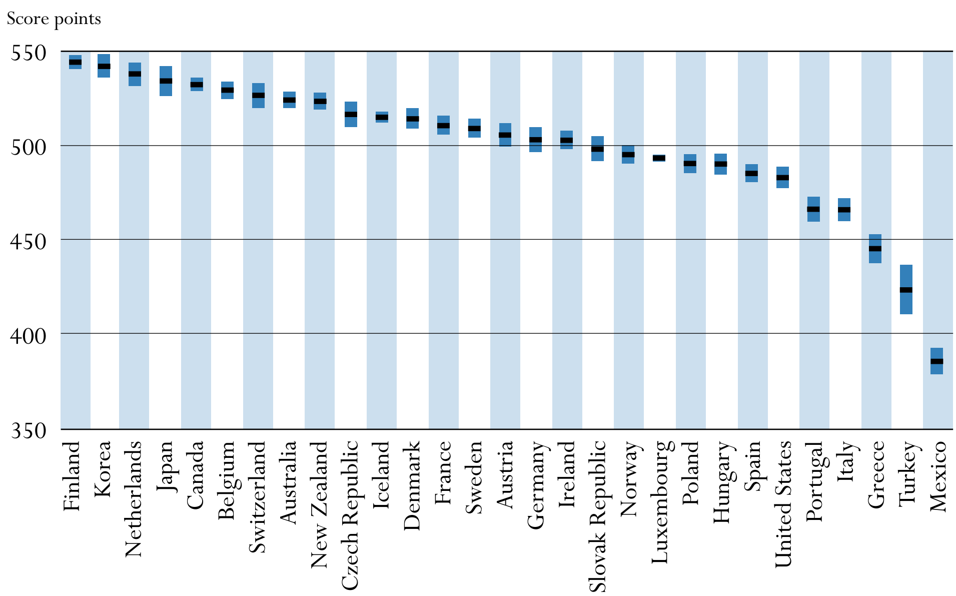
**Chart A4.1. Distribution of student performance on the OECD PISA mathematics scale (2003)**

*The chart summarises the overall performance of 15-year-old students in different countries on the OECD PISA 2003 mathematics scale. The width of the symbols indicates the statistical uncertainty with which the mean performance was estimated.*

95% confidence interval around the mean score

Mean score on the mathematical literacy scale

Three OECD countries (Finland, Korea and the Netherlands) achieve statistically similar average scores that are higher than the average scores in all other OECD countries. Students' average scores in these countries – ranging from 538 points in the Netherlands to 544 points in Finland – are over one-half a proficiency level higher than the average. Eleven other countries (Australia, Belgium, Canada, Czech Republic, Denmark, France, Iceland, Japan, New Zealand, Sweden, and Switzerland) have mean scores that are above the OECD mean. Four countries (Austria, Germany, Ireland and the Slovak Republic) perform similarly to the OECD mean, and the remaining 11 countries perform below it.




*Source*: OECD PISA 2003 database. Table A4.3.

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## *Other highlights of this indicator*

- At least 7% of students in Belgium, Japan, Korea, the Netherlands and Switzerland reach the highest level of mathematics proficiency (Level 6). Furthermore, in these countries and in Canada, Finland and New Zealand, over 20% of students reach at least Level 5. In Greece, Mexico, Portugal and Turkey, however, less than 6% of students reach these two levels of proficiency.
- With the exception of Finland and Korea, all OECD countries have at least 10% of students that perform at Level 1 or below, and there are 12 countries in which this exceeds one-fifth of all students. In Mexico and Turkey, a majority of students perform only at Level 1 or below.
- In the majority of countries, the range of performance in the middle half of the students exceeds the magnitude of two proficiency levels, and in Belgium and Germany it is around 2.4 proficiency levels. This suggests that educational programmes, schools and teachers need to cope with a wide range of student knowledge and skills.

## Policy context

For much of the last century, the content of school mathematics and science curricula was dominated by the need to provide the foundations for the professional training of a small number of mathematicians, scientists and engineers. With the growing role of science, mathematics and technology in modern life, however, the objectives of personal fulfilment, employment and full participation in society increasingly require that all adults – not just those aspiring to a scientific career – be mathematically, scientifically and technologically literate.

The performance of a country's best students in mathematics and related subjects may have implications for the part a country will play in tomorrow's advanced technology sector and for its general international competitiveness. Conversely, deficiencies of students in key competency areas can have negative consequences for individuals' labour market and earnings prospects and for their capacity to participate fully in society.

## Evidence and explanations

PISA starts with a concept of mathematical literacy that is concerned with the capacity of students to analyse, reason and communicate effectively as they pose, solve and interpret mathematical problems in a variety of situations involving quantitative, spatial, probabilistic or other mathematical concepts. When thinking about what mathematics might mean for individuals, one must consider both the extent to which they possess mathematical knowledge and understanding, and the extent to which they can activate their mathematical competencies to solve problems they encounter in life. PISA therefore presents students with problems mainly set in real-world situations. These are crafted in such a way that aspects of mathematics would be of genuine benefit in solving the problem. The objective of the PISA assessment is to obtain measures of the extent to which students presented with these problems can activate their mathematical knowledge and competencies to solve such problems successfully.

### Proficiency in mathematics

Chart A4.2 presents an overall profile of students' proficiency on the mathematics literacy scale with the length of the coloured components of the bars showing the percentage of students proficient at each of six levels that were based on substantive considerations relating to the nature of the underlying competencies (Box A4.2). Across OECD countries, on average, 4% of students reach Level 6 (the highest level of performance), 15% reach Level 5 or higher, 34% reach Level 4 or higher, 58% reach Level 3 or higher, and 79% reach Level 2 or higher. Thirteen percent of students reach Level 1, although 8% of students across OECD countries perform below this level (Table A4.1).

Examining individual countries' performance by proficiency level shows that in Belgium, Japan, Korea, the Netherlands and Switzerland, 7% or more of students reach the highest level of proficiency. In these countries and in Canada, Finland and New Zealand, a significant proportion of students also reach Level 5 or above (over 20% in each case). In contrast, in Greece, Mexico, Portugal and Turkey, less than 6% of students reach these two levels of proficiency.

Although there is general tendency among countries with a high proportion of 15-year-old students scoring at Levels 5 and 6 to have fewer students below the lowest level of proficiency (see, *e.g.*, Korea), this is not always the case. For example, while 9% of students in Belgium perform at Level 6, 7% do not reach Level 1.

