COUNTRY NOTE

PROGRAMME FOR INTERNATIONAL STUDENT ASSESSMENT (PISA)
RESULTS FROM PISA 2012

# GERMANY

## Key findings

- Germany, Mexico and Turkey are the only countries that have improved in both mathematics performance and equity since 2003.
- Significant improvements in mathematics performance were observed between 2006 and 2009, since then results have remained unchanged. The improvements were largely the result of better performance among low-achieving and disadvantaged students.
- Germany's performance in mathematics, reading and science is above the OECD average.
- The gender gap in German students' openness to problem solving, students' beliefs in their ability to solve mathematical problems, in their motivation to learn mathematics, anxiety towards mathematics, perseverance, and perceived control of success in mathematics – even when girls and boys perform at the same level – is wider than the OECD average.
- The strength of social comparisons in shaping students' enjoyment of mathematics and their beliefs in their ability to learn mathematics is particularly strong in Germany.
- While students' sense of belonging at school deteriorated somewhat between 2003 and 2012, this is not the case in Germany: the share of students who felt that they were liked by other students increased by more than 20 percentage points, from 70% to over 90%.
- Germany has one of the highest rates of grade repetition among OECD countries.

## Student performance in mathematics, reading and science

Germany performs above the average in mathematics (ranks between 13th and 17th among all participating countries and economies, and between 6th and 10th among OECD countries), reading (ranks between 13th and 22nd among all participating countries and economies, and between 9th and 15th among OECD countries) and science (ranks between 8th and 17nd among all participating countries and economies, and between 5th and 10th among OECD countries) (Figures I.2.14, I.4.2 and I.5.2 in OECD, 2013a).

### Mean mathematics performance

- Students in Germany score 514 point in mathematics, on average – above the OECD average and comparable with performance in Belgium, Canada, Finland, Poland and Viet Nam (Figure I.2.13 in OECD, 2013a).

- Germany's mean performance improved from 503 points in 2003, at an annualised rate of 1.4 score points per year (Table I.2.3b in OECD, 2013a). This improvement is largely the result of better performance among low-achieving and disadvantaged students. Largest improvements in mathematics performance took place between 2006 and 2009 (9 score points from 504 to 513).
- Between 2003 and 2012 differences in socio-economic status between disadvantaged and advantaged students and between students with an immigrant background and non-immigrant students have narrowed. Part of the observed improvement in PISA since 2003 may be due to the changing social and demographic profile of students (Tables I.2.4 in OECD, 2013a, tables II.2.4b and II.3.6b in OECD, 2013,b).

## Share of top- and low-performing students in mathematics

Changes in a country's average performance can result from changes among low performers (those who perform below the baseline Level 2) and/or among top performers (those who perform at Level 5 or 6).

- Some 18% of students in Germany score below Level 2 in mathematics (the OECD average is 23%), meaning that, at best, they can extract relevant information from a single source and can use basic algorithms, formulae, procedures or conventions to solve problems involving whole numbers (Table I.2.1a in OECD, 2013a). Since 2003, Germany reduced its share of low-achievers by almost 4 percentage points (Table I.2.1b in OECD, 2013a); and the 10% of students with the lowest scores in PISA 2012 scored more than 20 points higher in mathematics than their counterparts in 2003 did (Table I.2.3d in OECD, 2013a).
- Some 17% of 15-year-olds are top performers in mathematics (the OECD average is 13%), meaning that they are proficient at Level 5 or 6 (Table I.2.1a in OECD, 2013a). These students can develop and work with models for complex situations, and work strategically using broad, well-developed thinking and reasoning skills. The share of top performers has not changed significantly over time (Table I.2.1b in OECD, 2013a). Interestingly, despite higher mean performance in science than in mathematics, and similar mean performance in reading, the share of top performers in mathematics is larger than that in both reading (9%) and science (12%) (Tables I.4.1a and I.5.1a in OECD, 2013a).

## Gender differences in mathematics

- Boys outperform girls in mathematics by an average of 14 points, a gender gap larger than the OECD average of 11 score points (Table I.2.3a in OECD, 2013a). This gap widened slightly since 2003, when the differences was 9 score points in favour of boys (Table I.2.3c in OECD, 2013a).
- In Germany, more boys than girls are top performers in mathematics – 20% of boys compared to 15% of girls – while more girls than boys do not achieve the baseline level of proficiency (19% of girls compared to 17% of boys). Between 2003 and 2012, the share of low-performing boys shrank by 5 percentage points; no such change was observed among girls (Table I.2.2b in OECD, 2013a).

## Mean reading performance

- Students in Germany score 508 points in reading, on average – above the OECD average and comparable with Australia, Belgium, France, Liechtenstein, Macao-China, the Netherlands, New Zealand, Norway, Switzerland, the United Kingdom and Viet Nam (Figure I.4.1 in OECD, 2013a).

- Germany's mean performance in reading improved by 1.8 score points per year since 2000, when it was 484 points (Table I.4.3b in OECD, 2013a). As with trends in mathematics performance, improvements in Germany's reading performance over time may be partly due to demographic and socio-economic changes among students (Table I.4.4 in OECD, 2013a).

