PISA 2012 Results in Focus

What 15-year-olds know and what they can do with what they know

Programme for **I**nternational **S**tudent **A**ssessment

OECD

"Equipping young people with the skills to achieve their full potential, participate in an increasingly interconnected global economy, and ultimately convert better jobs into better lives is a central preoccupation of policy makers around the world. Skills empower people to meet the challenges of everyday life, related to making decisions; solving problems; dealing with unexpected events, such as job loss and family break-up. Beyond better outcomes for the individual, skills also provide the vital glue for resilient communities and well-functioning societies, by strengthening inclusiveness, tolerance, trust, ethics, responsibility, environmental awareness, collaboration and effective democratic processes.

Over the past decade, the OECD Programme for International Student Assessment (PISA), has become the world's premier yardstick for evaluating the quality, equity and efficiency of school systems in providing young people with these skills.

But the evidence base that PISA has produced goes well beyond statistical benchmarking. By identifying the characteristics of high-performing education systems, PISA allows governments and educators to identify effective policies that they can then adapt to their local contexts.

This brochure highlights some of the PISA 2012 results that are especially relevant to attain excellence in education and shows how skills can help improve personal outcomes, reinforce the resilience of local communities, and ultimately strengthen the social tissue of our economies."

Angel Gurría
OECD Secretary-General

What is PISA?

"What is important for citizens to know and be able to do?" That is the question that underlies the world's global metric for quality, equity and efficiency in school education known as the Programme for International Student Assessment (PISA). PISA assesses the extent to which 15-year-old students have acquired key knowledge and skills that are essential for full participation in modern societies. The assessment, which focuses on reading, mathematics, science and problem-solving, does not just ascertain whether students can reproduce what they have learned; it also examines how well they 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 societies reward individuals not for what they know, but for what they can do with what they know.

PISA results reveal what is possible in education by showing what students in the highest-performing and most rapidly improving education systems can do. 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

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.

Participating countries and economies

- All 34 OECD member countries and 31 partner countries and economies participated in PISA 2012, representing more than 80% of the world economy.

Participating students

- Around 510 000 students between the ages of 15 years 3 months and 16 years 2 months completed the assessment in 2012, representing about 28 million 15-year-olds in the schools of the 65 participating countries and economies.

The assessment

- Paper-based tests were used, with assessments lasting two hours. 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 questions requiring students to construct their own responses and multiple-choice items. 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.

What Students Know and Can Do: Student Performance in Mathematics, Reading and Science

WHAT THE DATA TELL US

- Shanghai-China has the highest scores in **mathematics**, with a mean score of 613 points – 119 points, or the equivalent of nearly three years of schooling, above the OECD average. Singapore, Hong Kong-China, Chinese Taipei, Korea, Macao-China, Japan, Liechtenstein, Switzerland and the Netherlands, in descending order of their scores, round out the top ten performers in mathematics.
- Of the 64 countries and economies with trend data between 2003 and 2012, 25 improved in mathematics performance.
- On average across OECD countries, 13% of students are top performers in mathematics (Level 5 or 6). They can develop and work with models for complex situations, and work strategically using broad, well-developed thinking and reasoning skills. The partner economy Shanghai-China has the largest proportion of students performing at Level 5 or 6 (55%), followed by Singapore (40%), Chinese Taipei (37%) and Hong Kong-China (34%). At the same time, 23% of students in OECD countries, and 32% of students in all participating countries and economies, did not reach the baseline Level 2 in the PISA mathematics assessment. At that level, students can extract relevant information from a single source and can use basic algorithms, formulae, procedures or conventions to solve problems involving whole numbers.
- Between 2003 and 2012, Italy, Poland and Portugal increased their shares of top performers and simultaneously reduced their shares of low performers in mathematics.
- Boys perform better than girls in mathematics in only 37 out of the 65 countries and economies that participated in PISA 2012, and girls outperform boys in five countries.
- Shanghai-China, Hong Kong-China, Singapore, Japan and Korea are the five highest-performing countries and economies in **reading** in PISA 2012.
- Of the 64 countries and economies with comparable data throughout their participation in PISA, 32 improved their reading performance.
- On average across OECD countries, 8% of students are top performers in reading (Level 5 or 6). These students can handle texts that are unfamiliar in either form or content and can conduct fine-grained analyses of texts. Shanghai-China has the largest proportion of top performers – 25% – among all participating countries and economies. More than 15% of students in Hong Kong-China, Japan and Singapore are top performers in reading as are more than 10% of students in Australia, Belgium, Canada, Finland, France, Ireland, Korea, Liechtenstein, New Zealand, Norway, Poland and Chinese Taipei.
- Between the 2000 and 2012 PISA assessments, Albania, Israel and Poland increased their shares of top performers and simultaneously reduced their shares of low performers in reading.
- Between 2000 and 2012 the gender gap in reading performance – favouring girls – widened in 11 countries.
- Shanghai-China, Hong Kong-China, Singapore, Japan and Finland are the top five performers in **science** in PISA 2012.
- Between 2006 and 2012, Italy, Poland and Qatar, and between 2009 and 2012, Estonia, Israel and Singapore increased their shares of top performers and simultaneously reduced their shares of low performers in science.
- Across OECD countries, 8% of students are top performers in science (Level 5 or 6). These students can identify, explain and apply scientific knowledge and knowledge about science in a variety of complex life situations.

Snapshot of performance in mathematics, reading and science

Countries/economies with a mean performance/share of top performers above the OECD average
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
Countries/economies with a share of low achievers above the OECD average

	Mathematics				Reading		Science	
	Mean score in PISA 2012	Share of low achievers in mathematics (Below Level 2)	Share of top performers in mathematics (Level 5 or 6)	Annualised change in score points	Mean score in PISA 2012	Annualised change in score points	Mean score in PISA 2012	Annualised change in score points
OECD average	494	23.0	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	19.0	19.5	**-1.6**	509	0.1	505	-0.9
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

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.

The annualised change is the average annual change in PISA score points from a country's/economy's earliest participation in PISA to PISA 2012. It is calculated taking into account all of a country's/economy's participation in PISA.

Note: Countries/economies in which the annualised change in performance is statistically significant are marked in bold.
Countries and economies are ranked in descending order of the mean mathematics 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.

WHAT THIS MEANS FOR POLICY AND PRACTICE

Proficiency in mathematics is a strong predictor of positive outcomes for young adults, influencing their ability to participate in post-secondary education and their expected future earnings.

OECD countries invest over USD 230 billion each year in mathematics education in schools. While this is a major investment, the returns are many times larger. The OECD's new Survey of Adult Skills finds that foundation skills in mathematics have a major impact on individuals' life chances. The survey shows that poor mathematics skills severely limit people's access to better-paying and more-rewarding jobs; at the aggregate level, inequality in the distribution of mathematics skills across populations is closely related to how wealth is shared within nations. Beyond that, the survey shows that people with strong skills in mathematics are also more likely to volunteer, see themselves as actors in rather than as objects of political processes, and are even more likely to trust others. Fairness, integrity and inclusiveness in public policy thus also hinge on the skills of citizens.

PISA 2012 provides the most comprehensive picture of the mathematics skills developed in schools that has ever been available, looking not just at what students know in the different domains of mathematics, but also at what they can do with what they know. The results show wide differences between countries in the mathematics knowledge and skills of 15-year-olds. The equivalent of almost six years of schooling, 245 score points on the PISA mathematics scale, separates the highest and lowest average performances of the countries that took part in the PISA 2012 mathematics assessment.

However, differences between countries represent only a fraction of the overall variation in student performance. The difference in mathematics performances *within* countries is generally even greater, with over 300 points – the equivalent of more than seven years of schooling – often separating the highest and the lowest performers in a country. Addressing the education needs of such diverse populations and narrowing the observed gaps in student performance remains a formidable challenge for all countries.

Comparing countries' and economies' performance in mathematics

- Statistically significantly **above** the OECD average
- Not statistically significantly different from the OECD average
- Statistically significantly **below** the OECD average

Mean	Comparison country/economy	Countries/economies whose mean score is NOT statistically significantly different from that comparison country's/economy's score
613	Shanghai-China	
573	Singapore	
561	Hong Kong-China	Chinese Taipei, Korea
560	Chinese Taipei	Hong Kong-China, Korea
554	Korea	Hong Kong-China, Chinese Taipei
538	Macao-China	Japan, Liechtenstein
536	Japan	Macao-China, Liechtenstein, Switzerland
535	Liechtenstein	Macao-China, Japan, Switzerland
531	Switzerland	Japan, Liechtenstein, Netherlands
523	Netherlands	Switzerland, Estonia, Finland, Canada, Poland, Viet Nam
521	Estonia	Netherlands, Finland, Canada, Poland, Viet Nam
519	Finland	Netherlands, Estonia, Canada, Poland, Belgium, Germany, Viet Nam
518	Canada	Netherlands, Estonia, Finland, Poland, Belgium, Germany, Viet Nam
518	Poland	Netherlands, Estonia, Finland, Canada, Belgium, Germany, Viet Nam
515	Belgium	Finland, Canada, Poland, Germany, Viet Nam
514	Germany	Finland, Canada, Poland, Belgium, Viet Nam
511	Viet Nam	Netherlands, Estonia, Finland, Canada, Poland, Belgium, Germany, Austria, Australia, Ireland
506	Austria	Viet Nam, Australia, Ireland, Slovenia, Denmark, New Zealand, Czech Republic
504	Australia	Viet Nam, Austria, Ireland, Slovenia, Denmark, New Zealand, Czech Republic
501	Ireland	Viet Nam, Austria, Australia, Slovenia, Denmark, New Zealand, Czech Republic, France, United Kingdom
501	Slovenia	Austria, Australia, Ireland, Denmark, New Zealand, Czech Republic
500	Denmark	Austria, Australia, Ireland, Slovenia, New Zealand, Czech Republic, France, United Kingdom
500	New Zealand	Austria, Australia, Ireland, Slovenia, Denmark, Czech Republic, France, United Kingdom
499	Czech Republic	Austria, Australia, Ireland, Slovenia, Denmark, New Zealand, France, United Kingdom, Iceland
495	France	Ireland, Denmark, New Zealand, Czech Republic, United Kingdom, Iceland, Latvia, Luxembourg, Norway, Portugal
494	United Kingdom	Ireland, Denmark, New Zealand, Czech Republic, France, Iceland, Latvia, Luxembourg, Norway, Portugal
493	Iceland	Czech Republic, France, United Kingdom, Latvia, Luxembourg, Norway, Portugal
491	Latvia	France, United Kingdom, Iceland, Luxembourg, Norway, Portugal, Italy, Spain
490	Luxembourg	France, United Kingdom, Iceland, Latvia, Norway, Portugal
489	Norway	France, United Kingdom, Iceland, Latvia, Luxembourg, Portugal, Italy, Spain, Russian Federation, Slovak Republic, United States
487	Portugal	France, United Kingdom, Iceland, Latvia, Luxembourg, Norway, Italy, Spain, Russian Federation, Slovak Republic, United States, Lithuania
485	Italy	Latvia, Norway, Portugal, Spain, Russian Federation, Slovak Republic, United States, Lithuania
484	Spain	Latvia, Norway, Portugal, Italy, Russian Federation, Slovak Republic, United States, Lithuania, Hungary
482	Russian Federation	Norway, Portugal, Italy, Spain, Slovak Republic, United States, Lithuania, Sweden, Hungary
482	Slovak Republic	Norway, Portugal, Italy, Spain, Russian Federation, United States, Lithuania, Sweden, Hungary
481	United States	Norway, Portugal, Italy, Spain, Russian Federation, Slovak Republic, Lithuania, Sweden, Hungary
479	Lithuania	Portugal, Italy, Spain, Russian Federation, Slovak Republic, United States, Sweden, Hungary, Croatia
478	Sweden	Russian Federation, Slovak Republic, United States, Lithuania, Hungary, Croatia
477	Hungary	Spain, Russian Federation, Slovak Republic, United States, Lithuania, Sweden, Croatia, Israel
471	Croatia	Lithuania, Sweden, Hungary, Israel
466	Israel	Hungary, Croatia
453	Greece	Serbia, Turkey, Romania
449	Serbia	Greece, Turkey, Romania, Bulgaria
448	Turkey	Greece, Serbia, Romania, Cyprus[1, 2], Bulgaria
445	Romania	Greece, Serbia, Turkey, Cyprus[1, 2], Bulgaria
440	Cyprus[1, 2]	Turkey, Romania, Bulgaria
439	Bulgaria	Serbia, Turkey, Romania, Cyprus[1, 2], United Arab Emirates, Kazakhstan
434	United Arab Emirates	Bulgaria, Kazakhstan, Thailand
432	Kazakhstan	Bulgaria, United Arab Emirates, Thailand
427	Thailand	United Arab Emirates, Kazakhstan, Chile, Malaysia
423	Chile	Thailand, Malaysia
421	Malaysia	Thailand, Chile
413	Mexico	Uruguay, Costa Rica
410	Montenegro	Uruguay, Costa Rica
409	Uruguay	Mexico, Montenegro, Costa Rica
407	Costa Rica	Mexico, Montenegro, Uruguay
394	Albania	Brazil, Argentina, Tunisia
391	Brazil	Albania, Argentina, Tunisia, Jordan
388	Argentina	Albania, Brazil, Tunisia, Jordan
388	Tunisia	Albania, Brazil, Argentina, Jordan
386	Jordan	Brazil, Argentina, Tunisia
376	Colombia	Qatar, Indonesia, Peru
376	Qatar	Colombia, Indonesia
375	Indonesia	Colombia, Qatar, Peru
368	Peru	Colombia, Indonesia

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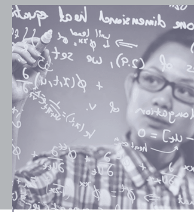
Countries and economies are ranked in descending order of the mean mathematics score in PISA 2012.