### Box A4.1. What is mathematical literacy in PISA?

Mathematics in PISA focuses on the capacity of students to analyse, reason, and communicate effectively as they pose, solve and interpret mathematical problems in a variety of situations involving quantitative, spatial, probabilistic, and other mathematical concepts. It defines "mathematical literacy" as an individual's capacity to identify and understand the role that mathematics plays in the world, to make well-founded judgments, and to use and engage with mathematics in ways that meet the needs of that individual's life as a constructive, concerned, and reflective citizen. This definition focuses on the extent to which students possess mathematical knowledge and understanding and the extent to which they can activate their mathematical competencies to solve problems they encounter in life.

**What scales are reported?** PISA's assessment of mathematics is reported on an overall mathematics scale (reported here) that is comprised of four components. *Space and shape* relates to spatial and geometric phenomena and relationships, drawing on the curricular discipline of geometry. *Change and relationships* involves mathematical manifestations of change as well as functional relationships and dependency among variables; it relates most closely to algebra. *Quantity* involves numeric phenomena as well as quantitative relationships and patterns, which in turn involve familiarity with numbers, representing numbers, understanding the meaning of operations, mental arithmetic and estimating. *Uncertainty* involves probabilistic and statistical phenomena and relationships that become increasingly relevant in the information society.

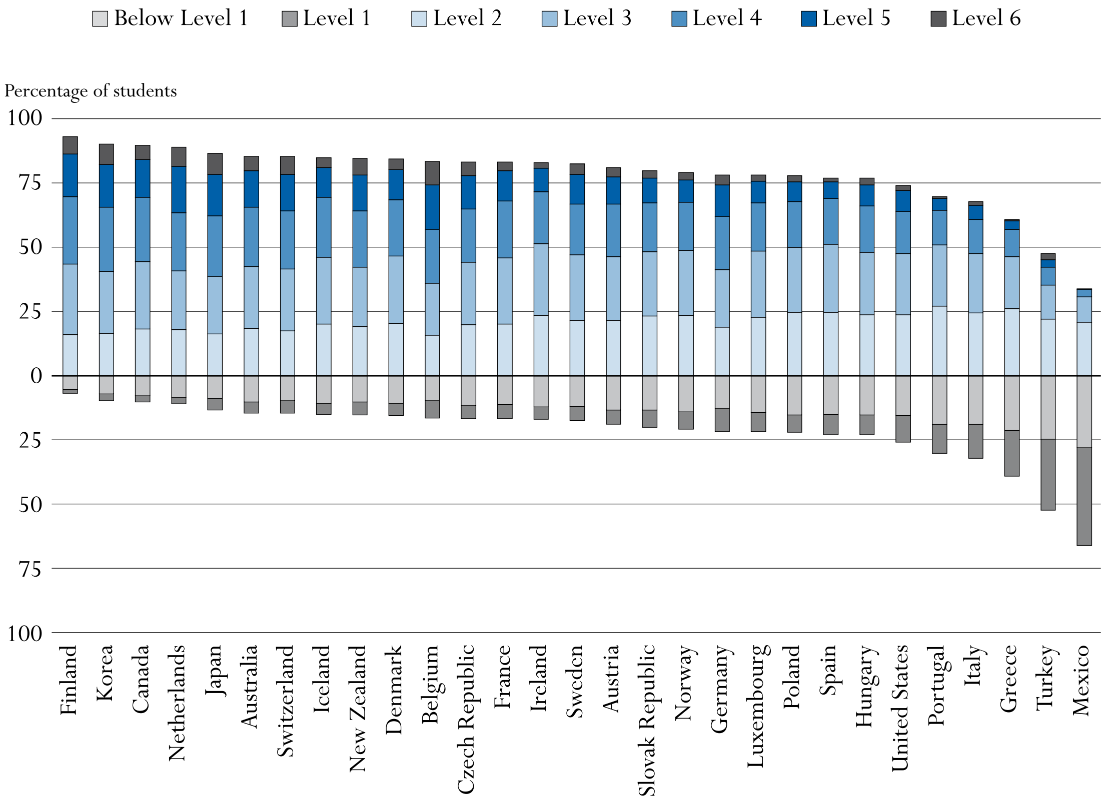
**What do the scale scores mean?** The scores on each scale represent degrees of proficiency along each dimension or aspect of mathematics (in this indicator, the combined scale). For example, a low score on a scale indicates that a student has more limited skills, whereas a high score indicates that a student has more advanced skills in this area.

**What are proficiency levels?** In an attempt to capture this progression, each of the mathematics scales is divided into six levels based on the type of knowledge and skills students need to demonstrate at a particular level. Students at a particular level are not only likely to demonstrate the knowledge and skills associated with that level but are also likely to demonstrate the proficiencies defined by lower levels. Thus, all students proficient at Level 3 are also proficient at Levels 1 and 2.

In 16 OECD countries, at least one-third of students reach Level 4 or beyond on the mathematics scale, and in nine of these countries, the percentage is over 40%. In all but five OECD countries, the percentage of students reaching Level 3 or higher is over 50%, and this extends to 77% in Finland. In all but four OECD countries, the percentage of students reaching Level 2 or higher is over 70%.

While most students in most OECD countries reach Level 2 or higher on the mathematics scale, there are a number of students performing at Level 1 or below. With the exception of Finland and Korea, all OECD countries have at least 10% of students that perform at Level 1 or below, and there are 12 countries in which this exceeds one-fifth of all students. In Mexico and Turkey, a majority of students are unable to complete tasks above Level 1 on a consistent basis.

**Chart A4.2. Percentage of students at each level of proficiency on the OECD PISA mathematics scale (2003)**




*Countries are ranked in descending order of percentage of 15-year-olds in Levels 2, 3, 4, 5 and 6.*
*Source*: OECD PISA 2003 database. Table A4.1.