## Share of top- and low-performing students in reading

- Some 14% of students in Germany perform below the baseline level of proficiency in reading, Level 2 (the OECD average is 18%) (Table I.4.1a in OECD, 2013a). At best, these students can recognise the main theme or author's purpose in a text about a familiar topic and make a simple connection between information in the text and everyday knowledge. Between 2000 and 2012, Germany reduced the share of low performers in reading by 8 percentage points (Table I.4.1b in OECD, 2013a); and in PISA 2012, the 10% of students with the poorest performance scored nearly 50 points higher in reading than their counterparts did in 2000 (Table I.4.3d in OECD, 2013a).
- Improvements among low-performing girls were larger than those among low-performing boys. While the share of boys performing below Level 2 decreased by around 6 percentage points, from 27% in 2000 to 20% in 2012, the share of girls scoring below Level 2 shrank by almost 10 percentage points, from 18% to 9% during the same period (Table I.4.2b in OECD, 2013a).
- Some 9% of students are proficient at proficiency Level 5 or 6 in reading. These top performers can handle texts that are unfamiliar in either form or content and can conduct fine-grained analyses of texts (Table I.4.1a in OECD, 2013a).
- Despite a significant improvement in overall mean reading performance, the share of top performers did not change between 2000 and 2012 (Table I.4.1b in OECD, 2013a). This means that the overall improvement between 2000 and 2012 can be attributed to better results among students at the bottom of the performance distribution, particularly among those performing at the 10th and 25th percentile (Table I.4.3d in OECD, 2013a).

## Gender differences in reading performance

- Girls outperform boys in reading by an average of 44 points, above the OECD average of 38 score points (Table I.4.3a in OECD, 2013a).
- More than twice as many girls (13% of girls) as boys (5% of boys) are top performers in reading (Table I.4.2a in OECD, 2013a).

## Mean science performance

- Students in Germany score 524 points in science, on average – above the OECD average and comparable with Australia, Canada, Ireland, Liechtenstein, Macao-China, the Netherlands, Poland, Chinese Taipei and Viet Nam (Figure I.5.1 in OECD, 2013a).

## Share of top- and low-performing students in science

- Some 12% of students in Germany do not achieve the baseline level of proficiency (Level 2) in science (the OECD average is 18%) (Table I.5.1a in OECD, 2013a). Students at this level can, at best, present scientific explanations that are obvious and follow explicitly from given evidence. Marginally more boys (13%) than girls (11%) are low performers. Since 2006, the share of low-performing girls shrank by 4 percentage points (Table I.5.2b in OECD, 2013a).
- Some 12% of students in Germany are top performers in science, meaning that they attain proficiency Level 5 or 6 (Table I.5.1a in OECD, 2013a). At those levels, students can identify,

explain and apply scientific knowledge and knowledge about science in a variety of complex life situations. Marginally more boys (13%) than girls (11%) are top performers in science; and there was no significant change between 2006 and 2012 in either the share of all students who are top performers or in the gender balance among top performers (Table I.5.2b in OECD, 2013a).

### Gender differences in science performance

- Girls and boys perform equally well in science, attaining an average mean score of 524 points (Table I.5.3a in OECD, 2013a). The small (7 score points) and not statistically significant gender gap in favour of boys observed in 2006 narrowed in 2012, the result of significant improvements in girls' performance (an average increase of 12 score points) since 2006 while boys' performance remained unchanged over the period (Tables I.5.2b and I.5.3c in OECD, 2013a).

### Opportunity to learn mathematics

Strong mathematics performance in PISA is related to opportunities to learn formal mathematics, such as solving a quadratic equation, using complex numbers, or calculating the volume of a box, and to opportunities to learn applied mathematics (using mathematics in a real-world context).

- In Germany, more frequent exposure to formal mathematics is related to a 44 score-point improvement in mathematics performance at the student level; at the school level, greater exposure to formal mathematics is related to an increase of 138 score points. While greater exposure to word problems is not related to performance at the student level, at the school level it is associated with a 19-point improvement in mathematics performance (Table I.3.2 in OECD, 2013a).

## Giving every student the chance to succeed

In Germany, more than half of the variation in performance is observed between schools – a far higher proportion than the OECD average. The relatively large performance variation between schools reflects Germany's multi-tiered secondary school system, which tracks students into different types of school based on students' performance. Despite extensive education reforms over the past decade that led to an increase in the number of students who attend schools that combine several types of programmes, performance variation between and within schools have not changed significantly since 2003.

### Equity and performance

- In Germany, 17% of the variation in student performance in mathematics is attributed to differences in students' socio-economic status; the OECD average is 15% (Table II.2.1 in OECD, 2013b).

- On average, a more socio-economically advantaged student in Germany scores 43 points higher in mathematics than a less-advantaged student. Across OECD countries, the score difference between these two students is 39 points– the equivalent of one year of schooling –, on average (Table II.2.1 in OECD, 2013b).

## Changes between 2003 and 2012 in equity and performance

Of the 39 countries and economies that participated in both PISA 2003 and 2012, Germany, Mexico and Turkey improved both their mathematics performance and their levels of equity in education during the period.