Source: OECD, PISA 2012 Database; Figure I.2.13.



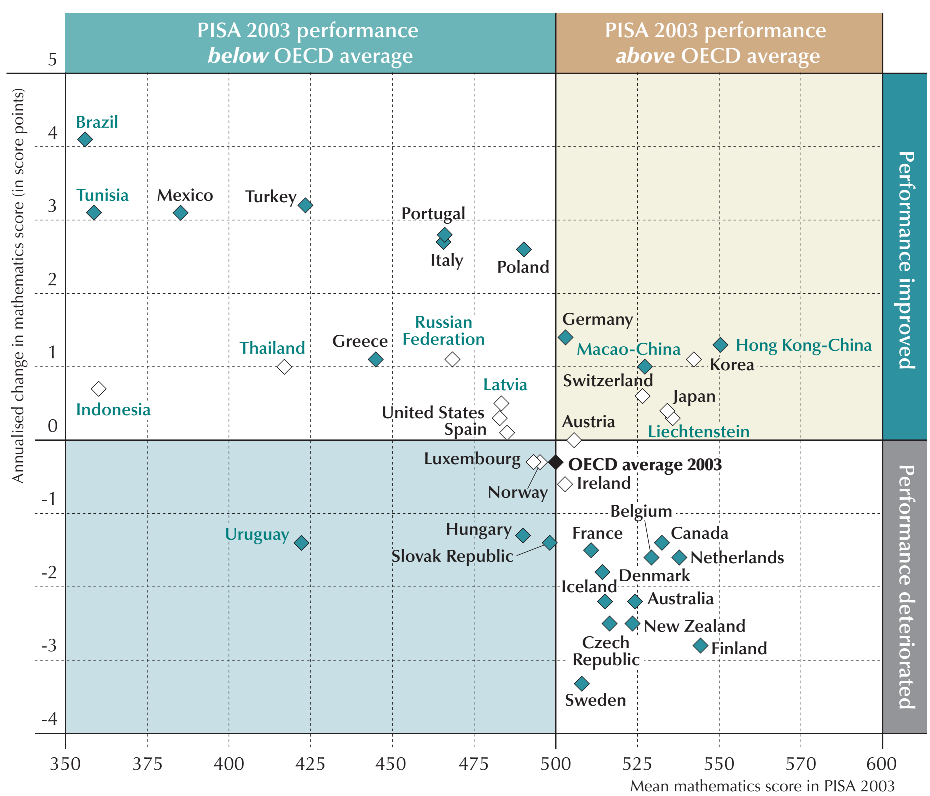



PISA 2012 results show that many countries and economies have improved their performance, whatever their culture or socio-economic status.

For some of the countries and economies that improved their performance in one or more of the domains assessed, improvements are observed among all students: everyone "moved up". Other countries concentrated their improvements among their low-achieving students, increasing the share of students who begin to show literacy in mathematics, reading or science. Improvement in other countries, by contrast, is concentrated among high-achieving students, so the share of top-performing students grew.

Some of the highest-performing education systems were able to extend their lead, while others with very low performance have been catching up. This suggests that improvement is possible, whatever the starting point for students, schools and education systems.

Annualised change in performance between 2003 and 2012 and average PISA 2003 mathematics scores



Notes: Annualised score-point changes in mathematics that are statistically significant are indicated in a darker tone.
The annualised change is the average annual change in PISA score points from a country's/economy's earliest participation in PISA to PISA 2012. It is calculated taking into account all of a country's/economy's participation in PISA.
Only countries and economies with comparable data from PISA 2003 and PISA 2012 are shown.
The correlation between a country's/economy's mean score in 2003 and its annualised performance is -0.60.
OECD average 2003 considers only those countries with comparable data since PISA 2003.
Source: OECD, PISA 2012 Database; Figure I.2.18.

Nurturing top performance and tackling low performance need not be mutually exclusive.

In most countries and economies only a small proportion of students attains the highest levels and can be called top performers in mathematics, reading or science. Even fewer are the academic all-rounders, those students who achieve proficiency Level 5 or higher in all three subjects. Nurturing excellence in mathematics, reading or science, or in all three domains, is crucial for a country's development as these students will be in the vanguard of a competitive, knowledge-based global economy.

Some high-performing countries in PISA 2012, like Estonia and Finland, also show small variations in student scores, proving that high performance is possible for all students. Equally important, since their first participations in PISA, France, Hong Kong-China, Italy, Japan, Korea, Luxembourg, Macao-China, Poland, Portugal and the Russian Federation have been able to increase the share of top performers in mathematics, reading or science, indicating that education systems can pursue and promote academic excellence whether they perform at or above the OECD average (e.g. Japan, Korea) or below the OECD average (e.g. Italy, Portugal, the Russian Federation).

Countries with large numbers of students who struggle to master basic reading skills at age 15 are likely to be held back in the future.

Among students who fail to reach the baseline level of performance (Level 2) in mathematics, reading or science, meaning that, at best, they can only handle the simplest and most obvious tasks, most can be expected not to continue with education beyond compulsory schooling, and therefore risk facing difficulties using mathematics, reading and science concepts throughout their lives. The proportion of 15-year-old students at this level varies widely across countries, from fewer than one student in ten in four countries and economies, to the majority of students in 15 countries.

Even in the average OECD country, where more than one in five students does not reach Level 2, tackling such low performance is a major challenge. It requires dismantling the barriers posed by social background, taking a close look at the relationship between performance and students' attitudes towards learning, and focusing on schools' organisation, resources and learning environment.

Reducing the proportion of students who perform below Level 2 also has an important economic dimension. According to one estimate, if all students attained Level 2 proficiency in mathematics the combined economic output of OECD countries would be boosted by around USD 200 trillion. While such estimates are never wholly certain, they do suggest that the cost of improving education outcomes is just a fraction of the high cost of low student performance.

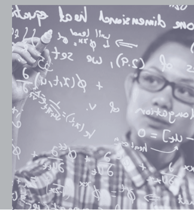
The gender gap in student performance can be narrowed considerably as both boys and girls in all countries and economies show that they can succeed in all three subjects.

Boys and girls show different levels of performance in mathematics, reading and science, but performance differences within the genders are significantly larger than those between them. Marked gender differences in mathematics performance – in favour of boys – are observed in many countries and economies, but with a number of exceptions and to varying degrees. Among girls, the greatest hurdle is in reaching the top: girls are under-represented among the highest achievers in most countries and economies, which poses a serious challenge to achieving gender parity in science, technology, engineering and mathematics occupations in the future.

Some countries succeeded in narrowing the gender gap in mathematics; others need to find more effective strategies for improving the level of engagement, drive, self-beliefs and performance among girls. At the same time, there is evidence that in many countries and economies more boys than girls are among the lowest-performing students, and in some of these countries/economies more should be done to engage boys in mathematics.

By contrast, girls outperform boys in reading almost everywhere. This gender gap is particularly large in some high-performing countries, where almost all underperformance in reading is seen only among boys. Low-performing boys face a particularly large disadvantage as they are heavily over-represented among those who fail to show basic levels of reading literacy. These low levels of performance tend to be coupled with low levels of engagement with school and – as observed in PISA 2009 – with low levels of engagement with and commitment to reading. To close the gender gap in reading performance, policy makers need to promote boys' engagement with reading and ensure that more boys begin to show the basic level of proficiency that will allow them to participate fully and productively in life.



Mathematics performance among PISA 2012 participants, at national and regional levels [Part 1/2]

	Mean score	Range of ranks: All countries/economies: Upper rank	Lower rank
Shanghai-China	613	1	1
Singapore	573	2	2
Hong Kong-China	561	3	5
Chinese Taipei	560	3	5
Korea	554	3	5
Macao-China	538	6	8
Japan	536	6	9
Liechtenstein	535	6	9
Switzerland	531	7	9
Flemish community (Belgium)	531		
Trento (Italy)	524		
Friuli Venezia Giulia (Italy)	523		
Netherlands	523	9	14
Veneto (Italy)	523		
Estonia	521	10	14
Finland	519	10	15
Canada	518	11	16
Australian capital territory (Australia)	518		
Poland	518	10	17
Lombardia (Italy)	517		
Navarre (Spain)	517		
Western Australia (Australia)	516		
Belgium	515	13	17
Germany	514	13	17
Massachusetts (United States)	514		
Viet Nam	511	11	19
German-speaking community (Belgium)	511		
New South Wales (Australia)	509		
Castile and Leon (Spain)	509		
Bolzano (Italy)	506		
Connecticut (United States)	506		
Austria	506	17	22
Basque Country (Spain)	505		
Australia	504	17	21
Madrid (Spain)	504		
Queensland (Australia)	503		
La Rioja (Spain)	503		
Ireland	501	18	24
Slovenia	501	19	23
Victoria (Australia)	501		
Emilia Romagna (Italy)	500		
Denmark	500	19	25
New Zealand	500	19	25
Asturias (Spain)	500		
Czech Republic	499	19	26
Piemonte (Italy)	499		
Scotland (United Kingdom)	498		
Marche (Italy)	496		
Aragon (Spain)	496		
Toscana (Italy)	495		
England (United Kingdom)	495		
France	495	23	29
United Kingdom	494	23	31
French community (Belgium)	493		
Catalonia (Spain)	493		
Iceland	493	25	29
Umbria (Italy)	493		
Valle d'Aosta (Italy)	492		
Cantabria (Spain)	491		
Latvia	491	25	32
Luxembourg	490	27	31
Norway	489	26	33
South Australia (Australia)	489		
Alentejo (Portugal)	489		
Galicia (Spain)	489		
Liguria (Italy)	488		
Portugal	487	26	36
Northern Ireland (United Kingdom)	487		

Mathematics performance among PISA 2012 participants, at national and regional levels [Part 2/2]

	Mean score	Range of ranks – All countries/economies	
		Upper rank	Lower rank
Italy	485	30	35
Spain	484	31	36
Perm Territory region (Russian Federation)	484		
Russian Federation	482	31	39
Slovak Republic	482	31	39
United States	481	31	39
Lithuania	479	34	40
Sweden	478	35	40
Puglia (Italy)	478		
Tasmania (Australia)	478		
Hungary	477	35	40
Abruzzo (Italy)	476		
Balearic Islands (Spain)	475		
Lazio (Italy)	475		
Andalusia (Spain)	472		
Croatia	471	38	41
Wales (United Kingdom)	468		
Florida (United States)	467		
Israel	466	40	41
Molise (Italy)	466		
Basilicata (Italy)	466		
Dubai (UAE)	464		
Murcia (Spain)	462		
Extremadura (Spain)	461		
Sardegna (Italy)	458		
Greece	453	42	44
Campania (Italy)	453		
Northern territory (Australia)	452		
Serbia	449	42	45
Turkey	448	42	46
Sicilia (Italy)	447		
Romania	445	43	47
Cyprus[1, 2]	440	45	47
Sharjah (United Arab Emirates)	439		
Bulgaria	439	45	49
Aguascalientes (Mexico)	437		
Nuevo León (Mexico)	436		
Jalisco (Mexico)	435		
Querétaro (Mexico)	434		
United Arab Emirates	434	47	49
Kazakhstan	432	47	50
Calabria (Italy)	430		
Colima (Mexico)	429		
Chihuahua (Mexico)	428		
Distrito Federal (Mexico)	428		
Thailand	427	49	52
Durango (Mexico)	424		
Chile	423	50	52
Morelos (Mexico)	421		
Abu Dhabi (United Arab Emirates)	421		
Malaysia	421	50	52
Coahuila (Mexico)	418		
Ciudad Autónoma de Buenos Aires (Argentina)	418		
Mexico (Mexico)	417		
Federal District (Brazil)	416		
Ras Al Khaimah (United Arab Emirates)	416		
Santa Catarina (Brazil)	415		
Puebla (Mexico)	415		
Baja California (Mexico)	415		
Baja California Sur (Mexico)	414		
Espírito Santo (Brazil)	414		
Nayarit (Mexico)	414		
Mexico	413	53	54
San Luis Potosí (Mexico)	412		
Guanajuato (Mexico)	412		
Tlaxcala (Mexico)	411		
Tamaulipas (Mexico)	411		
Sinaloa (Mexico)	411		
Fujairah (United Arab Emirates)	411		
Quintana Roo (Mexico)	411		
Yucatán (Mexico)	410		
Montenegro	410	54	56
Uruguay	409	53	56
Zacatecas (Mexico)	408		
Mato Grosso do Sul (Brazil)	408		
Rio Grande do Sul (Brazil)	407		
Costa Rica	407	54	56
Hidalgo (Mexico)	406		
Manizales (Colombia)	404		
São Paulo (Brazil)	404		
Paraná (Brazil)	403		
Ajman (United Arab Emirates)	403		
Minas Gerais (Brazil)	403		
Veracruz (Mexico)	402		
Umm Al Quwain (United Arab Emirates)	398		
Campeche (Mexico)	396		
Paraíba (Brazil)	395		
Albania	394	57	59
Medellin (Colombia)	393		
Bogota (Colombia)	393		
Brazil	391	57	60
Rio de Janeiro (Brazil)	389		
Argentina	388	57	61
Tunisia	388	57	61
Jordan	386	59	62
Piauí (Brazil)	385		
Sergipe (Brazil)	384		
Rondônia (Brazil)	382		
Rio Grande do Norte (Brazil)	380		
Goiás (Brazil)	379		
Cali (Colombia)	379		
Tabasco (Mexico)	378		
Ceará (Brazil)	378		
Colombia	376	62	64
Qatar	376	62	64
Indonesia	375	62	65
Bahia (Brazil)	373		
Chiapas (Mexico)	373		
Mato Grosso (Brazil)	370		
Peru	368	64	65
Guerrero (Mexico)	367		
Tocantins (Brazil)	366		
Pernambuco (Brazil)	363		
Roraima (Brazil)	362		
Amapá (Brazil)	360		
Pará (Brazil)	360		
Acre (Brazil)	359		
Amazonas (Brazil)	356		
Maranhão (Brazil)	343		
Alagoas (Brazil)	342		