*StatLink: http://dx.doi.org/10.1787/564711722418*

### Mean scores in mathematics

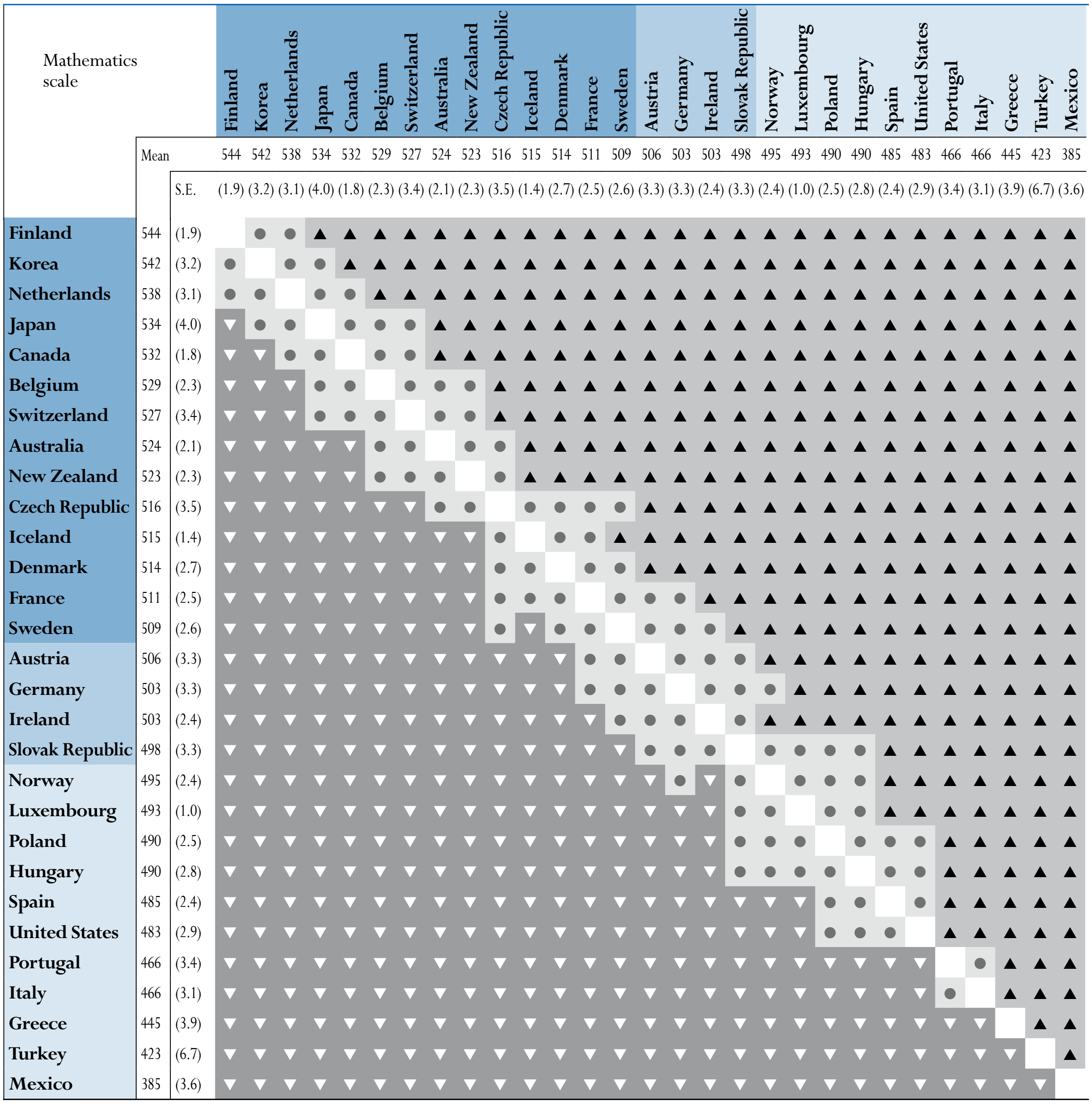
Another way to summarise student performance and to compare the relative standing of countries in terms of student performance is through the mean scores for students in each country. To the extent that high average performance at age 15 can be considered predictive of a highly skilled future workforce, countries with high average performance will have an important economic and social advantage. This section describes country means on the overall scale, as well as briefly describing countries' relative strengths and weakness on the four scales identified in Box A4.1. (See also Box A4.3 for an indication of how mean scores on select scales differed from the 2000 to the 2003 assessments of PISA.)

Chart A4.3 gives a summary of overall student performance in different countries on the combined mathematics scale, in terms of the mean student score, and indicates which countries perform above, at, or below the OECD average, and compares mean scores among pairs of countries. It also indicates the comparative performance of individual countries with each of the other countries.

## Box A4.2. What can students at each proficiency level do and what scores are associated with the levels?

- Students proficient at ***Level 6 (over 668 points)*** can conceptualise, generalise and utilise information based on their investigations and modelling of complex problem situations. They can link different information sources and representations and flexibly translate among them. Students at this level are capable of advanced mathematical thinking and reasoning; they can apply this insight and understanding, along with a mastery of symbolic and formal mathematical operations and relationships, to new approaches and strategies for attacking novel situations. Student at this level can formulate and precisely communicate their actions and reflections regarding their findings, interpretations, arguments and the appropriateness of these to the original situations.
- Students proficient at ***Level 5 (607 to 668 points)*** can develop and work with models for complex situations, identifying constraints and specifying assumptions. They can select, compare and evaluate appropriate problem solving strategies for dealing with complex problems related to these models. Students at this level can work strategically using broad, well-developed thinking and reasoning skills, appropriate linked representations, symbolic and formal characterisations, and insight pertaining to these situations. They can reflect on their actions and can formulate and communicate their interpretations and reasoning.
- Students proficient at ***Level 4 (545 to 606 points)*** can work effectively with explicit models for complex concrete situations that may involve constraints or call for making assumptions. They can select and integrate different representations, including symbolic, linking them directly to aspects of real-world situations. Students at this level can utilise well-developed skills and reason flexibly, with some insight, in these contexts. They can construct and communicate explanations and arguments based on their interpretations, arguments and actions.
- Students proficient at ***Level 3 (483 to 544 points)*** can execute clearly described procedures, including those that require sequential decisions. They can select and apply simple problem solving strategies. Students at this level can interpret and use representations based on different information sources and reason directly from them. They can develop short communications reporting their interpretations, results and reasoning.
- Students proficient at ***Level 2 (421 to 482 points)*** can interpret and recognise situations in contexts that require no more than direct inference. They can extract relevant information from a single source and make use of a single representational mode. Students at this level can employ basic algorithms, formulae, procedures or conventions. They are capable of direct reasoning and making literal interpretations of the results.
- Students proficient at ***Level 1 (358 to 420 points)*** can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and to carry out routine procedures according to direct instructions in explicit situations. They can perform actions that are obvious and follow immediately from the given stimuli.
- Students performing ***below Level 1 (below 358 points)*** are not able to show routinely the most basic type of knowledge and skills that PISA seeks to measure.