- In 2000, the level of social equity in education in Germany was among the lowest of all OECD countries; by 2012, Germany was around the OECD average in equity in education. Between 2003 and 2012, the proportion of the variation in students' mathematics performance that could be attributed to differences in students' socio-economic status decreased from 24% to 17%, meaning that the influence of socio-economic status on performance weakened (Table II.2.9b in OECD, 2013b). Notably, significant improvements in performance among low-achieving students over the period contributed to rise in equity levels.

## Resilient students

Across OECD countries, 26% of disadvantaged students – the equivalent of 6.5% of the entire student population – are "resilient", meaning that they beat the socio-economic odds against them and exceed expectations in performance. In Hong Kong-China, Korea, Macao-China, Singapore and Viet Nam, more than half of all disadvantaged students, or 12.5% of the overall student population, are considered resilient.

- In Germany the proportion of resilient students increased by 1.3 percentage points since 2003 to 7.0%[1] (Table II.2.7b in OECD, 2013b).

## Immigrant students

Reforms adopted since 2001 to promote quality and equity in education appear to have had a positive impact on the performance of immigrant students in Germany.

- In 2003 immigrant students scored an average of 81 points below non-immigrant students in mathematics; by 2012, that difference had shrunk to 54 points. Immigrant students are socio-economically disadvantaged compared to their non-immigrant peers; thus after accounting for students' socio-economic status, the performance difference between immigrant and non-immigrant students is more than halved to 25 score points (Table II.3.4b in OECD, 2013b).

- However, the proportion of immigrant students scoring below the baseline proficiency Level 2 in mathematics (31%) is more than double the proportion of non-immigrant students at that level (14%). Some 39% of first-generation immigrant students and around 29% of second-generation students perform below that level (Table II.3.7 in OECD, 2013b).

# Students' engagement, drive and self-beliefs

Students' engagement with school, the belief that they can achieve at high levels, and their ability and willingness to do what it takes to reach their goals not only play a central role shaping students' ability to master academic subjects, they are also valuable attributes that will enable students to lead

[1] For comparability over time the percentage of resilient students in PISA 2012 is calculated using only those countries and economies that have comparable data from both PISA 2003 and PISA 2012. Using only PISA 2012 data, the share of resilient students in Germany is 7.5% (Table II.2.7a in OECD, 2013b).

full lives, meeting challenges and making the most of available opportunities along the way. In other words, much more is required of students – and adults – than just cognitive proficiency.

## Engagement with and at school

Students who arrive late or play truant miss learning opportunities. They also disrupt class, creating a disciplinary climate that is not conducive to learning for their fellow students.

- On average across OECD countries 35% of students reported that they arrived late for school in the two weeks prior to the PISA test; in Germany, 23% of students so reported (Table III.2.1a in OECD, 2013c).

- In Germany, 10% of students reported that they had skipped at least one class (the OECD average is 18%) and 5% reported that they had skipped a day of school or more (the OECD average is 15%) in the two weeks prior to the PISA test (Tables III.2.a and III.2.b in OECD, 2013c).

- In many countries, students who arrive late for school are concentrated in certain schools. This is true – but to a lesser extent – in Germany. While across OECD countries 21% of students attend schools where more than 50% of students had arrived late for school during the two weeks prior to the PISA test, only 4% of students in Germany attend such schools. Some 35% of students in Germany (compared with the OECD average of 47%) attend schools where between 25% and 50% of students had arrived late for school during that period (Table IV.5.2 in OECD, 2013d).

- In Germany, arriving late for school is associated with a 15-point lower score in mathematics (the OECD average is a 27-point lower score); and skipping classes or days of school is associated with a 23-point lower score in mathematics (the OECD average is a 37-point lower score) (Tables III.2.1c and III.2.2c in OECD, 2013c).

## Sense of belonging

In 2012, as in 2003, PISA asked students to report whether they "strongly agree", "agree", "disagree" or "strongly disagree" that they feel like an outsider or left out of things, that they make friends easily, that they feel like they belong, that they feel awkward and out of place, that other students seem to like them, or that they feel lonely. As schools are a, if not *the*, primary social environment for 15-year-olds, these subjective evaluations provide a good indication of whether education systems are able to foster or hinder overall student well-being.

Students in Germany are generally around the OECD average in their sense of belonging at school, feeling happy at school, and their satisfaction with school.

- Some 70% of German students believe that conditions in their school are ideal (the OECD average is 61%) (Table III.2.3a in OECD, 2013c).

- While students' sense of belonging at school deteriorated somewhat between 2003 and 2012, this is not the case in Germany: the share of students who felt that they were liked by other students increased by more than 20 percentage points, from 70% to over 90% (Table III.2.3f in OECD, 2013c).

## Gender gap in students' engagement, drive and self-beliefs

Gender gaps in drive, motivation and self-beliefs are particularly worrying because these factors are essential if students are to achieve at the highest levels; and the relationship between drive, motivation and mathematics-related self-beliefs on the one hand, and mathematics performance on the other, is particularly strong at the top of the performance distribution. Unless girls believe that they can achieve at the highest levels, they will not be able to do so.

- The gender gap in German students' openness to problem solving, students' beliefs in their ability to solve mathematical problems (mathematics self-efficacy and self-concept), in their motivation to learn mathematics, anxiety towards mathematics, perseverance, and perceived control of success in mathematics – even when girls and boys perform at the same level – is wider than the OECD average (Tables III.7.2a and III.7.3a in OECD, 2013c).