Notes: OECD countries are shown in bold black. Partner countries are shown in bold blue. Participating economies and subnational entities that are not included in national results are shown in bold blue italics. Regions are shown in black italics (OECD countries) or blue italics (partner countries).

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.

Countries, economies and subnational entities are ranked in descending order of the mean mathematics score in PISA 2012.

Source: OECD, PISA 2012 Database; Figure I.2.14.

Excellence through Equity: Giving Every Student the Chance to Succeed

WHAT THE DATA TELL US

- Australia, Canada, Estonia, Finland, Hong Kong-China, Japan, Korea, Liechtenstein, the Netherlands and Macao-China **combine high levels of performance with equity in education opportunities** as assessed in PISA 2012.
- Of the 39 countries and economies that participated in both PISA 2003 and 2012, Mexico, Turkey and Germany **improved both their mathematics performance and their levels of equity in education** during the period.
- Across OECD countries, **a more socio-economically advantaged student scores 39 points higher in mathematics** – the equivalent of nearly one year of schooling – than a less-advantaged student.
- Some 6% of students across OECD countries – nearly one million students – are **"resilient"**, meaning that they beat the socio-economic odds against them and exceed expectations, when compared with students in other countries. In Hong Kong-China, Macao-China, Shanghai-China, Singapore and Viet Nam, 13% of students or more are resilient and perform among the top 25% of students across all participating countries and economies.
- The share of **immigrant students** in OECD countries increased from 9% in 2003 to 12% in 2012 while the performance disadvantage of immigrant students as compared to students without an immigrant background but with similar socio-economic status shrank by 10 score points during the same period.
- The **concentration of immigrant students in a school** is not, in itself, associated with poor performance.
- Across OECD countries, students who reported that they had attended **pre-primary school** for more than one year score 53 points higher in mathematics – the equivalent of more than one year of schooling – than students who had not attended pre-primary education.
- OECD countries allocate at least an equal, if not a larger, **number of teachers per student** to socio-economically disadvantaged schools as to advantaged schools; but disadvantaged schools tend to have great difficulty in attracting qualified teachers.

WHAT THIS MEANS FOR POLICY AND PRACTICE

The large differences between countries/economies in the extent to which socio-economic status influences learning outcomes suggests that it is possible to combine high performance with high levels of equity in education.

Socio-economic disadvantage is closely interconnected with many of the student and school characteristics that are associated with performance. Although poor performance in school does not automatically stem from disadvantage, the socio-economic status of students and schools does appear to exert a powerful influence on learning outcomes. Because advantaged families are better able to reinforce and enhance the effects of schools, because students from advantaged families attend higher-quality schools, or because schools are simply better-equipped to nurture and develop young people from advantaged backgrounds, in many countries, schools tend to reproduce existing patterns of socio-economic advantage, rather than create a more equitable distribution of learning opportunities and outcomes. However, differences across countries in the extent to which student-level factors (such as family structure, parents' job status and immigrant background) and school-level factors (such as how resources are allocated across schools) are associated with performance show that policies and practices have an impact on both equity and performance.

Performance and equity

Source: OECD, PISA 2012 Database; Figure II.1.2.

The allocation of resources across schools is associated with equity in education opportunities.

With some notable exceptions, OECD countries try to allocate at least an equal, if not a larger, number of teachers per student to disadvantaged schools compared with advantaged schools. This said, disadvantaged schools still report greater difficulties in attracting qualified teachers. In other words, in disadvantaged schools, more resources do not necessarily translate into better-quality resources. This suggests that many of their students face the double drawback of coming from a disadvantaged background and attending a school with lower-quality resources.

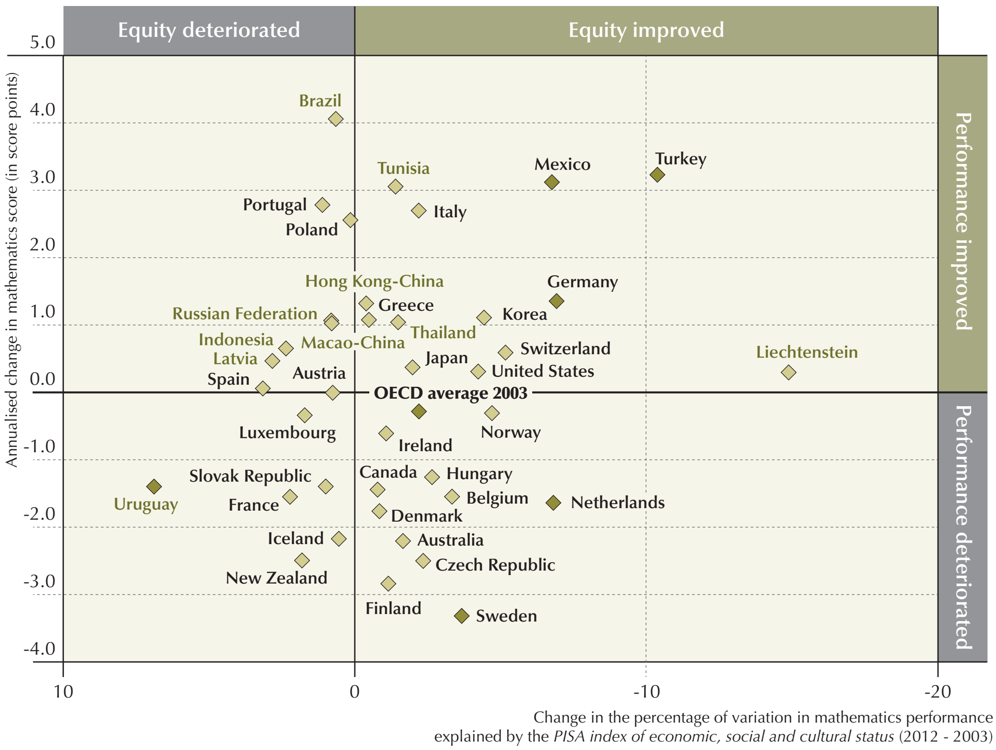
In addition, some education systems tend to separate students either across classes or schools. Evidence from PISA shows that school systems that segregate students according to their performance tend to be those where students are also segregated by socio-economic status and by the frequency of their exposure to formal mathematics.

In Finland, early detection mechanisms, such as periodic individualised assessments of students by several groups of teachers, allow educators to identify struggling students and offer them the necessary support early on, before they become stuck and cannot continue their education at the same pace as their peers. Israel and Germany have designed programmes that offer more learning opportunities to immigrant and minority students by providing a longer school day (Germany) or by encouraging students to participate in smaller study groups (Israel).

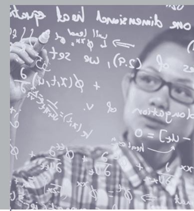
The PISA results of several countries demonstrate that high average performance and equity are not mutually exclusive.

Australia, Canada, Estonia, Finland, Hong Kong-China, Japan, Korea, Liechtenstein, the Netherlands and Macao-China show above-OECD-average mean performance and a weak relationship between socio-economic status and student performance. In Viet Nam, the strength of the relationship is around average while performance disparities associated with differences in students' socio-economic status are below average.

Change between 2003 and 2012 in the strength of the impact of socio-economic status on performance and annualised mathematics performance



Notes: Changes in both equity and performance that are statistically significant are indicated in a darker tone.
The annualised change is the average annual change in PISA score points from a country's/economy's earliest participation in PISA to PISA 2012. It is calculated taking into account all of a country's/economy's participation in PISA.
For comparability over time, PISA 2003 values on the *PISA index of economic, social and cultural status* have been rescaled to the PISA 2012 scale of the index. PISA 2003 results reported in this table may thus differ from those presented in *Learning for Tomorrow's World: First Results from PISA 2003* (OECD, 2004).
OECD average considers only those countries with comparable mathematics scores and values on the *PISA index for economic, social and cultural status* since PISA 2003.
Only countries and economies with comparable data from PISA 2003 and PISA 2012 are shown.
Source: OECD, PISA 2012 Database; Figure II.2.12.

Several policy options, sometimes applied in combination, can improve performance and equity in education.

- ***Target low performance, regardless of students' socio-economic status, either by targeting low-performing schools or low-performing students within schools, depending on the extent to which low performance is concentrated by school.***
These policies often tend to provide a specialised curriculum or additional instructional resources for particular students based on their academic achievement. For example, some school systems provide early-prevention programmes that target children who are deemed to be at risk of failure at school when they enter early childhood programmes or schools, while other systems provide late-prevention or recovery programmes for children who fail to progress at a normal rate during the first few years of primary school. The objective is to bring low-performing students, regardless of their socio-economic status, up to par with their peers. Colombia, Mexico and Poland, for example, have improved the information infrastructure of their school systems so that they can better identify and support struggling students and schools.

- ***Target disadvantaged children through additional instructional resources or economic assistance.***
These programmes select students based on their families' socio-economic status, rather than on the students' cognitive abilities. While policies targeting disadvantaged children can aim to improve these students' performance in school, they can also provide additional economic resources to these students. In Brazil, Colombia and Mexico, for example, parents receive cash transfers if their children attend school. Other countries provide free transportation and free lunch programmes for students from poor families. Brazil, Germany, Israel, Mexico and Turkey have implemented targeted policies to improve the performance of low-achieving schools or students, or have distributed more resources to those regions and schools that need them most.

- ***Apply more universal policies to raise standards for all students.***
These policies can involve altering the content and pace of the curriculum, improving instructional techniques, introducing full-day schooling, changing the age of entry into school, or increasing the time spent in classes. Some countries, such as Denmark and Germany, responded to PISA 2000 results by introducing major school and curricular reforms that included some of these changes. Some countries have introduced system-wide reforms that are aimed at moving towards more comprehensive schooling (Poland) or less tracking (Germany). These reforms simultaneously address various sources of inequity, such as socio-economic disadvantage, an immigrant background, or a challenging family structure. Brazil, Colombia, Estonia, Israel, Japan and Poland, all of which have improved their performance in PISA, have established policies to improve the quality of their teaching staff by adding to the requirements to earn a teaching license, offering incentives for high-achieving students to enter the profession, increasing salaries to make the profession more attractive, or providing incentives for teachers to engage in in-service teacher-training programmes.

- ***Include marginalised students in mainstream schools and classrooms.***
These policies aim to include students who may be segregated, whether because of disability or ethnic or socio-economic status. Some inclusive policies try to reduce socio-economic segregation among schools by redrawing school-catchment boundaries, amalgamating schools, or by creating magnet schools in low-income areas. Poland reformed its school system by delaying the age of selection into different programmes; and schools in Germany are moving away from separating students into different education programmes.

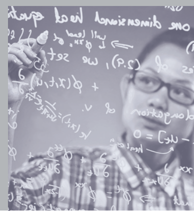
Framework of policies to improve performance and equity in education

Countries and economies with mean mathematics performance above the OECD average are shown in **bold**.

Countries and economies with mean mathematics performance below the OECD average are shown in *italics*.