## Chart A4.3. Multiple comparisons of mean performance on the OECD PISA mathematics scale (2003)




Range of rank*

| | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| OECD countries | Upper rank | 1 | 1 | 1 | 2 | 4 | 4 | 4 | 7 | 7 | 9 | 10 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 18 | 19 | 19 | 19 | 22 | 22 | 25 | 25 | 27 | 28 | 29 |
| | Lower rank | 3 | 4 | 5 | 7 | 7 | 8 | 9 | 9 | 10 | 14 | 13 | 14 | 15 | 16 | 18 | 18 | 18 | 21 | 21 | 21 | 23 | 23 | 24 | 24 | 26 | 26 | 27 | 28 | 29 |

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

**Instructions:**

Read across the row for a country to compare performance with the countries listed along the top of the chart. The symbols indicate whether the average performance of the country in the row is lower than that of the comparison country, higher than that of the comparison country, or if there is no statistically significant difference between the average achievement of the two countries.

- ▲ Mean performance statistically significantly higher than in comparison country
- ● No statistically significant difference from comparison country
- ▼ Mean performance statistically significantly lower than in comparison country
- Statistically significantly above the OECD average
- Not statistically significantly different from the OECD average
- Statistically significantly below the OECD average

*Source:* OECD PISA 2003 database.

StatLink: http://dx.doi.org/10.1787/564711722418

On the combined mathematics scale, Finland, Korea and the Netherlands are the best performing OECD countries. Students' average scores in these countries – ranging from 538 points in the Netherlands to 544 points in Finland – are over one-half a proficiency level higher than the OECD average. Eleven other OECD countries (Australia, Belgium, Canada, Czech Republic, Denmark, France, Iceland, Japan, New Zealand, Sweden and Switzerland) have mean scores that are above the OECD mean. Four countries (Austria, Germany, Ireland and the Slovak Republic) perform similarly to the OECD mean, and the remaining 11 OECD countries perform below it.

Table A4.2 compares the performance results in the different content areas of mathematics, allowing an assessment of the relative strengths and weaknesses of countries. Although it is not appropriate to compare numerical scale scores directly between the different content areas of mathematics, it is possible to determine the relative strengths of countries in the different content areas of mathematics, on the basis of their relative positions on the respective scales. The relative probability that a country will assume each position on each scale is determined from the country mean scores, their standard errors and the covariance between the performance scales of two domains. From this, it can be concluded, with a likelihood of 95%, whether a country would rank statistically significantly higher, not statistically differently, or statistically significantly lower in one domain than in the other domain. For details on the methods employed, see the *PISA 2003 Technical Report* (OECD, 2005c).

For some countries – most notably Greece, Italy, Korea, Mexico, Portugal, Spain and Turkey – the relative standing is similar across the four mathematics content areas. By contrast, in Austria, Canada, the Czech Republic, France, Germany, Ireland, Japan, New Zealand, Norway, the Slovak Republic and Switzerland, performance differences among the content areas are particularly large and may warrant attention in curriculum development and implementation. For additional details, see *Learning for Tomorrow's World – First Results from PISA 2003* (OECD, 2004a).

For some countries – most notably Japan – the relative standing is broadly similar in the content areas that were assessed in both 2000 and 2003, while performance is lower on the quantity and uncertainty scales that were newly introduced in 2003. While it would be wrong to conclude that mathematics performance in these countries has declined, the results do suggest that the introduction of the new content areas into the assessment shed a slightly different light on the overall performance of these countries.

### *Distribution of student performance*

While average performance figures can provide a good indication of the overall performance of a country, they may mask significant variation in performance within countries, possibly reflecting different performance among different student groups. Thus, this section presents information on the distribution of mathematics scores, examining the range of performance within countries.

Table A4.3 shows the distribution of student performance within countries. This analysis is different from the examination of the distribution of student performance across the PISA proficiency levels discussed in the first section in the following way. Whereas the distribution of students across proficiency levels indicates the proportion of students in each country that can demonstrate a specified level of knowledge and skills, and thus compares countries on the basis of absolute benchmarks of student performance, the analysis below focuses on the relative distribution of scores, *i.e.* the gap that exists between students with the highest and the lowest levels of performance within each country. This is an important indicator of the equality of educational outcomes in mathematics.

The results show that there is wide variation in overall student performance on the combined mathematics scale within countries. The middle 90% of the population exceeds by far the range between the mean scores of the highest and lowest performing countries. In almost all OECD countries, this group includes some students proficient at Level 5 and others not proficient above Level 1 (Table A4.3).

In addition, the range of performance in the middle half of the students (*i.e.* the difference between the 75th and 25th percentiles) on the combined mathematics scale ranges from less than 120 score points in Canada, Finland, Ireland and Mexico to more than 140 score points in Belgium and Germany. In the majority of countries, this range exceeds the magnitude of two proficiency levels and in Belgium and Germany it is around 2.4 proficiency levels. In Belgium, this difference can be explained partially by the difference in performance between the Flemish and French Communities). For additional details, see *Learning for Tomorrow's World – First Results from PISA 2003* (OECD, 2004a).

### Box A4.3. Differences in mathematics in PISA 2000 and PISA 2003

PISA was first administered in 2000, and thus it is possible to estimate differences in mathematics performance between PISA 2000 and PISA 2003 for the two scales that were used in the 2000 assessment: *space and shape* and *change and relationships*. However, in both cases, data should be interpreted with caution. First, since data are only available from two points in time, it is not possible to assess to what extent the observed differences are indicative of trends. Second, while the overall approach to measurement used by PISA is consistent across cycles, small refinements continue to be made, so it would not be prudent to read too much into small changes in results at this stage. Furthermore, sampling and measurement error limit the reliability of comparisons of results over time. Both types of error inevitably arise when assessments are linked through a limited number of common items over time. To account for the effects of such error, the confidence band for comparisons over time has been broadened correspondingly.

With these caveats in mind, performance on the *space and shape* scale has remained broadly similar across countries between 2000 (494 points) and 2003 (496 points), though this varies for individual countries. In four OECD countries, there were statistically significant increases on this scale, ranging from 15 points in Italy to 28 points in Belgium. On the other hand, average performance in Mexico and Iceland decreased by 18 and 15 points, respectively.