- Gender differences in intrinsic motivation to learn mathematics, i.e. when students learn for the joy of learning, are particularly large in Germany, as they are also in Liechtenstein, Luxembourg and Switzerland; and there are particularly larger differences between German boys and girls in their beliefs in their ability to learn mathematics (mathematics self-concept), only in Switzerland is the gender gap larger (Tables III.7.2a and III.7.3a in OECD, 2013c).

In order to increase the number of girls who choose to pursue further studies in mathematics and to enter science, technology, engineering and mathematics-related professions, it is crucial to narrow the gender gap in students' engagement, drive and self-beliefs in mathematics.

## Importance of classmates' performance

In most countries, students' intrinsic motivation to learn mathematics and students' beliefs that they can be effective mathematics learners are associated not only with how well they perform in mathematics, but also with how much better these students perform compared to other students in their school. In Germany, the strength of social comparisons in shaping students' enjoyment of mathematics and their beliefs in their ability to learn mathematics is particularly strong.

- Students in Germany are particularly likely to report enjoying mathematics and believing in their ability to learn mathematics when they have higher relative standing compared to other students in their school (Table III.5.5c in OECD, 2013c). When students score 100 points higher in the PISA test than the average student in their school, they have significantly greater (more than half a standard deviation) mathematics self-concept (Table III.5.8c in OECD, 2013c). In fact, in no other OECD country does relative performance have a stronger influence on intrinsic motivation, instrumental motivation and mathematics self-concept than in Germany (Tables III.5.5c and III.5.8c in OECD, 2013c).

Teachers and parents can play an important role in motivating all students and in helping them to develop their full potential, by holding high expectations, celebrating each student's efforts and achievements, and rewarding each student who achieves specific learning goals.

# Resources, policies and practices

## The learning environment

The disciplinary climate in German schools deteriorated between 2003 and 2012. In 2003, students in Germany reported above-average levels of orderliness in class; by 2012, the disciplinary climate in German schools was at the OECD average.

- The share of students in Germany who reported that they attend schools where "there is noise and disorder" and where "students don't start working for a long time after the lesson begins" grew between 2003 and 2012 by 4 percentage points, from 25% to 29% (OECD average 38% to 33%) for the former, and from 26% to 29% (OECD average: 29% to 28%) for the latter. The proportion of students who reported that they attend schools where "students don't listen to what the teacher says" increased by a substantial 14 percentage points: from 22% in 2003 to 36% in 2012 (OECD average: 31% in 2003, 32% in 2012) (Table IV.5.18 in OECD, 2013d).
- While on OECD average 82% of students agreed or strongly agreed that they would receive extra help from their teachers if they need it only 66% of students in Germany responded so. Similarly, 74% of students agreed or strongly agreed that most of their teachers really listen to what they have to say, while at least one in three students in Germany did not respond so (Figure IV.5.3 in OECD, 2013d).
- However, between 2003 and 2012 the proportion of students in schools whose principals reported that teachers do not meet individual students' needs decreased by 6 percentage points from 31% to 25%. Similarly, the share of students in schools whose principals reported that "students not being encouraged to achieve their full potential" and where "poor teacher-students relations" affect school climate dropped by around 10 percentage points in the same period (Table III.5.19 in OECD, 2013c).

## Grouping and selecting students (stratification)

In Germany, students are selected for as many as four schooling "tracks" as early as the age of 10. Only in Austria does the first selection take place as early (Table IV.2.5 in OECD, 2013d). Students in vocational tracks receive both general education and workplace training as part of the country's well-developed dual education and training system. In contrast to other German-speaking countries with similarly established vocational education and training (VET) systems, tracking into VET takes place after the age of 15 in Germany. At that age, 98% of students are still in purely general education tracks. In Austria, more than two out of three students are enrolled in vocational tracks by the age of 15; in Switzerland, 11% of 15-year-olds are enrolled in such tracks (Table IV.2.6 in OECD, 2013d).

- Germany's mostly tracked system of secondary education allocates students according to their performance; thus, 62% of secondary students attend selective schools,– meaning that they attend schools, where either "students' records of academic performance" or "recommendations of feeder schools", or both factors, are always considered for admission. These students would likely have to repeat a grade or be transferred to other schools if they were low achievers or if they had behavioural problems or special learning needs. On average, across OECD countries, only 43% of students are in such schools (Table IV.2.7 in OECD, 2013d).

- While the proportion of German students who attend schools that do not group by ability decreased from 54% to 32% between 2003 and 2012, a larger share of students reported that their schools group students by ability for some or all classes (Table IV.2.21 in OECD, 2013d). This could be the result of broader changes in Germany's school system. Germany has introduced education reforms over the past decade that have led to an increase in the proportion of students who attend schools that combine several types of programmes. The practice of ability grouping among schools that characterised the German school system in the past has been replaced by a more comprehensive approach to schooling in which students with diverse academic abilities are admitted to the same school. In order to adapt to these changes, some schools may choose to group students by ability in some or all classes.