Strength of the relationship between mathematics performance and socio-economic status	Performance differences in mathematics across socio-economic groups: Below OECD average	Average	Above OECD average
Below OECD average	**Canada** **Estonia** **Finland** **Hong Kong-China** Iceland *Italy* *Jordan* *Kazakhstan* **Macao-China** *Mexico* *Montenegro* Norway *Qatar* *Serbia* *Thailand* *United Arab Emirates*	*Croatia* **Japan** **Korea** **Liechtenstein** **Netherlands** *Sweden*	**Australia**
Average	*Argentina* *Brazil* *Colombia* *Costa Rica* *Greece* *Indonesia* *Malaysia* *Spain* *Tunisia* *Turkey* *United States* **Viet Nam**	**Austria** **Denmark** **Germany** **Ireland** Latvia *Lithuania* **Poland** *Romania* *Russian Federation* **Shanghai-China** **Slovenia** **Switzerland** United Kingdom	Czech Republic *Israel* **Singapore**
Above OECD average	*Chile* *Luxembourg* *Peru* Portugal	*Bulgaria* *Uruguay*	**Belgium** France *Hungary* **New Zealand** *Slovak Republic* **Chinese Taipei**

Impact of socio-economic status on performance is…	Performance differences across the socio-economic spectrum are… small	large
weak	When performance differences across the socio-economic spectrum are small and students often perform better (or worse) than expected, given their socio-economic status, one of the main policy goals is to improve performance across the board. In these cases, universal policies tend to be most effective. These types of policies include changing curricula or instructional systems and/or improving the quality of the teaching staff, e.g. by requiring more qualifications to earn a teaching license, providing incentives for high-achieving students to enter the profession, increasing salaries to make the profession more attractive and to retain more teachers, and/or offering incentives for teachers to engage in in-service teacher-training programmes (e.g. Brazil, Estonia, Japan, Israel and Poland).	When performance differences across the socio-economic spectrum are large and students often perform better (or worse) than expected given their socio-economic status, one of the main policy goals is to improve performance among the lowest performers, regardless of their socio-economic status. In these cases, targeting disadvantaged students only would provide extra support to some students who are already performing relatively well, while it would leave out some students who are not necessarily disadvantaged but who perform poorly. Policies can be targeted to low-performing students if these students can be easily identified, or to low-performing schools, particularly if low performance is concentrated in particular schools. Examples of such policies involve evaluation, feedback and appraisals for students, teachers and schools, or establishing early-warning mechanisms and providing a modified curriculum or additional instructional support for struggling students. Colombia, Mexico and Poland, for example, have improved the information infrastructure of their education systems to better identify and support struggling students and schools.
strong	When performance differences across the socio-economic spectrum are small but students perform as expected, given their socio-economic status, one of the main policy goals is to dismantle the barriers to high performance associated with socio-economic disadvantage. In these cases, effective compensatory policies target disadvantaged students or schools, providing them with additional support, resources or assistance. Brazil, Colombia and Mexico, for example, offer cash transfers to disadvantaged families with children in school. Free lunch programmes or free textbooks for disadvantaged families are other examples.	When performance differences across the socio-economic spectrum are large and students perform as would be expected, given their socio-economic status, one of the main policy goals is to reduce performance differences and improve performance, particularly among disadvantaged students. A combination of policies targeting low performance and socio-economic disadvantage tend to be most effective in these cases, since universal policies may be less effective in improving both equity and performance simultaneously.



Ready to Learn: Students' Engagement, Drive and Self-Beliefs

WHAT THE DATA TELL US

- Students whose **parents have high expectations for them** – who expect them to earn a university degree and work in a professional or managerial capacity later on – tend to have more perseverance, greater intrinsic motivation to learn mathematics, and more confidence in their own ability to solve mathematics problems than students of similar socio-economic status and academic performance, but whose parents hold less ambitious expectations for them.
- While four out of five students in OECD countries agree or strongly agree that they feel **happy at school** or that they feel like they belong at school, not all students are equally likely to report a strong sense of belonging: on average across OECD countries, for example, 78% of disadvantaged but 85% of advantaged students agree or strongly agree with the statement "I feel like I belong at school".
- Although the vast majority of students reported a strong **sense of belonging**, more than one in three students in OECD countries reported that they had arrived late for school in the two weeks prior to the PISA test; and more than one in four students reported that they had skipped a class or a day of school during the same period.
- **Lack of punctuality and truancy** are negatively associated with student performance: on average across OECD countries, arriving late for school is associated with a 27-point lower score in mathematics, while skipping classes or days of school is associated with a 37-point lower score in mathematics – the equivalent of almost one full year of formal schooling.
- Students who are **open to solving mathematics problems** – who feel that they can handle a lot of information, are quick to understand things, seek explanations for things, can easily link facts together, and like to solve complex problems – score 31 points higher in mathematics, on average, than those who are less open to problem solving. Among high achievers, the difference between the two groups of students is even greater – an average of 39 score points.
- Across most countries and economies, socio-economically **disadvantaged students** not only score lower in mathematics, they also reported lower levels of engagement, drive, motivation and self-beliefs. Resilient students, disadvantaged students who achieve at high levels, break this link; in fact, they share many of the characteristics of advantaged high-achievers.
- Better **teacher-student relations** are strongly associated with greater student engagement with and at school.
- One way that a student's negative self-belief can manifest itself is in **anxiety towards mathematics**. Some 30% of students reported that they feel helpless when doing mathematics problems: 25% of boys, 35% of girls, 35% of disadvantaged students, and 24% of advantaged students reported feeling that way.
- PISA results show that even **when girls perform as well as boys in mathematics**, they tend to report less perseverance, less openness to problem solving, less intrinsic and instrumental motivation to learn mathematics, less self-belief in their ability to learn mathematics and more anxiety about mathematics than boys, on average; they are also more likely than boys to attribute failure in mathematics to themselves rather than to external factors.

Snapshot of students' engagement, drive and self-beliefs

- Countries/economies with values above the OECD average
- Countries/economies with values not statistically significantly different from the OECD average
- Countries/economies with values below the OECD average

Values that are statistically significant are indicated in bold or with the symbol √.

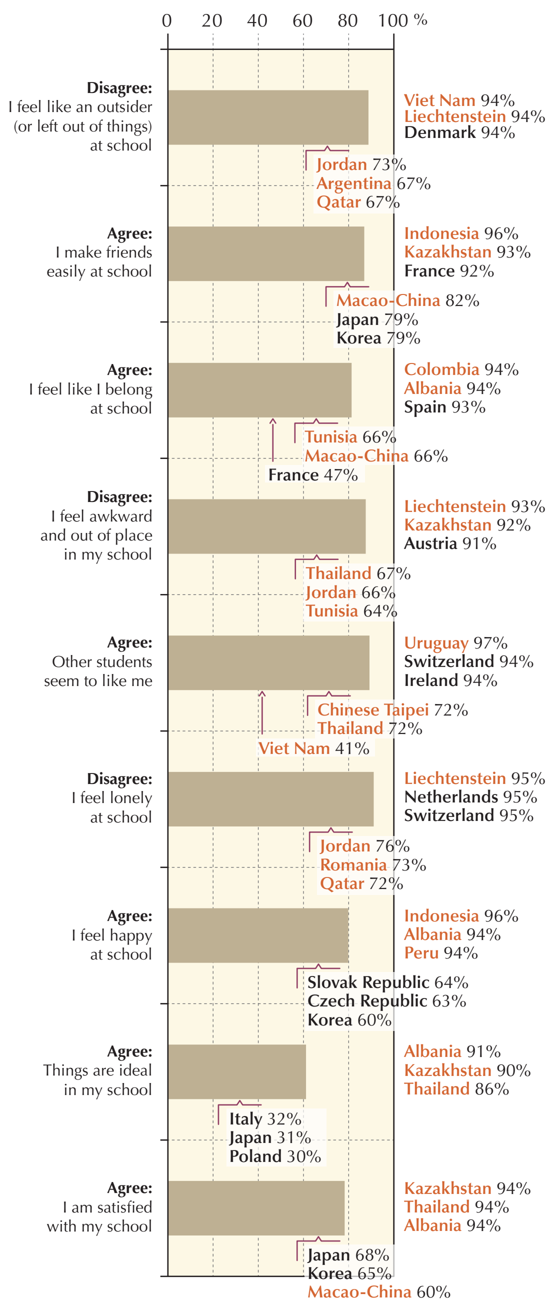
		Engagement with and at school			Drive				Mathematics self-beliefs		
	Mean mathematics score	**Percentage of students who reported having skipped classes or days of school**	**Score-point difference that is associated with students skipping classes or days of school**	**Socio-economic disparities in sense of belonging among students of equal performance in mathematics**	**Openness to problem solving**	**Score-point difference per unit of the index of openness to problem solving**	**Gender gap in openness to problem solving among students of equal performance in mathematics**	**Socio-economic disparities in openness to problem solving among students of equal mathematics performance**	**Mathematics self-efficacy**	**Score-point difference per unit of the index of mathematics self-efficacy**	**Gender gap in mathematics self-efficacy among students of equal performance in mathematics**
	Mean score	%	Change in score	Dif. in mean index	Mean index	Change in score	Dif. in mean index	Dif. in mean index	Mean index	Change in score	Dif. in mean index
OECD average	494	25	**-37**	√		**31**	√	√		**49**	√
Shanghai-China	613	4	**-33**	√		**30**	√	√		**53**	√
Singapore	573	23	**-27**	√		**25**	√	√		**58**	√
Hong Kong-China	561	6	**-67**	√		**29**	√	√		**50**	√
Chinese Taipei	560	11	**-93**	√		**34**	√	√		**64**	√
Korea	554	4	**-118**	√		**48**	√	√		**58**	√
Macao-China	538	9	**-47**	√		**30**	√	√		**50**	√
Japan	536	4	**-88**	√		**28**	√	√		**53**	√
Liechtenstein	535	5	**-57**			**30**	√	√		**60**	√
Switzerland	531	13	**-24**			**29**	√	√		**55**	√
Netherlands	523	12	-9	√		**21**	√	√		**44**	√
Estonia	521	36	**-38**	√		**32**		√		**49**	√
Finland	519	20	**-36**	√		**41**	√	√		**49**	√
Canada	518	35	**-29**	√		**37**	√	√		**47**	√
Poland	518	27	**-31**			**26**		√		**56**	√
Belgium	515	11	**-73**	√		**31**	√	√		**46**	√
Germany	514	12	**-23**	√		**27**	√	√		**53**	√
Viet Nam	511	13	**-48**	√		**25**	√	√		**66**	√
Austria	506	17	**-14**	√		**32**	√	√		**48**	√
Australia	504	38	**-40**	√		**42**	√	√		**55**	√
Ireland	501	14	**-14**	√		**35**	√	√		**48**	√
Slovenia	501	30	**-42**	√		**29**	√			**43**	√
Denmark	500	21	**-35**	√		**34**	√	√		**50**	√
New Zealand	500	26	**-77**			**42**	√	√		**56**	√
Czech Republic	499	11	**-35**	√		**35**	√	√		**54**	√
France	495	21	**-32**	√		**33**	√			**51**	√
United Kingdom	494	25	**-35**	√		**41**	√	√		**54**	√
Iceland	493	12	**-47**	√		**29**	√	√		**41**	√
Latvia	491	67	**-12**	√		**30**		√		**49**	√
Luxembourg	490	11	**-49**	√		**27**	√	√		**44**	√
Norway	489	15	**-55**	√		**33**	√	√		**47**	√
Portugal	487	36	**-32**	√		**31**		√		**60**	√
Italy	485	61	**-31**	√		**23**	√	√		**53**	√
Spain	484	44	**-35**	√		**32**	√	√		**47**	√
Russian Federation	482	38	**-27**	√		**24**	√	√		**47**	√
Slovak Republic	482	16	**-45**			**25**	√	√		**59**	√
United States	481	28	**-24**	√		**30**	√	√		**50**	√
Lithuania	479	39	**-42**	√		**35**		√		**48**	√
Sweden	478	23	**-46**	√		**35**	√	√		**49**	√
Hungary	477	12	**-65**			**28**		√		**54**	√
Croatia	471	29	**-47**			**20**	√	√		**50**	√
Israel	466	47	-4			**17**	√			**45**	√
Greece	453	48	**-14**			**29**	√	√		**40**	√
Serbia	449	30	**-23**	√		**15**	√	√		**38**	√
Turkey	448	65	**10**	√		**18**		√		**45**	√
Romania	445	58	**-20**	√		**14**		√		**33**	√
Bulgaria	439	39	**-46**	√		**12**	√	√		**26**	√
United Arab Emirates	434	50	**-28**			**15**	√	√		**33**	√
Kazakhstan	432	27	**-24**	√		**9**		√		**22**	
Thailand	427	33	**-21**	√		**9**	√	√		**27**	√
Chile	423	20	**-30**	√		**26**	√	√		**33**	√
Malaysia	421	43	**-23**			**12**		√		**40**	
Mexico	413	33	**-10**	√		**22**	√	√		**28**	√
Montenegro	410	39	**-14**			**5**		√		**25**	√
Uruguay	409	34	**-22**	√		**20**	√	√		**33**	√
Costa Rica	407	57	**-7**	√		**20**		√		**19**	√
Albania	394	25	**10**	m		0		m		1	
Brazil	391	30	-4	√		**11**	√	√		**27**	√
Argentina	388	66	**-24**	√		**13**	√	√		**19**	√
Tunisia	388	34	**-13**			**15**	√	√		**27**	√
Jordan	386	57	**-10**			**14**	√	√		**20**	√
Colombia	376	18	-5	√		**6**	√	√		**14**	√
Qatar	376	29	**-15**			**10**	√	√		**23**	√
Indonesia	375	30	**-17**	√		**7**		√		**17**	
Peru	368	20	**-41**	√		**17**	√	√		**23**	√

Countries and economies are ranked in descending order of the mean mathematics score in PISA 2012.