On the *change and relationships* scale, among the 25 countries for which data can be compared, the OECD average increased from 488 points in 2000 to 499 points in 2003, the largest observed difference in any areas of the PISA assessment. Again, however, there is wide variation across countries and more countries saw differences on this scale than on the *space and shape* scale. The Czech Republic and Poland both saw increases of around 30 score points (equivalent to about one-half a proficiency level); and in Belgium, Canada, Finland, Germany, Hungary, Korea, Portugal, and Spain, increases were between 13 and 22 points. There were no statistically significant increases or decreases in average scores of the remaining countries.

*Source: Learning for Tomorrow's World – First Results from PISA 2003* (OECD, 2004a), Tables 2.1c, 2.1d, 2.2c and 2.2d.

Even countries with similar levels of average performance show considerable variation in the disparities of student performance. For example, Germany and Ireland both have mean scores around the OECD average, but while Ireland shows one of the narrowest distributions, the difference between the 75th and 25th percentiles in Germany is among the widest. Similarly, towards the lower end of the scale, Italy and Portugal show similar levels of average performance, but Italy shows much larger performance variation than Portugal. Among the top performing countries, Finland displays much less performance variation than Korea or the Netherlands (Table A4.3).

Finally, a comparison between the range of performance within a country and its average performance reveals that wide disparities in performance are not a necessary condition for a country to attain a high level of overall performance. For example, Canada, Denmark, Finland, Iceland and Korea all have above-average performance but below-average differences between the 75th and 25th percentiles.

### *Definitions and methodologies*

The achievement scores are based on assessments administered in 2003 as part of the Programme for International Student Assessment (PISA) undertaken by the OECD.

The target population studied for this indicator was 15-year-old students. Operationally, this referred to students who were from 15 years and 3 (completed) months to 16 years and 2 (completed) months at the beginning of the testing period and who were enrolled in an educational institution at the secondary level, irrespective of the grade levels or type of institutions in which they were enrolled, and irrespective of whether they participated in school full-time or part-time.

## Further references

For further information about PISA 2003, see *Learning for Tomorrow's World – First Results from PISA 2003* (OECD, 2004a), *Problem Solving for Tomorrow's World – First Measures of Cross-Curricular Competencies from PISA 2003* (OECD, 2004b) and the *PISA 2003 Technical Report* (OECD, 2005c). PISA data is also available on the PISA Web site: *www.pisa.oecd.org.*

Table A4.1.
## Percentage of students at each level of proficiency on the OECD PISA mathematics scale (2003)

| | | Proficiency levels | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Below Level 1 (below 358 score points) | | Level 1 (from 358 to 420 score points) | | Level 2 (from 421 to 482 score points) | | Level 3 (from 483 to 544 score points) | | Level 4 (from 545 to 606 score points) | | Level 5 (from 607 to 668 score points) | | Level 6 (above 668 score points) | |
| | | % | S.E. | % | S.E. | % | S.E. | % | S.E. | % | S.E. | % | S.E. | % | S.E. |
| OECD countries | Australia | 4.3 | (0.4) | 10.0 | (0.5) | 18.6 | (0.6) | 24.0 | (0.7) | 23.3 | (0.6) | 14.0 | (0.5) | 5.8 | (0.4) |