## Assessment practices

- The share of students in schools that use assessments to compare their performance to district or national performance or with other schools, to monitor the school's progress from year to year, to make judgements about teachers' effectiveness and/or to identify aspects of instruction or the curriculum that could be improved increased by more than 10 percentage points between 2003 and 2012. Despite these relatively large increases, Germany is situated well below the OECD average (Table IV.4.36 in OECD, 2013d)
- The practice of using student assessments to make decisions about whether students are held back or promoted is prevalent in Germany, as it is in Belgium, France, Greece, Hong Kong-China, Latvia, the Netherlands, Poland and Portugal (Table IV.4.30 in OECD, 2013d).
- The share of German students in schools whose principal reported that "tests or assessments of student achievement" have been used to monitor the practice of mathematics teachers at their schools" rose from 62% in 2003 to 72% in 2012. The use of "teacher peer review of lesson plans, assessment instruments, and lessons" increased by almost 20 percentage points to 45% (Table IV.4.37 in OECD, 2013d).

## Learning time

On average across OECD countries, students who are in socio-economically disadvantaged schools tend to spend fewer minutes in regular mathematics lessons than students in advantaged schools.

- In Germany, however, the opposite is true. Students in disadvantaged schools spend an average of 32 minutes more per week in regular mathematics lessons than students in advantaged schools (this is also observed in Austria, Qatar, Switzerland, the United Arab Emirates and the United Kingdom). Yet, in Germany, students in advantaged schools spend more hours per week on homework set by the teacher than do students in disadvantaged schools.

- Students in Germany spent 15 minutes more in mathematics lessons per week in 2012, on average, than they did in 2003 (an increase from 182 to 197 minutes per week). Despite this increase, students in Germany spend less time in mathematics lessons than do their peers in other OECD countries (212 minutes in PISA 2012) (Table IV.3.46 in OECD, 2013d). At the same time, students in Germany reported that they spend less time on homework after school set by the teacher in 2012 than they did in 2003 – a decrease by more than one and a half hours from 6.3 to 4.7 hours per week. This amount is at the OECD average (4.9 hours) (Table IV.3.48 in OECD, 2013d).

## Grade repetition

- One in five students in Germany reported that he or she had repeated a grade at least once. Only in six European countries (Belgium, France, Luxembourg, the Netherlands, Portugal and Spain), seven Latin American countries (Argentina, Brazil, Chile, Colombia, Costa Rica, Peru and Uruguay), Macao-China and Tunisia did larger proportions of students report that they had repeated a grade at least once (Table IV.2.2 in OECD, 2013d). The incidence of grade repetition decreased slightly from 23.1% in 2003 to 20.3% in 2012 (Table IV.2.18 in OECD, 2013d).

## Teacher quality

Higher salaries can help school systems to attract the best candidates to the teaching profession, and they signal that teachers are regarded and treated as professionals. But attracting the best teachers to the profession is equally important. The type and quality of the training teachers receive, as well as the requirements to enter and progress through the teaching profession, have significant consequences on the quality of the teaching force.

- Germany has the longest pre-service teacher training among all participating countries and economies: 5.5 years for primary teachers lasts 5.5 years; between 5.5 and 6.5 years for lower secondary teachers; and 6.5 years for upper secondary teachers. In addition, competitive examinations are required to enter pre-service teacher training, and to participate in teaching practicums to obtain a licence after being recruited (Table IV.3.4 in OECD, 2013d).
- During 2003 and 2012 the proportion of students in schools whose principals reported teacher shortages – a lack of qualified teachers decreased significantly, by 22 percentage points in science and by 14% in German language. However, a larger share of students is in schools whose principals reported that instruction is hindered by the lack of qualified mathematics teachers. The share increased by 11 percentage points in this period (Table IV.3.37 in OECD, 2013d).

## Pre-primary education

- Some 85% of students in Germany reported that they had attended pre-primary school for more than one year – well above the OECD average of 74%. Since 2003, the share of students who reported that they had attended pre-primary school for more than one year increased by around 3 percentage points, while the share of students who had not attended pre-primary education dropped by 1 percentage point (Table IV.3.50 in OECD, 2013d).

- There are stark socio-economic differences in these high attendance rates, however. While more than 90% of socio-economically advantaged students reported that they had attended pre-primary education for more than one year, fewer than 80% of disadvantaged students reported so. Similarly, while 92% of students in advantaged schools had attended pre-primary education, only 76% of students in disadvantaged students had attended pre-primary education for more than one year (Table IV.3.34 in OECD, 2013d). Still, between 2003 and 2012 the socio-economic disparity in pre-primary school attendance narrowed (Table IV.1.27 in OECD, 2013d).