Source: OECD, PISA 2012 Database; Tables I.2.3a, III.2.2c, III.3.2d, III.4.1d, III.5.2a, III.7.1b, III.7.2a, III.7.2b and III.7.3a.

Students' sense of belonging

Percentage of students who reported "agree" or "strongly agree" or who reported "disagree" or "strongly disagree"
The top and bottom three countries/economies in these measures are shown.



Source: OECD, PISA 2012 Database; Table III.2.3a.

WHAT THIS MEANS FOR POLICY AND PRACTICE

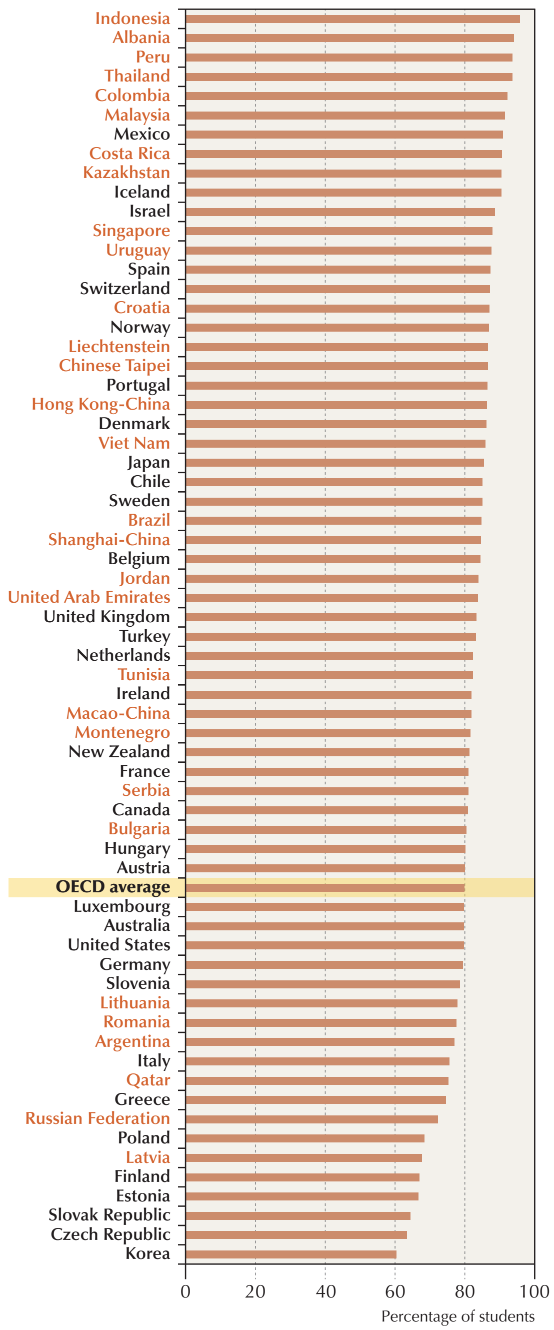
PISA reveals that in most countries and economies, far too many students do not make the most of the learning opportunities available to them because they are not engaged with school and learning.

This is evident in the fact that more than one in three students in OECD countries reported that they had arrived late for school during the two weeks prior to the PISA assessment; and more than one in four students reported that they had skipped classes or days of school during the same period. This is not just a question of lost time; these students are also far more likely to show poorer performance.

Attendance at and engagement with school do not just vary among students and schools, but also across countries. In particular, the high-performing East Asian countries and economies, such as Hong Kong-China, Japan, Korea, Macao-China and Shanghai-China, have relatively small proportions of students who reported that they had arrived late for class or skipped a class or a day of school.

The extent to which the educational aspirations of students and parents are the result of cultural values or determinants of these, and how such aspirations interact with education policies and practices is an important subject that merits further study. Whatever the case, it seems that if a country seeks better education performance, it is incumbent on political and social leaders to persuade the country's citizens to make the choices needed to show that they value education more than other areas of national interest.

Percentage of students who reported being happy at school



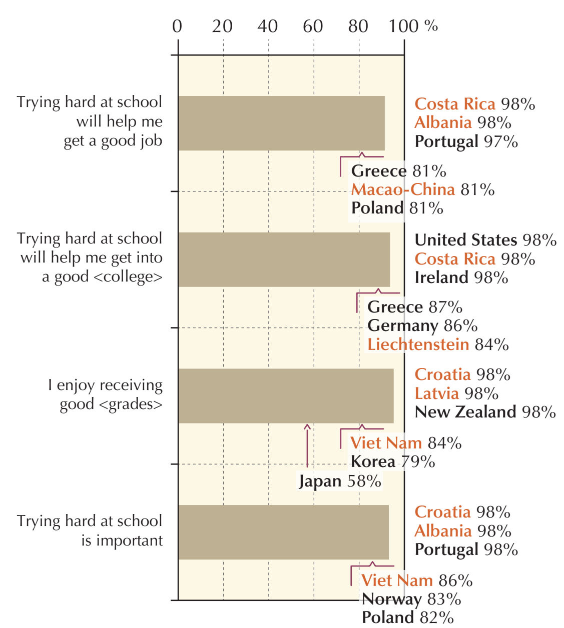
Countries and economies are ranked in descending order of the percentage of students who agreed or strongly agreed with the statement "I feel happy at school".
Source: OECD, PISA 2012 Database; Figure III.1.2.

PISA results also indicate that drive, motivation and confidence in oneself are essential if students are to fulfil their potential.

Practice and hard work go a long way towards developing each student's potential, but students can only achieve at the highest levels when they believe that they are in control of their success and that they are capable of achieving at high levels. In Shanghai-China, for example, students not only believe they are in control of their ability to succeed, but they are prepared to do what it takes to do so: for example 73% of students agreed or strongly agreed that they remain interested in the tasks that they start. The fact that students in some countries consistently believe that achievement is mainly a product of hard work, rather than inherited intelligence, suggests that education and its social context can make a difference in instilling the values that foster success in education.

Students' attitudes towards school: Learning outcomes

Percentage of students across OECD countries who reported that they "agree" or "strongly agree" with the following statements
The top and bottom three countries/economies in these measures are shown.



Source: OECD, PISA 2012 Database; Table III.2.5a.

Teachers and school principals need to be able to identify students who show signs of lack of engagement with school and work with them individually before disengagement takes firm root.

Schools can help students learn how to learn, nurture their willingness to solve problems, and build their capacity for hard work and persistence. Teachers can help students to develop perseverance and motivation by supporting students in their efforts to meet high expectations and in showing greater degrees of commitment, and by encouraging students to regard mistakes and setbacks as learning opportunities.

Teachers' practices can promote students' drive and willingness to engage with complex problems. Teachers' use of cognitive-activation strategies, such as giving students problems that require them to think for an extended time, presenting problems for which there is no immediately obvious way of arriving at a solution, and helping students to learn from the mistakes they have made, is associated with students' perseverance and openness to problem solving.

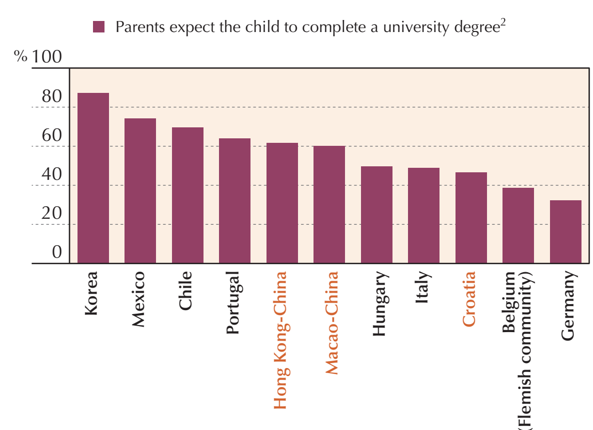
Similarly, students who reported that their mathematics teachers use teacher-directed instruction (e.g. the teacher sets clear goals for student learning and asks students to present their thinking or reasoning at some length) and formative assessments (e.g. the teacher gives students feedback on their strengths and weaknesses in mathematics) also reported particularly high levels of perseverance, openness to problem solving, and willingness to pursue mathematics as a career or field of further study. Yet the use of such strategies among teachers is not widespread: only 53% of students reported that their teachers often present them with problems that require them to think for an extended time, and 47% reported that their teachers often present problems for which there is no immediately obvious way of arriving at a solution. Similarly, on average across OECD countries, only 17% of students reported that their teacher assigns projects that require at least one week to complete.

Canada is more successful in this regard: 60% of students in Canada reported that their teachers often present problems for which there is no immediately obvious way of arriving at a solution, and 66% reported that their teachers often present them with problems that require them to think for an extended time. Education systems could and should do more to promote students' ability to work towards long-term goals.

Parents who hold ambitious expectations for their children motivate and guide them in their learning; they create the conditions that promote academic excellence and the acquisition of skills.

Education systems can also promote motivation to learn by ensuring that all students are surrounded by excellence. PISA reveals that when education systems stream students into different schools based on ability, student motivation to learn and student performance suffers, on average. This suggests that only when education systems cultivate, foster and communicate the belief that all students can achieve at higher levels do students feel the drive and motivation that enable them to learn.

Parents' expectations for their child's future



Note: Only countries and economies with data from the optional parental questionnaire are shown.
1. Managerial and professional occupations refer to ISCO-08 codes 1 and 2.
2. A university degree refers to ISCED levels 5A and 6.
Countries and economies are ranked in descending order of the percentage of students whose parents reported having these expectations for their child.
Source: OECD, PISA 2012 Database; Table III.6.1c.

More must be done to engage disadvantaged students and girls in learning mathematics.

Disadvantaged students are more likely to report skipping classes or days of school and arriving late for school, and are less likely to have a strong sense of belonging and hold positive attitudes towards school. For example, in OECD countries, while 85% of advantaged students agreed or strongly agreed with the statement "I feel like I belong at school", only 78% of disadvantaged students did. In some countries these differences are more pronounced. For example, in France, Korea and Lithuania, the difference between the percentage of advantaged students who agreed or strongly agreed with the statement and the proportion of disadvantaged students who did is larger than 15 percentage points.

While disadvantaged students may have fewer resources at home through which they can benefit from their motivation to learn, there are established strategies to aid disadvantaged students at school, including: developing conditional, incentive-based programmes aimed at promoting attendance at school (targeted policies); creating a culture that values effort, perseverance and motivation (policies inherently more universal in nature); and building strong partnerships among families, teachers and local communities to ensure that socio-economic disadvantage does not prevent these students from flourishing.

Girls underperform in mathematics, compared with boys, in 37 of the 65 countries and economies that participated in PISA 2012; in OECD countries, girls underperform boys by an average of 11 points. However, this gender gap between the average 15-year-old boy and girl masks even wider gaps among the least and most able students. In most countries, the most able girls lag behind the most able boys in mathematics performance.

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.

Although boys show higher mean mathematics performance, differences within the genders are far greater than those between the genders. In addition, the size of the gender gap varies considerably across countries, suggesting that strengths and weaknesses in academic subjects are not inherent, but are acquired and often socially reinforced.

Given girls' lower levels of confidence in their own abilities, school systems, teachers and parents should try to find – or create – more effective ways of bolstering girls' beliefs in their own abilities in mathematics, both at school and at home. In the short term, changing mindsets may require making mathematics more interesting to girls, identifying and eliminating gender stereotypes in textbooks, promoting female role models, and using learning materials that appeal to girls. Over the longer term, shrinking the gender gap in mathematics performance will require the concerted effort of parents, teachers and society as a whole to change the stereotyped notions of what boys and girls excel at, what they enjoy doing, and what they believe they can achieve.