| | Austria | 5.6 | (0.7) | 13.2 | (0.8) | 21.6 | (0.9) | 24.9 | (1.1) | 20.5 | (0.8) | 10.5 | (0.9) | 3.7 | (0.5) |
| | Belgium | 7.2 | (0.6) | 9.3 | (0.5) | 15.9 | (0.6) | 20.1 | (0.7) | 21.0 | (0.6) | 17.5 | (0.7) | 9.0 | (0.5) |
| | Canada | 2.4 | (0.3) | 7.7 | (0.4) | 18.3 | (0.6) | 26.2 | (0.7) | 25.1 | (0.6) | 14.8 | (0.5) | 5.5 | (0.4) |
| | Czech Republic | 5.0 | (0.7) | 11.6 | (0.9) | 20.1 | (1.0) | 24.3 | (0.9) | 20.8 | (0.9) | 12.9 | (0.8) | 5.3 | (0.5) |
| | Denmark | 4.7 | (0.5) | 10.7 | (0.6) | 20.6 | (0.9) | 26.2 | (0.9) | 21.9 | (0.8) | 11.8 | (0.9) | 4.1 | (0.5) |
| | Finland | 1.5 | (0.2) | 5.3 | (0.4) | 16.0 | (0.6) | 27.7 | (0.7) | 26.1 | (0.9) | 16.7 | (0.6) | 6.7 | (0.5) |
| | France | 5.6 | (0.7) | 11.0 | (0.8) | 20.2 | (0.8) | 25.9 | (1.0) | 22.1 | (1.0) | 11.6 | (0.7) | 3.5 | (0.4) |
| | Germany | 9.2 | (0.8) | 12.4 | (0.8) | 19.0 | (1.1) | 22.6 | (0.8) | 20.6 | (1.0) | 12.2 | (0.9) | 4.1 | (0.5) |
| | Greece | 17.8 | (1.2) | 21.2 | (1.2) | 26.3 | (1.0) | 20.2 | (1.0) | 10.6 | (0.9) | 3.4 | (0.5) | 0.6 | (0.2) |
| | Hungary | 7.8 | (0.8) | 15.2 | (0.8) | 23.8 | (1.1) | 24.3 | (0.9) | 18.2 | (0.9) | 8.2 | (0.7) | 2.5 | (0.4) |
| | Iceland | 4.5 | (0.4) | 10.5 | (0.6) | 20.2 | (1.0) | 26.1 | (0.9) | 23.2 | (0.8) | 11.7 | (0.6) | 3.7 | (0.4) |
| | Ireland | 4.7 | (0.6) | 12.1 | (0.8) | 23.6 | (0.8) | 28.0 | (0.8) | 20.2 | (1.1) | 9.1 | (0.8) | 2.2 | (0.3) |
| | Italy | 13.2 | (1.2) | 18.7 | (0.9) | 24.7 | (1.0) | 22.9 | (0.8) | 13.4 | (0.7) | 5.5 | (0.4) | 1.5 | (0.2) |
| | Japan | 4.7 | (0.7) | 8.6 | (0.7) | 16.3 | (0.8) | 22.4 | (1.0) | 23.6 | (1.2) | 16.1 | (1.0) | 8.2 | (1.1) |
| | Korea | 2.5 | (0.3) | 7.1 | (0.7) | 16.6 | (0.8) | 24.1 | (1.0) | 25.0 | (1.1) | 16.7 | (0.8) | 8.1 | (0.9) |
| | Luxembourg | 7.4 | (0.4) | 14.3 | (0.6) | 22.9 | (0.9) | 25.9 | (0.8) | 18.7 | (0.8) | 8.5 | (0.6) | 2.4 | (0.3) |
| | Mexico | 38.1 | (1.7) | 27.9 | (1.0) | 20.8 | (0.9) | 10.1 | (0.8) | 2.7 | (0.4) | 0.4 | (0.1) | 0.0 | (0.0) |
| | Netherlands | 2.6 | (0.7) | 8.4 | (0.9) | 18.0 | (1.1) | 23.0 | (1.1) | 22.6 | (1.3) | 18.2 | (1.1) | 7.3 | (0.6) |
| | New Zealand | 4.9 | (0.4) | 10.1 | (0.6) | 19.2 | (0.7) | 23.2 | (0.9) | 21.9 | (0.8) | 14.1 | (0.6) | 6.6 | (0.4) |
| | Norway | 6.9 | (0.5) | 13.9 | (0.8) | 23.7 | (1.2) | 25.2 | (1.0) | 18.9 | (1.0) | 8.7 | (0.6) | 2.7 | (0.3) |
| | Poland | 6.8 | (0.6) | 15.2 | (0.8) | 24.8 | (0.7) | 25.3 | (0.9) | 17.7 | (0.9) | 7.8 | (0.5) | 2.3 | (0.3) |
| | Portugal | 11.3 | (1.1) | 18.8 | (1.0) | 27.1 | (1.0) | 24.0 | (1.0) | 13.4 | (0.9) | 4.6 | (0.5) | 0.8 | (0.2) |
| | Slovak Republic | 6.7 | (0.8) | 13.2 | (0.9) | 23.5 | (0.9) | 24.9 | (1.1) | 18.9 | (0.8) | 9.8 | (0.7) | 2.9 | (0.4) |
| | Spain | 8.1 | (0.7) | 14.9 | (0.9) | 24.7 | (0.8) | 26.7 | (1.0) | 17.7 | (0.6) | 6.5 | (0.6) | 1.4 | (0.2) |
| | Sweden | 5.6 | (0.5) | 11.7 | (0.6) | 21.7 | (0.8) | 25.5 | (0.9) | 19.8 | (0.8) | 11.6 | (0.6) | 4.1 | (0.5) |
| | Switzerland | 4.9 | (0.4) | 9.6 | (0.6) | 17.5 | (0.8) | 24.3 | (1.0) | 22.5 | (0.7) | 14.2 | (1.1) | 7.0 | (0.9) |
| | Turkey | 27.7 | (2.0) | 24.6 | (1.3) | 22.1 | (1.1) | 13.5 | (1.3) | 6.8 | (1.1) | 3.1 | (0.8) | 2.4 | (1.0) |
| | United States | 10.2 | (0.8) | 15.5 | (0.8) | 23.9 | (0.8) | 23.8 | (0.8) | 16.6 | (0.7) | 8.1 | (0.5) | 2.0 | (0.4) |
| | *OECD total* | *11.0* | *(0.3)* | *14.6* | *(0.3)* | *21.2* | *(0.3)* | *22.4* | *(0.3)* | *17.6* | *(0.2)* | *9.6* | *(0.2)* | *3.5* | *(0.2)* |
| | *OECD average* | *8.2* | *(0.2)* | *13.2* | *(0.2)* | *21.1* | *(0.1)* | *23.7* | *(0.2)* | *19.1* | *(0.2)* | *10.6* | *(0.1)* | *4.0* | *(0.1)* |