# Snapshot of performance in mathematics, reading and science

| |
|---|
| Countries/economies with a mean performance/share of top-performers above the OECD average<br>Countries/economies with a share of low-achievers below the OECD average |
| Countries/economies with a mean performance/share of low-achievers/share of top-performers not statistically significantly different from the OECD average |
| Countries/economies with a mean performance/share of top-performers below the OECD average<br>Countries/economies with a share of low-achievers above the OECD average |
| Countries/economies in which the annualised change in performance is statistically significant are marked in **bold**. |

| | Mathematics | | | | Reading | | Science | |
|---|---|---|---|---|---|---|---|---|
| | Mean score in PISA 2012 | Share of low-achievers (Below Level 2) | Share of top-performers in mathematics (Level 5 or 6) | Annualised change | Mean score in PISA 2012 | Annualised change | Mean score in PISA 2012 | Annualised change |
| OECD average | 494 | 23.1 | 12.6 | **-0.3** | 496 | **0.3** | 501 | **0.5** |
| Shanghai-China | 613 | 3.8 | 55.4 | **4.2** | 570 | **4.6** | 580 | 1.8 |
| Singapore | 573 | 8.3 | 40.0 | **3.8** | 542 | **5.4** | 551 | **3.3** |
| Hong Kong-China | 561 | 8.5 | 33.7 | **1.3** | 545 | **2.3** | 555 | **2.1** |
| Chinese Taipei | 560 | 12.8 | 37.2 | 1.7 | 523 | **4.5** | 523 | -1.5 |
| Korea | 554 | 9.1 | 30.9 | 1.1 | 536 | **0.9** | 538 | **2.6** |
| Macao-China | 538 | 10.8 | 24.3 | **1.0** | 509 | **0.8** | 521 | **1.6** |
| Japan | 536 | 11.1 | 23.7 | 0.4 | 538 | **1.5** | 547 | **2.6** |
| Liechtenstein | 535 | 14.1 | 24.8 | 0.3 | 516 | **1.3** | 525 | 0.4 |
| Switzerland | 531 | 12.4 | 21.4 | 0.6 | 509 | **1.0** | 515 | 0.6 |
| Netherlands | 523 | 14.8 | 19.3 | **-1.6** | 511 | -0.1 | 522 | -0.5 |
| Estonia | 521 | 10.5 | 14.6 | 0.9 | 516 | **2.4** | 541 | 1.5 |
| Finland | 519 | 12.3 | 15.3 | **-2.8** | 524 | **-1.7** | 545 | **-3.0** |
| Canada | 518 | 13.8 | 16.4 | **-1.4** | 523 | **-0.9** | 525 | **-1.5** |
| Poland | 518 | 14.4 | 16.7 | **2.6** | 518 | **2.8** | 526 | **4.6** |
| Belgium | 515 | 18.9 | 19.4 | **-1.6** | 509 | 0.1 | 505 | -0.8 |
| Germany | 514 | 17.7 | 17.5 | **1.4** | 508 | **1.8** | 524 | 1.4 |
| Viet Nam | 511 | 14.2 | 13.3 | m | 508 | m | 528 | m |
| Austria | 506 | 18.7 | 14.3 | 0.0 | 490 | -0.2 | 506 | -0.8 |
| Australia | 504 | 19.7 | 14.8 | **-2.2** | 512 | **-1.4** | 521 | -0.9 |
| Ireland | 501 | 16.9 | 10.7 | -0.6 | 523 | **-0.9** | 522 | **2.3** |
| Slovenia | 501 | 20.1 | 13.7 | **-0.6** | 481 | **-2.2** | 514 | -0.8 |
| Denmark | 500 | 16.8 | 10.0 | **-1.8** | 496 | 0.1 | 498 | 0.4 |
| New Zealand | 500 | 22.6 | 15.0 | **-2.5** | 512 | **-1.1** | 516 | **-2.5** |
| Czech Republic | 499 | 21.0 | 12.9 | **-2.5** | 493 | -0.5 | 508 | -1.0 |
| France | 495 | 22.4 | 12.9 | **-1.5** | 505 | 0.0 | 499 | 0.6 |
| United Kingdom | 494 | 21.8 | 11.8 | -0.3 | 499 | 0.7 | 514 | -0.1 |
| Iceland | 493 | 21.5 | 11.2 | **-2.2** | 483 | **-1.3** | 478 | **-2.0** |
| Latvia | 491 | 19.9 | 8.0 | 0.5 | 489 | **1.9** | 502 | **2.0** |
| Luxembourg | 490 | 24.3 | 11.2 | **-0.3** | 488 | **0.7** | 491 | 0.9 |
| Norway | 489 | 22.3 | 9.4 | -0.3 | 504 | 0.1 | 495 | 1.3 |
| Portugal | 487 | 24.9 | 10.6 | **2.8** | 488 | **1.6** | 489 | **2.5** |
| Italy | 485 | 24.7 | 9.9 | **2.7** | 490 | 0.5 | 494 | **3.0** |
| Spain | 484 | 23.6 | 8.0 | 0.1 | 488 | -0.3 | 496 | 1.3 |
| Russian Federation | 482 | 24.0 | 7.8 | 1.1 | 475 | **1.1** | 486 | 1.0 |
| Slovak Republic | 482 | 27.5 | 11.0 | **-1.4** | 463 | -0.1 | 471 | **-2.7** |
| United States | 481 | 25.8 | 8.8 | 0.3 | 498 | -0.3 | 497 | 1.4 |
| Lithuania | 479 | 26.0 | 8.1 | -1.4 | 477 | 1.1 | 496 | 1.3 |
| Sweden | 478 | 27.1 | 8.0 | **-3.3** | 483 | **-2.8** | 485 | **-3.1** |
| Hungary | 477 | 28.1 | 9.3 | **-1.3** | 488 | **1.0** | 494 | -1.6 |
| Croatia | 471 | 29.9 | 7.0 | 0.6 | 485 | 1.2 | 491 | -0.3 |
| Israel | 466 | 33.5 | 9.4 | **4.2** | 486 | **3.7** | 470 | **2.8** |
| Greece | 453 | 35.7 | 3.9 | **1.1** | 477 | 0.5 | 467 | -1.1 |
| Serbia | 449 | 38.9 | 4.6 | **2.2** | 446 | **7.6** | 445 | 1.5 |
| Turkey | 448 | 42.0 | 5.9 | **3.2** | 475 | **4.1** | 463 | **6.4** |
| Romania | 445 | 40.8 | 3.2 | **4.9** | 438 | 1.1 | 439 | **3.4** |
| Cyprus[1,2] | 440 | 42.0 | 3.7 | m | 449 | m | 438 | m |
| Bulgaria | 439 | 43.8 | 4.1 | **4.2** | 436 | 0.4 | 446 | 2.0 |
| United Arab Emirates | 434 | 46.3 | 3.5 | m | 442 | m | 448 | m |
| Kazakhstan | 432 | 45.2 | 0.9 | **9.0** | 393 | 0.8 | 425 | **8.1** |
| Thailand | 427 | 49.7 | 2.6 | **1.0** | 441 | **1.1** | 444 | **3.9** |
| Chile | 423 | 51.5 | 1.6 | **1.9** | 441 | **3.1** | 445 | 1.1 |
| Malaysia | 421 | 51.8 | 1.3 | **8.1** | 398 | **-7.8** | 420 | -1.4 |
| Mexico | 413 | 54.7 | 0.6 | **3.1** | 424 | **1.1** | 415 | 0.9 |
| Montenegro | 410 | 56.6 | 1.0 | **1.7** | 422 | **5.0** | 410 | -0.3 |
| Uruguay | 409 | 55.8 | 1.4 | **-1.4** | 411 | **-1.8** | 416 | **-2.1** |
| Costa Rica | 407 | 59.9 | 0.6 | -1.2 | 441 | -1.0 | 429 | -0.6 |
| Albania | 394 | 60.7 | 0.8 | **5.6** | 394 | **4.1** | 397 | 2.2 |
| Brazil | 391 | 67.1 | 0.8 | **4.1** | 410 | **1.2** | 405 | **2.3** |
| Argentina | 388 | 66.5 | 0.3 | 1.2 | 396 | -1.6 | 406 | 2.4 |
| Tunisia | 388 | 67.7 | 0.8 | **3.1** | 404 | **3.8** | 398 | **2.2** |
| Jordan | 386 | 68.6 | 0.6 | 0.2 | 399 | -0.3 | 409 | **-2.1** |
| Colombia | 376 | 73.8 | 0.3 | 1.1 | 403 | **3.0** | 399 | 1.8 |
| Qatar | 376 | 69.6 | 2.0 | **9.2** | 388 | **12.0** | 384 | **5.4** |
| Indonesia | 375 | 75.7 | 0.3 | 0.7 | 396 | **2.3** | 382 | -1.9 |
| Peru | 368 | 74.6 | 0.6 | 1.0 | 384 | **5.2** | 373 | 1.3 |