What Makes Schools Successful? Resources, Policies and Practices

WHAT THE DATA TELL US

- **Stratification** in school systems, which is the result of policies like grade repetition and selecting students at a young age for different "tracks" or types of schools, is negatively related to equity; and students in highly stratified systems tend to be less motivated than those in less-stratified systems.
- PISA results show that beyond a certain level of **expenditure** per student, excellence in education requires more than money: how resources are allocated is just as important as the amount of resources available.
- High-performing school systems tend to **allocate resources** more equitably across socio-economically advantaged and disadvantaged schools.
- Most countries and economies with comparable data between 2003 and 2012 have moved towards **better-staffed and better-equipped schools**.
- Students in 2012 were more likely than their counterparts in 2003 to have attended at least one year of **pre-primary education**; yet many of the students who reported that they had not attended pre-primary school are disadvantaged – the students who could benefit most from pre-primary education.
- If offered a **choice of schools** for their child, parents are more likely to consider such criteria as "a safe school environment" and "a school's good reputation" more important than "high academic achievement of students in the school".
- In 37 participating countries and economies, students who attend **private schools** (either government-dependent or government-independent schools) are more socio-economically advantaged than those who attend public schools.
- Schools with more **autonomy over curricula and assessments** tend to perform better than schools with less autonomy when they are part of school systems with more accountability arrangements and/or greater teacher-principal collaboration in school management.
- Between 2003 and 2012 there was a clear trend towards schools using **student assessments** to compare the school's performance with district or national performance and with that of other schools.
- Systems with larger proportions of **students who arrive late for school and skip classes** tend to show lower overall performance.
- According to students' reports, **teacher-student relations** improved between 2003 and 2012 in all but one country; and disciplinary climate also improved during the period, on average across OECD countries and in 27 individual countries and economies.

Relationship between selected resources, policies and practices

+	Positive correlation that is statistically significant
-	Negative correlation that is statistically significant
	Correlation is not statistically significant

Across all participating countries and economies (below the diagonal line)		Mathematics performance	Equity	Across OECD countries (above the diagonal line)											
				Vertical stratification		Horizontal stratification (between schools)	Financial resources	Material resources	Time resources	Inequity in allocation of material resources	School autonomy	Assessment and accountability policies		Student truancy	
				Standard deviation of grade levels in which 15 year olds are enrolled	Percentage of students who repeated one or more grades	Number of years between age of selection and age 15	Teachers' salaries relative to GDP per capita[1]	Average index of quality of schools' educational resources	Percentage of students reporting that they had attended pre-primary education for more than one year	Difference in the index of quality of schools' educational resources between socio-economically advantaged and disadvantaged schools[2]	Average index of school responsibility for curriculum and assessment	Percentage of students in schools that use achievement data to have their progress tracked by administrative authorities	Percentage of students in schools that seek written feedback from students for quality assurance and improvement	Percentage of students who arrived late for school in the two weeks prior to the PISA test	Percentage of students who skipped some lessons or a day of school in the two weeks prior to the PISA test
	Mathematics performance			-			+	+	+	-	+	-	+	-	-
	Equity			-	-	-							+		
Vertical stratification	Standard deviation of grade levels in which 15 year olds are enrolled	-	-		+	+					-				
	Percentage of students who repeated one or more grades	-	-	+			+				-				
Horizontal stratification (between schools)	Number of years between age of selection and age 15		-									-		-	
Financial resources	Teachers' salaries relative to GDP per capita[1]							+							
Material resources	Average index of quality of schools' educational resources	+		-										-	
Time resources	Percentage of students reporting that they had attended pre-primary education for more than one year	+	-	-		+	-	+		-	+	-		-	-
Inequity in allocation of material resources	Difference in the index of quality of schools' educational resources between socio-economically advantaged and disadvantaged schools[2]	-		+	+	-		-	-		-	+		+	+
School autonomy	Average index of school responsibility for curriculum and assessment	+						+	+					-	-
Assessment and accountability policies	Percentage of students in schools that use achievement data to have their progress tracked by administrative authorities	-				-		-	-	+	-			+	
	Percentage of students in schools that seek written feedback from students for quality assurance and improvement		+		-							+			
Student truancy	Percentage of students who arrived late for school in the two weeks prior to the PISA test	-						-	-	+	-	+			+
	Percentage of students who skipped some lessons or a day of school in the two weeks prior to the PISA test	-						-	-	+	-	+		+	

Notes: Equity refers to the strengh of the relationship between mathematics performance and students' socio-economic status, and a positive relationship with equity indicates greater equity. Correlations with mathematics performance and equity are partial correlation coefficients after accounting for per capita GDP.

1. Weighted average of upper and lower secondary school teachers' salaries. The average is computed by weighting upper and lower secondary teachers' salaries according to the respective 15-year-old students' enrolment (for countries and economies with valid information on both the upper and lower secondary levels).

2. A socio-economically disadvantaged school is one whose students' mean socio-economic status is statistically significantly below the mean socio-economic status of the country; and an advantaged school is one whose students' mean socio-economic status is statistically significantly above the country mean.

Source: OECD, PISA 2012 Database; Tables IV.1.1, IV.1.2, IV.1.3, IV.1.4, IV.1.5, IV.1.19 and IV.1.20.

WHAT THIS MEANS FOR POLICY AND PRACTICE

Given that a positive learning climate can be considered a pre-condition for better student performance, it is important to attract the most talented teachers into the most challenging classrooms, and to ensure that children from all socio-economic backgrounds benefit from such a disciplinary climate.

It is encouraging that learning environments have generally improved between 2003 and 2012, even if there are still schools with poor learning environments in all countries and economies. PISA results show that, when comparing two schools, public or private, of the same size, in the same kind of location, and whose students share similar socio-economic status, the disciplinary climate tends to be better in the school that does not suffer from a shortage of qualified teachers. Teacher shortage and disciplinary climate are inter-related. While the nature of that relationship cannot be discerned from PISA data, public policy needs to break this vicious cycle. The fact that these inter-relationships are far weaker in some countries than in others shows that this can be done.

The quality of a school cannot exceed the quality of its teachers and principals. Countries that have improved their performance in PISA, like Brazil, Colombia, Estonia, Israel, Japan and Poland, for example, have established policies to improve the quality of their teaching staff by either adding to the requirements to earn a teaching license, providing incentives for high-achieving students to enter the profession, increasing salaries to make the profession more attractive and to retain more teachers, or by offering incentives for teachers to engage in in-service teacher-training programmes. While paying teachers well is only part of the equation, higher salaries can help school systems to attract the best candidates to the teaching profession. PISA results show that, among countries and economies whose per capita GDP is more than USD 20 000, high-performing school systems tend to pay more to teachers relative to their national income per capita.

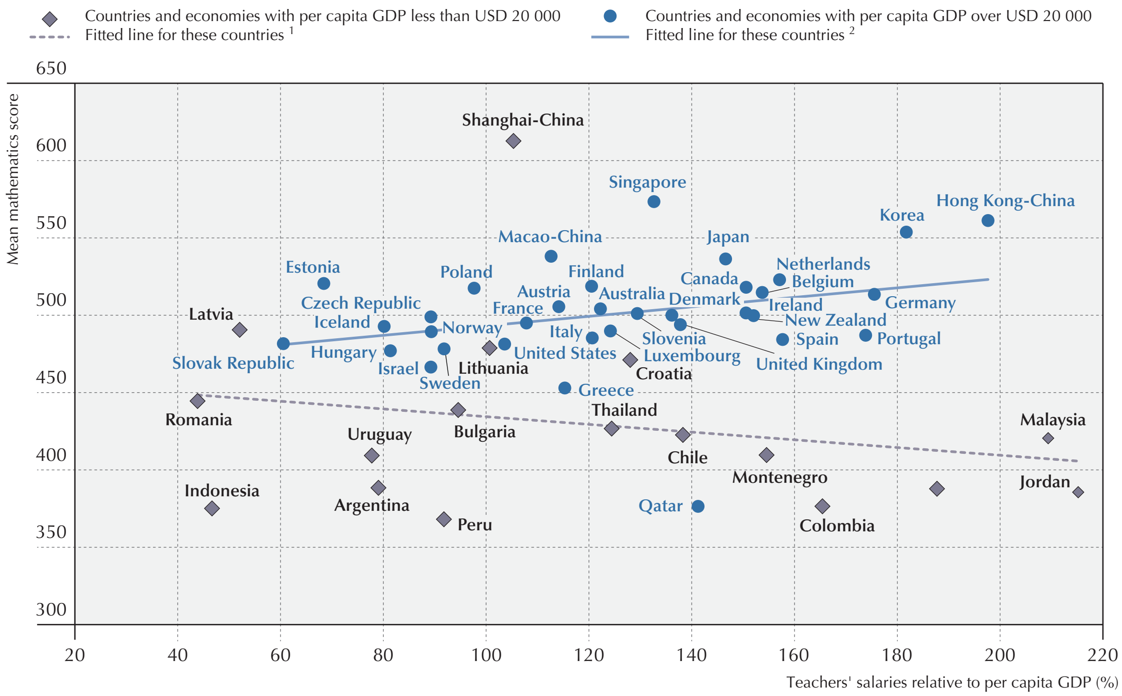
School systems also need to ensure that teachers are allocated to schools and students where they can make the most difference. They could re-examine teacher hiring/allocation systems to ensure that disadvantaged schools get enough qualified teachers, develop incentive programmes to attract qualified teachers to these schools, and ensure that teachers in disadvantaged schools participate in in-service training (results show that these teachers are less likely to participate in professional training).

Fairness in resource allocation is not only important for equity in education, but it is also related to the performance of the school system as a whole.

PISA results show that school systems with high student performance in mathematics tend to allocate resources more equitably between advantaged and disadvantaged schools. In these systems, there are smaller differences in principals' reports on teacher shortage, the adequacy of educational resources and physical infrastructure, and smaller differences in average mathematics learning time between schools with more advantaged and those with more disadvantaged students. For example, Estonia, Finland and Korea all show higher-than-OECD-average performance in mathematics. In these countries, principals in disadvantaged schools tended to report that their schools had adequate educational resources as much as, if not more than, principals in advantaged schools so reported.

Pre-primary education is also an educational resource. Although enrolment in pre-primary schools has increased since 2003, the rate of that increase is higher among advantaged students than disadvantaged students, which means that the socio-economic disparity between students who had attended pre-primary education and those who had not has widened over time. Policies that ensure that disadvantaged students and families have access to high-quality pre-primary education and care can help to reverse that trend. Governments should ensure that quality pre-primary education is available locally, especially when disadvantaged families are concentrated in certain geographic areas, and should develop fair and efficient mechanisms for subsidising pre-primary education to ease the financial burden on families.

Teachers' salaries and mathematics performance



Note: Teachers' salaries relative to per capita GDP refers to the weighted average of upper and lower secondary school teachers' salaries. The average is computed by weighting lower and upper secondary teachers' salaries according to the enrolments of 15-year-old students (for countries and economies with valid information for both upper and lower secondary education).

1. A non-significant relationship (p > 0.10) is shown by the dotted line.
2. A significant relationship (p < 0.10) is shown by the solid line.

Source: OECD, PISA 2012 Database; Figure IV.1.10.

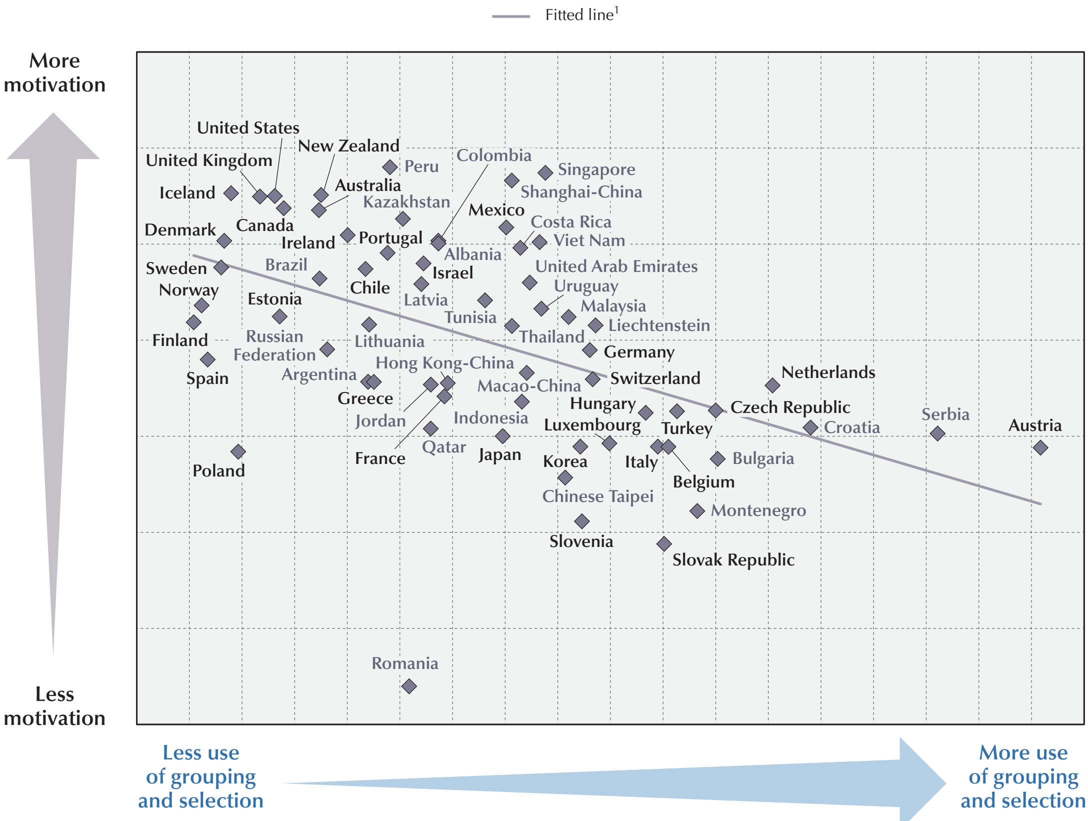
Brazil, Germany, Israel, Mexico and Turkey have recently implemented targeted policies to improve the performance of low-achieving schools or students, or have distributed more resources to those regions and schools that need them most. Considering the importance of equity in resource allocation, the OECD has launched a new project on this issue, the OECD Review of Policies to Improve the Effectiveness of Resource Use in Schools. More detailed information on how some high-performing countries allocate resources will be available as of 2015.