*Source:* OECD PISA 2003 database. See Annex 3 for notes *(www.oecd.org/edu/eag2006)*

*StatLink: http://dx.doi.org/10.1787/564711722418*

Table A4.2.

## Mean student performance and variation on different aspects of the OECD PISA mathematics scale (2003)

| | Space and shape | | | | Change and relationships | | | | Quantity | | | | Uncertainty | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Mean | | Standard deviation | | Mean | | Standard deviation | | Mean | | Standard deviation | | Mean | | Standard deviation | |
| | Score | S.E. | S.D. | S.E. | Score | S.E. | S.D. | S.E. | Score | S.E. | S.D. | S.E. | Score | S.E. | S.D. | S.E. |
| **OECD countries** | | | | | | | | | | | | | | | | |
| **Australia** | 521 | (2.3) | 104 | (1.7) | 525 | (2.3) | 98 | (1.8) | 517 | (2.1) | 97 | (1.5) | 531 | (2.2) | 98 | (1.6) |
| **Austria** | 515 | (3.5) | 112 | (1.7) | 500 | (3.6) | 102 | (1.8) | 513 | (3.0) | 86 | (1.7) | 494 | (3.1) | 95 | (1.7) |
| **Belgium** | 530 | (2.3) | 111 | (1.4) | 535 | (2.4) | 117 | (1.6) | 530 | (2.3) | 110 | (1.8) | 526 | (2.2) | 106 | (1.5) |
| **Canada** | 518 | (1.8) | 95 | (0.9) | 537 | (1.9) | 92 | (0.9) | 528 | (1.8) | 94 | (0.9) | 542 | (1.8) | 87 | (0.9) |
| **Czech Republic** | 527 | (4.1) | 119 | (2.3) | 515 | (3.5) | 100 | (1.8) | 528 | (3.5) | 98 | (2.1) | 500 | (3.1) | 91 | (1.7) |
| **Denmark** | 512 | (2.8) | 103 | (1.6) | 509 | (3.0) | 98 | (1.8) | 516 | (2.6) | 92 | (1.6) | 516 | (2.8) | 92 | (1.6) |
| **Finland** | 539 | (2.0) | 92 | (1.2) | 543 | (2.2) | 95 | (1.4) | 549 | (1.8) | 83 | (1.1) | 545 | (2.1) | 85 | (1.1) |
| **France** | 508 | (3.0) | 102 | (2.0) | 520 | (2.6) | 100 | (2.1) | 507 | (2.5) | 95 | (1.8) | 506 | (2.4) | 92 | (1.7) |
| **Germany** | 500 | (3.3) | 112 | (1.9) | 507 | (3.7) | 109 | (1.7) | 514 | (3.4) | 106 | (1.9) | 493 | (3.3) | 98 | (1.7) |
| **Greece** | 437 | (3.8) | 100 | (1.6) | 436 | (4.3) | 107 | (1.7) | 446 | (4.0) | 100 | (1.7) | 458 | (3.5) | 88 | (1.5) |
| **Hungary** | 479 | (3.3) | 109 | (2.2) | 495 | (3.1) | 99 | (2.1) | 496 | (2.7) | 95 | (1.9) | 489 | (2.6) | 86 | (1.8) |
| **Iceland** | 504 | (1.5) | 94 | (1.5) | 510 | (1.4) | 97 | (1.2) | 513 | (1.5) | 96 | (1.3) | 528 | (1.5) | 95 | (1.4) |
| **Ireland** | 476 | (2.4) | 95 | (1.5) | 506 | (2.4) | 88 | (1.4) | 502 | (2.5) | 88 | (1.3) | 517 | (2.6) | 89 | (1.4) |
| **Italy** | 470 | (3.1) | 109 | (1.8) | 452 | (3.2) | 103 | (1.9) | 475 | (3.4) | 106 | (2.0) | 463 | (3.0) | 95 | (1.7) |
| **Japan** | 553 | (4.3) | 110 | (2.9) | 536 | (4.3) | 112 | (3.0) | 527 | (3.8) | 102 | (2.5) | 528 | (3.9) | 98 | (2.6) |
| **Korea** | 552 | (3.8) | 117 | (2.5) | 548 | (3.5) | 100 | (2.4) | 537 | (3.0) | 90 | (1.9) | 538 | (3.0) | 89 | (1.9) |
| **Luxembourg** | 488 | (1.4) | 100 | (1.2) | 487 | (1.2) | 102 | (1.0) | 502 | (1.1) | 91 | (1.1) | 492 | (1.1) | 96 | (1.0) |
| **Mexico** | 382 | (3.2) | 87 | (1.4) | 364 | (4.1) | 99 | (1.9) | 394 | (3.9) | 95 | (1.9) | 390 | (3.3) | 80 | (1.5) |
| **Netherlands** | 526 | (2.9) | 94 | (2.3) | 551 | (3.1) | 94 | (2.0) | 528 | (3.1) | 97 | (2.4) | 549 | (3.0) | 90 | (2.0) |
| **New Zealand** | 525 | (2.3) | 106 | (1.3) | 526 | (2.4) | 103 | (1.5) | 511 | (2.2) | 99 | (1.3) | 532 | (2.3) | 99 | (1.3) |
| **Norway** | 483 | (2.5) | 103 | (1.3) | 488 | (2.6) | 98 | (1.3) | 494 | (2.2) | 94 | (1.1) | 513 | (2.6) | 98 | (1.1) |
| **Poland** | 490 | (2.7) | 107 | (1.9) | 484 | (2.7) | 100 | (1.7) | 492 | (2.5) | 89 | (1.7) | 494 | (2.3) | 85 | (1.7) |
| **Portugal** | 450 | (3.4) | 93 | (1.7) | 468 | (4.0) | 99 | (2.2) | 465 | (3.5) | 94 | (1.8) | 471 | (3.4) | 83 | (1.8) |
| **Slovak Republic** | 505 | (4.0) | 117 | (2.3) | 494 | (3.5) | 105 | (2.3) | 513 | (3.4) | 94 | (2.3) | 476 | (3.2) | 87 | (1.8) |
| **Spain** | 477 | (2.6) | 92 | (1.4) | 481 | (2.8) | 99 | (1.4) | 492 | (2.5) | 97 | (1.3) | 489 | (2.4) | 88 | (1.4) |
| **Sweden** | 498 | (2.6) | 100 | (1.7) | 505 | (2.9) | 111 | (1.9) | 514 | (2.5) | 90 | (1.7) | 511 | (2.7) | 101 | (1.7) |
| **Switzerland** | 540 | (3.5) | 110 | (2.1) | 523 | (3.7) | 112 | (2.2) | 533 | (3.1) | 96 | (1.7) | 517 | (3.3) | 100 | (2.1) |
| **Turkey** | 417 | (6.3) | 102 | (5.1) | 423 | (7.6) | 121 | (5.4) | 413 | (6.8) | 112 | (5.1) | 443 | (6.2) | 98 | (5.0) |
| **United States** | 472 | (2.8) | 98 | (1.4) | 486 | (3.0) | 98 | (1.6) | 476 | (3.2) | 105 | (1.5) | 492 | (3.0) | 99 | (1.5) |
| ***OECD total*** | *486* | *(1.0)* | *112* | *(0.7)* | *489* | *(1.2)* | *113* | *(0.8)* | *487* | *(1.1)* | *108* | *(0.7)* | *492* | *(1.1)* | *102* | *(0.7)* |
| ***OECD average*** | *496* | *(0.6)* | *110* | *(0.4)* | *499* | *(0.7)* | *109* | *(0.5)* | *501* | *(0.6)* | *102* | *(0.4)* | *502* | *(0.6)* | *99* | *(0.4)* |

*Source:* OECD PISA 2003 database. See Annex 3 for notes *(www.oecd.org/edu/eag2006)*.

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Table A4.3.
## Mean score and variation in student performance on the OECD PISA mathematics scale (2003)