*Countries and economies are ranked in descending order of the mathematics mean score in PISA 2012.*
Source: OECD PISA 2012 database, Tables I.2.1a, I.2.1b, I.2.3a, I.2.3b, I.4.3a, I.4.3b, I.5.3a and I.5.3b.

1. Footnote by Turkey: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

2. Footnote by all the European Union Member States of the OECD and the European Union: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

# What is PISA?

The Programme for International Student Assessment (PISA) is an ongoing triennial survey that assesses the extent to which 15-year-olds students near the end of compulsory education have acquired key knowledge and skills that are essential for full participation in modern societies. The assessment does not just ascertain whether students can reproduce knowledge; it also examines how well students can extrapolate from what they have learned and apply that knowledge in unfamiliar settings, both in and outside of school. This approach reflects the fact that modern economies reward individuals not for what they know, but for what they can do with what they know.

PISA offers insights for education policy and practice, and helps monitor trends in students' acquisition of knowledge and skills across countries and in different demographic subgroups within each country. The findings allow policy makers around the world to gauge the knowledge and skills of students in their own countries in comparison with those in other countries, set policy targets against measurable goals achieved by other education systems, and learn from policies and practices applied elsewhere.

# Key features of PISA 2012

## The content

- The PISA 2012 survey focused on mathematics, with reading, science and problem-solving minor areas of assessment. For the first time, PISA 2012 also included an assessment of the financial literacy of young people, which was optional for countries.