School systems that make less use of stratification – separating students into different schools, "tracks" and grade levels according to their ability or behaviour – show greater equity in education opportunities and outcomes.

Cross-country analyses show that in the systems where more students repeat a grade, the impact of students' socio-economic status on their performance is stronger. Students in schools where no ability grouping is practiced also scored eight points higher in mathematics in 2012 compared to their counterparts in 2003, while students in schools where ability grouping is practiced in some or all classes had lower scores in 2012 than their counterparts in 2003 did.

In highly stratified systems, there may be more incentives for schools to select the best students, and fewer incentives to support difficult students if there is an option of transferring them to other schools.

Students' motivation and grouping of students



Note: The horizontal axis is based on values on the composite *index of horizontal differential between schools*, which, in turn, is based on the number of educational tracks, prevalence of vocational and pre-vocational programmes, early selection, academic selectivity, and school transfer rates; the vertical axis is based on values on the adjusted *index of instrumental motivation for mathematics*.

1. A significant relationship ($p < 0.10$) is shown by the solid line.

Source: OECD, PISA 2012 Database; Figure IV.2.9.

In contrast, in comprehensive systems, schools must find ways of working with students from across the performance spectrum. School systems that continue to differentiate among students in these ways need to create appropriate incentives to ensure that some students are not "discarded" by the system.

PISA 2012 results also show that students in more comprehensive systems reported that making an effort in mathematics and learning mathematics are important for their future career. This does not necessarily mean that if stratification policies were changed, students in stratified systems would be more motivated to learn, since PISA does not measure cause and effect. However, policy makers in highly stratified systems need to consider not only the equity aspect of education outcomes but also non-cognitive outcomes, such as students' attitudes towards learning.

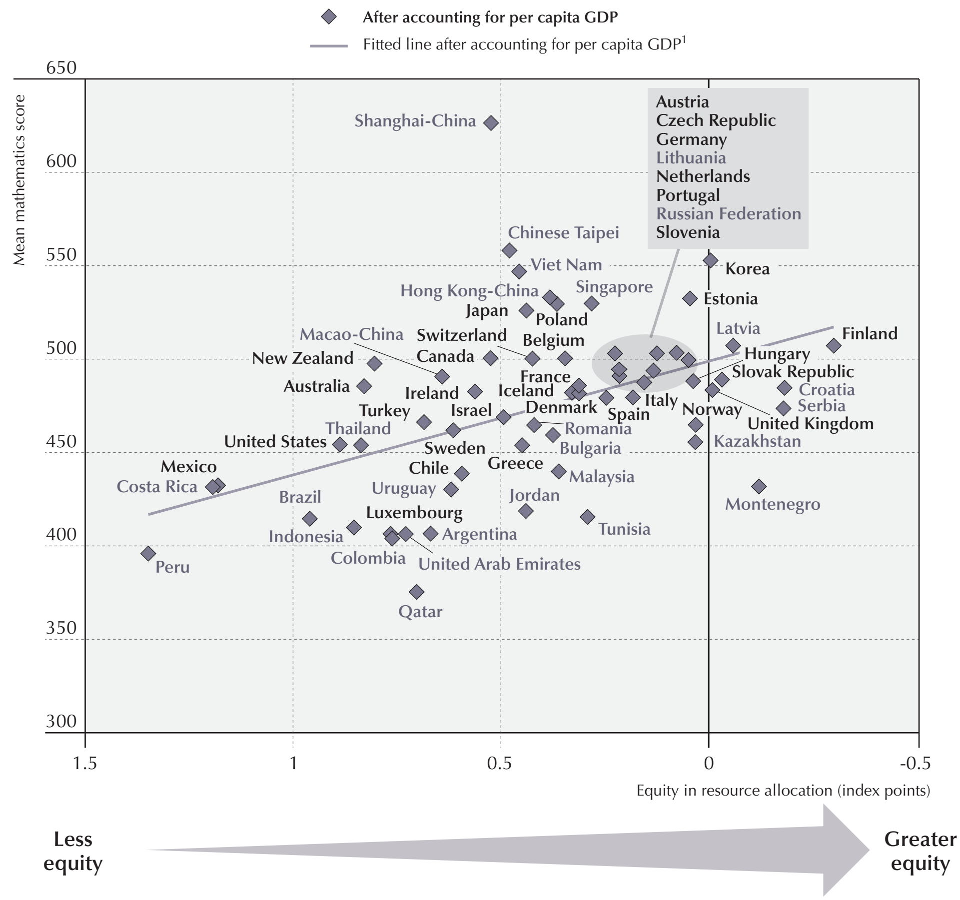
Reflecting these results, Poland, for example, reformed its education system by delaying the age of selection into different programmes; and schools in Germany are also moving towards reducing the levels of stratification across education programmes.

It is important to engage all stakeholders, including students, in school self-evaluations.

Most schools use various forms of evaluations, such as self-evaluations, external school evaluations and teacher appraisals for quality control. PISA shows that, on average across OECD countries, 92% of students are in schools that use at least a self-evaluation or external evaluation to ensure and improve school quality, and around 60% of students are in schools that seek written feedback from students regarding lessons, teachers or resources in addition to using self-evaluations and/or external evaluations of the school.

PISA results also show that in systems that attain a high level of equity, more schools tend to seek written feedback from students regarding lessons, teachers or resources. Some countries engage students in school evaluations by establishing student councils or conducting student surveys in schools. In order to use the feedback from students effectively, school staff may need assistance in interpreting the evaluative information and translating it into action. Trust among school staff and students, and strong commitment from the school community, is key to making this practice work.

Allocation of educational resources and mathematics performance



Note: Equity in resource allocation refers to the difference in the *index of quality of schools' educational resources* between socio-economically advantaged and disadvantaged schools.
1. A significant relationship (p < 0.10) is shown by the solid line.
Source: OECD, PISA 2012 Database; Figure IV.1.11.

Creative Problem Solving: Students' Skills in Tackling Real-Life Problems

WHAT THE DATA TELL US

- Students in Singapore and Korea, followed by students in Japan, **score higher in problem solving** than students in all other participating countries and economies.
- In Australia, Brazil, Italy, Japan, Korea, Macao-China, Serbia, England (United Kingdom) and the United States, students perform significantly better in problem solving, on average, than students in other countries who show **similar performance in reading, mathematics and science.** In Australia, England (United Kingdom) and the United States, this is particularly true among strong and top performers in mathematics; in Italy, Japan and Korea, this is particularly true among moderate and low performers in mathematics.
- Across OECD countries, 11.4% of 15-year-old students are top performers in problem solving (Level 5 or 6). They can systematically explore a complex problem scenario, devise multi-step solutions that take into account all constraints, and adjust their plans in light of the feedback received. In Singapore, Korea and Japan, more than one in five students achieve this level. At the same time, 21.4% of students in OECD countries did **not reach the baseline Level 2** in the PISA assessment of problem solving. This means that, at best, they are only able to solve to solve very simple problems that do not require thinking ahead and that are cast in familiar settings, such as choosing a meeting point from a limited set of possibilities while keeping in mind a single constraint on participants' travel times.
- Students in Hong Kong-China, Japan, Korea, Macao-China, Shanghai-China, Singapore and Chinese Taipei perform strongest on **problems that require understanding, formulating or representing new knowledge,** compared to other types of problems. Meanwhile, students in Brazil, Ireland, Korea and the United States perform strongest on **interactive problems** (those that require students to uncover some of the information needed to solve the problem) compared to static problems (those that have all information disclosed at the outset).
- Boys outperform girls in problem solving in 23 countries/economies, girls outperform boys in five countries/economies, and in 16 countries/economies, there is no significant difference in average performance between **boys and girls**.
- On average across OECD countries, there are three top-performing boys for every two top-performing girls in problem solving. In Croatia, Italy and the Slovak Republic, boys are as likely as girls to be low-achievers, but are more than twice as likely to be **top performers** as girls. In no country or economy are there more girls than boys among the top performers in problem solving.
- **Girls** appear to be stronger in performing the "planning and executing" tasks that measure how students use knowledge, compared to other tasks, and weaker in performing the more abstract "representing and formulating" tasks, which relate to how students acquire knowledge.
- The **impact of socio-economic status** on problem-solving performance is weaker than it is on performance in mathematics, reading or science.

Snapshot of performance in problem solving

Light blue	Countries/economies with mean score/share of top performers/relative performance/solution rate above the OECD average Countries/economies with share of low achievers below the OECD average
White	Countries/economies with mean score/share of top performers/share of low achievers/relative performance/solution rate not statistically different from the OECD average
Grey	Countries/economies with mean score/share of top performers/relative performance/solution rate below the OECD average Countries/economies with a share of low achievers above the OECD average

Countries/economies in which the performance difference between boys and girls is statistically significant are marked in **bold**

	Performance in problem solving				Relative performance in problem solving, compared with students around the world with similar performance in mathematics, reading and science	Performance in problem solving, by process		Performance in problem solving, by nature of the problem situation	
	Mean score in PISA 2012	Share of low achievers (below Level 2)	Share of top performers (Level 5 or 6)	Gender difference (boys - girls)		Solution rate on tasks measuring **acquisition of knowledge**	Solution rate on tasks measuring **utilisation of knowledge**	Solution rate on items referring to a **static** problem situation	Solution rate on items referring to an **interactive** problem situation
	Mean score	%	%	Score dif.	Score dif.	Percent correct	Percent correct	Percent correct	Percent correct
OECD average	500	21.4	11.4	**7**	-7	45.5	46.4	47.1	43.8
Singapore	562	8.0	29.3	**9**	2	62.0	55.4	59.8	57.5
Korea	561	6.9	27.6	**13**	14	62.8	54.5	58.9	57.7
Japan	552	7.1	22.3	**19**	11	59.1	56.3	58.7	55.9
Macao-China	540	7.5	16.6	**10**	8	58.3	51.3	57.0	51.7
Hong Kong-China	540	10.4	19.3	**13**	-16	57.7	51.1	56.1	52.2
Shanghai-China	536	10.6	18.3	**25**	-51	56.9	49.8	56.7	50.3
Chinese Taipei	534	11.6	18.3	12	-9	56.9	50.1	56.3	50.1
Canada	526	14.7	17.5	**5**	0	52.6	52.1	52.7	50.5
Australia	523	15.5	16.7	2	7	52.3	51.5	52.8	49.9
Finland	523	14.3	15.0	**-6**	-8	50.2	51.0	52.1	47.7
England (United Kingdom)	517	16.4	14.3	6	8	49.6	49.1	49.5	47.9
Estonia	515	15.1	11.8	5	-15	46.8	49.5	49.7	45.6
France	511	16.5	12.0	5	5	49.6	49.4	50.3	47.6
Netherlands	511	18.5	13.6	5	-16	48.2	49.7	50.4	46.5
Italy	510	16.4	10.8	**18**	10	49.5	48.0	49.5	46.8
Czech Republic	509	18.4	11.9	8	1	45.0	46.9	46.2	44.4
Germany	509	19.2	12.8	**7**	-12	47.5	49.5	49.4	46.3
United States	508	18.2	11.6	3	10	46.5	47.1	46.6	45.9
Belgium	508	20.8	14.4	**8**	-10	47.0	47.5	48.3	45.4
Austria	506	18.4	10.9	**12**	-5	45.7	47.4	48.3	43.0
Norway	503	21.3	13.1	-3	1	47.7	48.1	49.4	44.5
Ireland	498	20.3	9.4	5	-18	44.6	45.5	44.4	44.6
Denmark	497	20.4	8.7	**10**	-11	44.2	48.1	47.9	42.3
Portugal	494	20.6	7.4	**16**	-3	41.6	45.7	44.0	42.0
Sweden	491	23.5	8.8	-4	-1	45.2	44.6	47.7	41.6
Russian Federation	489	22.1	7.3	**8**	-4	40.4	43.8	43.8	39.7
Slovak Republic	483	26.1	7.8	**22**	-5	40.5	43.2	44.2	38.8
Poland	481	25.7	6.9	0	-44	41.3	43.7	44.1	39.7
Spain	477	28.5	7.8	2	-20	40.0	42.3	42.3	39.8
Slovenia	476	28.5	6.6	-4	-34	37.8	42.3	42.9	36.7
Serbia	473	28.5	4.7	**15**	11	37.7	40.7	40.3	36.8
Croatia	466	32.3	4.7	**15**	-22	35.2	40.5	39.3	35.6
Hungary	459	35.0	5.6	3	-34	35.2	37.6	38.2	33.9
Turkey	454	35.8	2.2	**15**	-14	32.8	36.0	35.8	32.7
Israel	454	38.9	8.8	6	-28	38.7	37.0	39.7	35.6
Chile	448	38.3	2.1	**13**	1	30.9	35.2	34.9	31.8
Cyprus[1,2]	445	40.4	3.6	**-9**	-12	33.6	34.8	37.0	31.4
Brazil	428	47.3	1.8	**22**	7	28.0	32.0	29.8	29.1
Malaysia	422	50.5	0.9	**8**	-14	29.1	29.3	30.1	27.4
United Arab Emirates	411	54.8	2.5	**-26**	-43	28.4	29.0	29.9	27.1
Montenegro	407	56.8	0.8	**-6**	-24	25.6	30.0	30.3	25.1
Uruguay	403	57.9	1.2	**11**	-27	24.8	27.9	27.5	24.8
Bulgaria	402	56.7	1.6	**-17**	-54	23.7	26.7	28.4	22.3
Colombia	399	61.5	1.2	**31**	-7	21.8	27.7	26.3	23.7

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.