| | | Mean | | Standard deviation | | Percentiles | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 5th | | 10th | | 25th | | 75th | | 90th | | 95th | |
| | | Score | S.E. | S.D. | S.E. | Score | S.E. | Score | S.E. | Score | S.E. | Score | S.E. | Score | S.E. | Score | S.E. |
| OECD countries | Australia | 524 | (2.1) | 95 | (1.5) | 364 | (4.4) | 399 | (3.4) | 460 | (2.7) | 592 | (2.5) | 645 | (3.0) | 676 | (3.5) |
| | Austria | 506 | (3.3) | 93 | (1.7) | 353 | (6.6) | 384 | (4.4) | 439 | (4.0) | 571 | (4.2) | 626 | (4.0) | 658 | (5.0) |
| | Belgium | 529 | (2.3) | 110 | (1.8) | 334 | (6.5) | 381 | (4.6) | 456 | (3.4) | 611 | (2.5) | 664 | (2.4) | 693 | (2.4) |
| | Canada | 533 | (1.8) | 87 | (1.0) | 386 | (3.1) | 419 | (2.5) | 474 | (2.2) | 593 | (2.1) | 644 | (2.6) | 673 | (3.4) |
| | Czech Republic | 517 | (3.5) | 96 | (1.9) | 358 | (6.2) | 392 | (5.7) | 449 | (4.5) | 584 | (4.0) | 641 | (4.3) | 672 | (4.9) |
| | Denmark | 514 | (2.7) | 91 | (1.4) | 361 | (4.4) | 396 | (4.5) | 453 | (3.7) | 578 | (3.1) | 632 | (3.7) | 662 | (4.7) |
| | Finland | 544 | (1.9) | 84 | (1.1) | 406 | (3.8) | 438 | (2.8) | 488 | (2.2) | 603 | (2.3) | 652 | (2.8) | 680 | (3.1) |
| | France | 511 | (2.5) | 92 | (1.8) | 352 | (6.0) | 389 | (5.6) | 449 | (3.7) | 575 | (3.0) | 628 | (3.6) | 656 | (3.5) |
| | Germany | 503 | (3.3) | 103 | (1.8) | 324 | (6.1) | 363 | (5.6) | 432 | (4.7) | 578 | (3.5) | 632 | (3.5) | 662 | (3.6) |
| | Greece | 445 | (3.9) | 94 | (1.8) | 288 | (5.4) | 324 | (5.1) | 382 | (4.6) | 508 | (4.3) | 566 | (5.3) | 598 | (5.1) |
| | Hungary | 490 | (2.8) | 94 | (2.0) | 335 | (5.6) | 370 | (4.2) | 426 | (3.0) | 556 | (3.9) | 611 | (4.7) | 644 | (4.6) |
| | Iceland | 515 | (1.4) | 90 | (1.2) | 362 | (4.1) | 396 | (2.7) | 454 | (2.8) | 578 | (1.9) | 629 | (3.0) | 658 | (3.8) |
| | Ireland | 503 | (2.4) | 85 | (1.3) | 360 | (4.7) | 393 | (3.2) | 445 | (3.4) | 562 | (3.0) | 614 | (3.6) | 641 | (3.3) |
| | Italy | 466 | (3.1) | 96 | (1.9) | 307 | (6.4) | 342 | (5.9) | 401 | (4.3) | 530 | (3.0) | 589 | (3.6) | 623 | (3.7) |
| | Japan | 534 | (4.0) | 101 | (2.8) | 361 | (8.2) | 402 | (6.3) | 467 | (5.4) | 605 | (4.4) | 660 | (6.1) | 690 | (6.6) |
| | Korea | 542 | (3.2) | 92 | (2.1) | 388 | (4.6) | 423 | (4.5) | 479 | (3.7) | 606 | (4.2) | 659 | (5.4) | 690 | (6.8) |
| | Luxembourg | 493 | (1.0) | 92 | (1.0) | 339 | (3.9) | 373 | (2.7) | 430 | (2.2) | 557 | (1.9) | 611 | (3.2) | 641 | (2.7) |
| | Mexico | 385 | (3.6) | 85 | (1.9) | 247 | (5.4) | 276 | (4.7) | 327 | (4.3) | 444 | (4.5) | 497 | (4.7) | 527 | (5.6) |
| | Netherlands | 538 | (3.1) | 93 | (2.3) | 385 | (6.9) | 415 | (5.8) | 471 | (5.4) | 608 | (3.8) | 657 | (3.2) | 684 | (3.4) |
| | New Zealand | 524 | (2.3) | 98 | (1.2) | 359 | (4.1) | 394 | (3.9) | 455 | (2.9) | 593 | (2.2) | 650 | (3.2) | 682 | (2.9) |
| | Norway | 495 | (2.4) | 92 | (1.2) | 344 | (4.0) | 376 | (3.4) | 433 | (2.9) | 560 | (3.3) | 614 | (3.6) | 645 | (3.9) |
| | Poland | 490 | (2.5) | 90 | (1.3) | 343 | (5.8) | 376 | (3.6) | 428 | (3.1) | 553 | (2.9) | 607 | (3.3) | 640 | (3.5) |
| | Portugal | 466 | (3.4) | 88 | (1.7) | 321 | (6.3) | 352 | (5.3) | 406 | (5.0) | 526 | (3.5) | 580 | (3.3) | 610 | (3.7) |
| | Slovak Republic | 498 | (3.3) | 93 | (2.3) | 342 | (6.9) | 379 | (5.8) | 436 | (4.6) | 565 | (3.8) | 619 | (3.5) | 648 | (4.1) |
| | Spain | 485 | (2.4) | 89 | (1.3) | 335 | (5.1) | 369 | (3.5) | 426 | (3.0) | 546 | (3.1) | 597 | (3.5) | 626 | (3.7) |
| | Sweden | 509 | (2.6) | 95 | (1.8) | 353 | (5.3) | 387 | (4.4) | 446 | (3.0) | 576 | (3.2) | 631 | (3.8) | 662 | (4.8) |
| | Switzerland | 527 | (3.4) | 98 | (2.1) | 359 | (4.8) | 396 | (4.2) | 461 | (3.6) | 595 | (4.9) | 652 | (5.2) | 684 | (6.8) |
| | Turkey | 423 | (6.7) | 105 | (5.3) | 270 | (5.8) | 300 | (5.0) | 351 | (5.3) | 485 | (8.5) | 560 | (14.2) | 614 | (22.7) |
| | United States | 483 | (2.9) | 95 | (1.3) | 323 | (4.9) | 357 | (4.5) | 418 | (3.7) | 550 | (3.4) | 607 | (3.9) | 638 | (5.1) |
| | *OECD total* | *489* | *(1.1)* | *104* | *(0.7)* | *315* | *(2.1)* | *352* | *(1.7)* | *418* | *(1.6)* | *563* | *(1.1)* | *622* | *(1.3)* | *655* | *(1.8)* |
| | *OECD average* | *500* | *(0.6)* | *100* | *(0.4)* | *332* | *(1.3)* | *369* | *(1.1)* | *432* | *(0.9)* | *571* | *(0.7)* | *628* | *(0.7)* | *660* | *(1.0)* |

*Source:* OECD PISA 2003 database. See Annex 3 for notes *(www.oecd.org/edu/eag2006)*.

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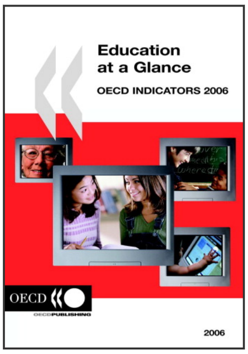


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