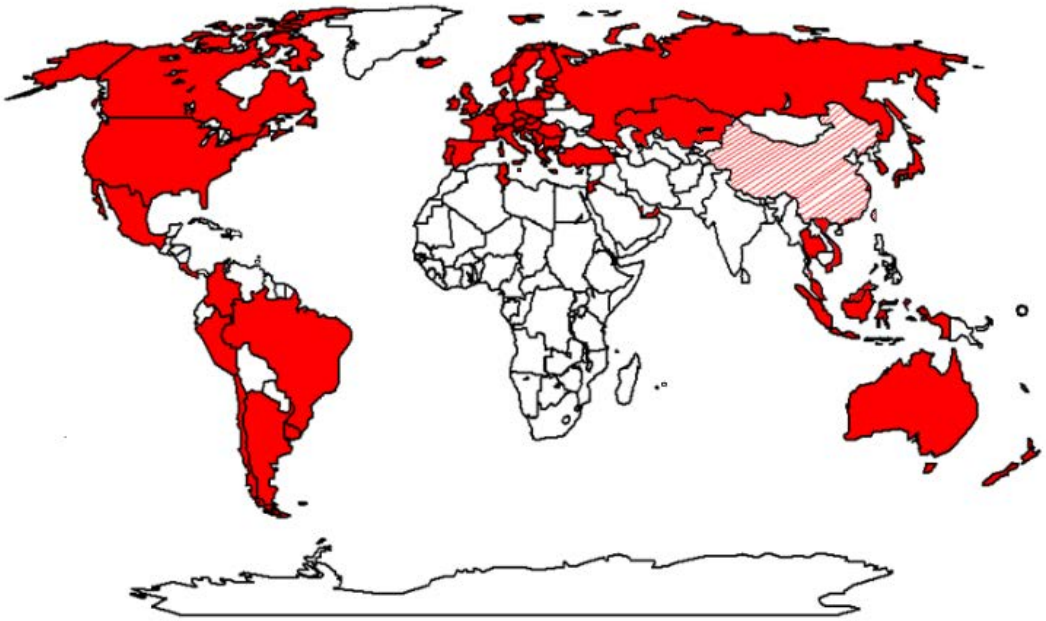
## The students

- Around 510 000 students completed the assessment in 2012, representing about 28 million 15-year-olds in the schools of the 65 participating countries and economies.
- In Germany, around 5 000 students completed the assessment in 2012. The sample is representative for almost 800 000 15-year-olds in Germany (Table A2.1 in OECD, 2013a).

## The assessment

- Paper-based tests were used, with assessments lasting a total of two hours for each student. In a range of countries and economies, an additional 40 minutes were devoted to the computer-based assessment of mathematics, reading and problem solving.
- Test items were a mixture of multiple-choice items and questions requiring students to construct their own responses. The items were organised in groups based on a passage setting out a real-life situation. A total of about 390 minutes of test items were covered, with different students taking different combinations of test items.
- Students answered a background questionnaire, which took 30 minutes to complete, that sought information about themselves, their homes and their school and learning experiences. School principals were given a questionnaire, to complete in 30 minutes, that covered the school system and the learning environment. In some countries and economies, optional questionnaires were distributed to parents, who were asked to provide information on their perceptions of and involvement in their child's school, their support for learning in the home, and their child's career expectations, particularly in mathematics. Countries could choose two other optional questionnaires for students: one asked students about their familiarity with and use of information and communication technologies, and the second sought information about their education to date, including any interruptions in their schooling and whether and how they are preparing for a future career.

# Map of PISA 2012 countries and economies



**OECD countries**

| | |
|---|---|
| Australia | Japan |
| Austria | Korea |
| Belgium | Luxembourg |
| Canada | Mexico |
| Chile | Netherlands |
| Czech Republic | New Zealand |
| Denmark | Norway |
| Estonia | Poland |
| Finland | Portugal |
| France | Slovak Republic |
| Germany | Slovenia |
| Greece | Spain |
| Hungary | Sweden |
| Iceland | Switzerland |
| Ireland | Turkey |
| Israel | United Kingdom |
| Italy | United States |

**Partner countries and economies in PISA 2012**

| | |
|---|---|
| Albania | Malaysia |
| Argentina | Montenegro |
| Brazil | Peru |
| Bulgaria | Qatar |
| Colombia | Romania |
| Costa Rica | Russian Federation |
| Croatia | Serbia |
| Cyprus[1,2] | Shanghai-China |
| Hong Kong-China | Singapore |
| Indonesia | Chinese Taipei |
| Jordan | Thailand |
| Kazakhstan | Tunisia |
| Latvia | United Arab Emirates |
| Liechtenstein | Uruguay |
| Lithuania | Vietnam |
| Macao-China | |

1. Footnote by Turkey: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue".

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## References

OECD (2013a), *PISA 2012 Results: What Students Know and Can Do (Volume I): Student Performance in Mathematics, Reading and Science*, OECD Publishing.

OECD (2013b), *PISA 2012 Results: Excellence through Equity (Volume II): Giving every Student the Chance to Succeed*, OECD Publishing.

OECD (2013c), *PISA 2012 Results: Ready to Learn (Volume III): Students' Engagement, Drive and Self-Beliefs*, OECD Publishing.

OECD (2013d), *PISA 2012 Results: What Makes a School Successful (Volume IV): Resources, Policies and Practices*, OECD Publishing.

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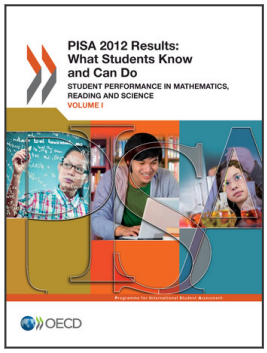
**For more information on**
**the Programme for International Student Assessment**
**and to access the full set of PISA 2012 results, visit:**

www.oecd.org/pisa

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