Countries and economies are ranked in descending order of the mean score in problem solving in PISA 2012.

Source: OECD, PISA 2012 Database; Tables V.2.1, V.2.2, V.2.6, V.3.1, V.3.6 and V.4.7.

WHAT THIS MEANS FOR POLICY AND PRACTICE

Recent decades witnessed a marked increase in the share of jobs that require high levels of creative problem-solving skills. Fifteen-year-olds who, today, lack these skills thus face a high risk of economic disadvantage as adults. They will compete for jobs that are becoming rare; and if they are unable to adapt to new circumstances and learn in unfamiliar contexts, they may find it particularly difficult to move to better jobs as economic and technological conditions evolve. The first PISA assessment of creative problem-solving skills shows how well-prepared students are to confront – and solve – the kinds of problems that are encountered almost daily in 21st century life.

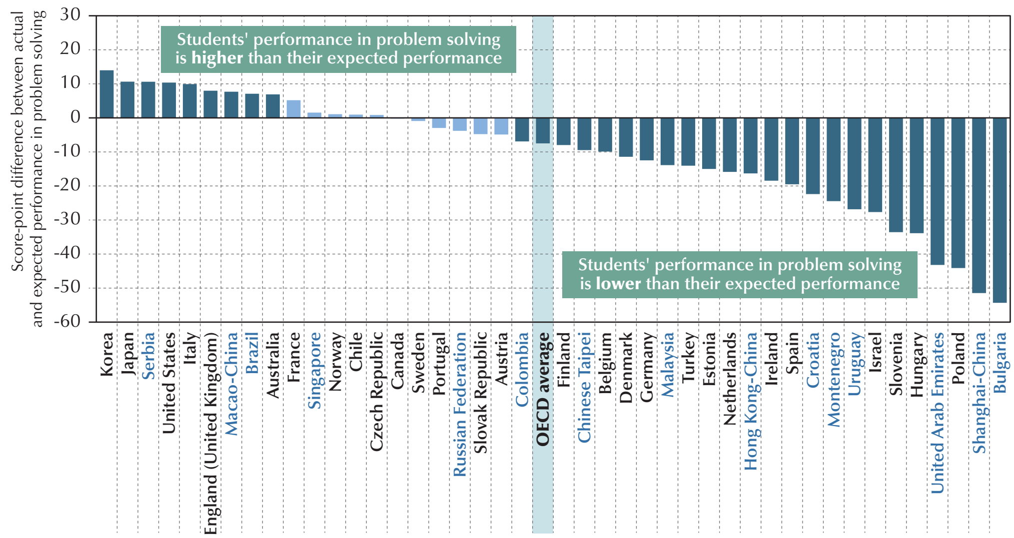
Large proportions of 15-year-olds lack basic problem-solving skills.

The analysis of results from the problem-solving assessment shows that, on average across OECD countries, about one in five students is only able to solve very straightforward problems – if any – provided they refer to familiar situations, such as choosing the least-expensive furniture from a catalogue showing different brands and prices (Level 1 tasks). In six partner countries, fewer than half the students can perform beyond this baseline level of problem-solving proficiency. In contrast, in Korea, Japan, Macao-China and Singapore, more than nine out of ten students can complete tasks at Level 2 or higher. While these countries are close to the goal of giving each student the basic tools needed to meet the challenges that arise in daily life, even within the best-performing countries, significant numbers of 15-year-olds do not possess the basic problem-solving skills considered necessary to succeed in today's world, such as the ability to think just one step ahead or to engage with unfamiliar situations.

Results show that school curricula – and teachers – make a difference in imparting problem-solving skills.

As in other assessment areas, there are wide differences between and within countries in the ability of 15-year-olds to fully engage with and solve non-routine problems in real-life contexts. These differences, however, do not always mirror those observed in the core PISA domains of mathematics, reading and science.

Relative performance in problem solving



Notes: Significant differences are shown in a darker tone.
Each student's expected performance is estimated, using a regression model, as the predicted performance in problem solving given his or her score in mathematics, reading and science.
Countries and economies are ranked in descending order of the score-point difference between actual and expected performance.
Source: OECD, PISA 2012 Database; Table V.2.6.

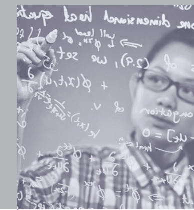
Just because a student performs well in core school subjects doesn't mean he or she is proficient in problem solving. In Australia, Brazil, Italy, Japan, Korea, Macao-China, Serbia, England (United Kingdom) and the United States, students perform significantly better in problem solving than students in other countries who show similar performance in mathematics, reading and science. Countries where students perform worse in problem-solving than students in other countries who show similar proficiency in core school subjects may look more closely at the curricula and instructional styles in the more successful countries to determine how to equip students better for tackling complex, real-life problems in contexts that they do not usually encounter at school.

Within all countries, problem-solving results vary greatly between schools – including schools that share similar performance in mathematics. This suggests that the development of problem-solving competencies, while influenced by differences in individuals' cognitive abilities, critically depends on good teaching. Ensuring that all students are provided opportunities to develop problem-solving skills in all subjects, including those not assessed by PISA, depends, in turn, on school- and system-level policies.

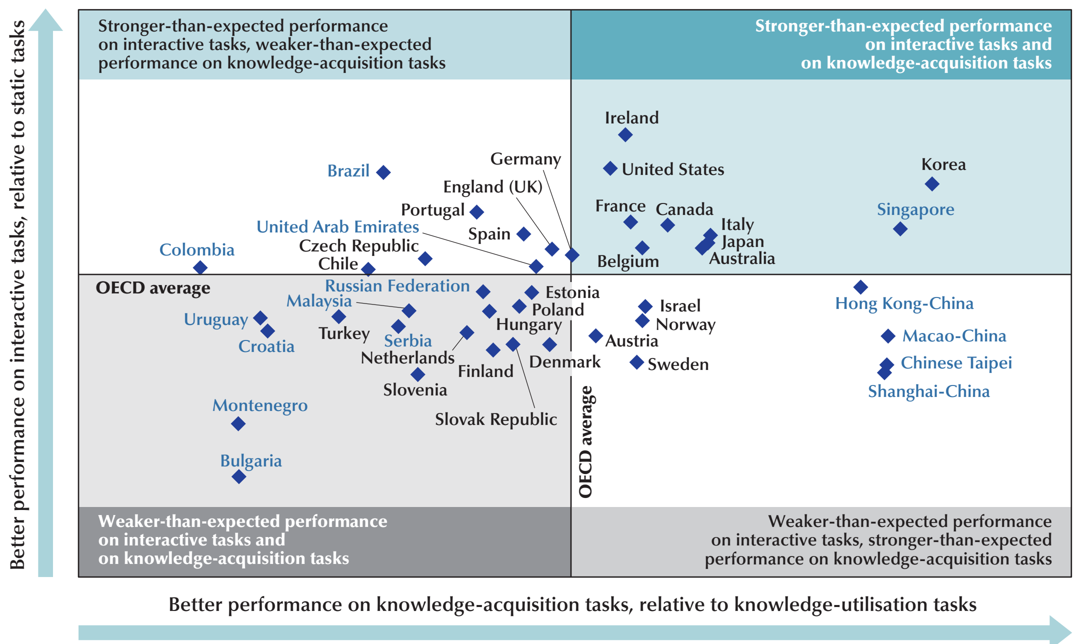
But how can teachers and schools foster students' skills in solving problems across domains? Research shows that training problem-solving skills out of context is not the solution. One promising approach is to encourage teachers and students to reflect on solution strategies when dealing with subject-specific problems in the classroom. This metacognitive reflection might support students' own thought processes and expand their repertoire of generic principles applicable to different contexts. In addition, such strategies can be applied within all areas of instruction – from reading and mathematics to biology, history and the visual arts. Students who recognise, for instance, a systematic exploration strategy when it occurs in history or science class may use it with more ease when confronted with unfamiliar problems. When teachers ask students to describe the steps they took to solve a problem, they encourage students' metacognition, which, in turn, improves general problem-solving skills.





Students' strengths and weaknesses in problem solving



Note: In interactive tasks, students must uncover some of the information required to solve the problem; static tasks have all the necessary information disclosed at the outset. For each country/economy and for each set of tasks, expected performance is based on the country's/economy's overall performance in problem solving and on the relative difficulty of tasks, as measured across OECD countries.
Source: OECD, PISA 2012 Database; Tables V.3.1 and V.3.6.

Strengths and weaknesses in problem solving can inform a redesign of the curriculum and teaching practices.

Differences in performance across different types of problem-solving tasks are likely a reflection of how well students learn, through the content of the various school subjects and the way in which it is taught, to handle unexpected obstacles and deal with novelty.

In some countries and economies, such as Finland, Shanghai-China and Sweden, students master the skills needed to solve static, analytical problems similar to those that textbooks and exam sheets typically contain. But the same 15-year-olds are less successful when not all information that is needed to solve the problem is disclosed, and the information provided must be completed by interacting with the problem situation.

A specific difficulty with problems that require students to be open to novelty, tolerate doubt and uncertainty, and dare to use intuitions ("hunches and feelings") to initiate a solution suggests that opportunities to develop and exercise these traits, which are related to curiosity, perseverance and creativity, need to be prioritised.

In yet other countries and economies, such as Portugal and Slovenia, students are better at using their knowledge to plan and execute a solution than they are at acquiring such useful knowledge themselves, questioning their own understanding, and generating and experimenting with alternatives. The relatively weak performance of these students on problems that require abstract information processing suggests that opportunities to develop the reasoning skills and habits of self-directed learners and effective problem-solvers need to be prioritised.

Gender disparities among top performers may be related to the scarcity of women in leadership positions.

While boys and girls do not differ markedly in their average problem-solving performance, the variation in performance is larger among boys than among girls. At lower levels of proficiency, there are, in general, equal proportions of boys and girls. But the highest-performing students in problem solving are largely boys – with a few notable exceptions, such as in Australia, Finland and Norway, where the proportion of top-performing girls is about the same as the proportion of top-performing boys. Similarly, the Survey of Adult Skills (PIAAC) shows that among adults, top-performers in problem solving are mostly men (except in Australia, Canada and Finland).

Increasing the number of girls at the highest levels of performance in problem solving, and improving their ability to handle complex, unfamiliar problems, may help more women attain leadership positions in the future.

Inequities in education related to socio-economic status cast a long shadow.

The impact of socio-economic disadvantage on problem-solving skills is weaker than it is on performance in mathematics, reading or science. Across the socio-economic spectrum, there is more variation in performance in problem solving than there is in mathematics, perhaps because after-school opportunities to develop problem-solving skills are more evenly distributed than opportunities to develop proficiency in mathematics or reading.

Still, unequal access to high-quality education means that the risk of not reaching the baseline level of performance in problem solving is about twice as large for disadvantaged students as it is for their more advantaged peers, on average. The fact that inequities in education opportunities extend beyond the boundaries of individual school subjects to performance in problem solving underscores the importance of promoting equal learning opportunities for all. Because current inequities have such significant consequences over the long term, policies that aim to reduce socio-economic disparities in education can be expected to benefit the lives of students well beyond their school days.

Students and Money: Financial Literacy Skills for the 21st Century

WHAT THE DATA TELL US

- Shanghai-China has the **highest score in financial literacy**, followed by the Flemish Community of Belgium, Estonia, Australia, New Zealand, the Czech Republic and Poland. On average, all of these score above the average for the participating OECD countries. There are wide differences in average performance between the highest- and lowest-performing countries and economies: more than 75 score points (a full PISA proficiency level) among OECD countries and economies, and more than 225 score points across all participants.
- Only one in ten students across participating OECD countries and economies can tackle the **most difficult financial literacy tasks** in PISA 2012. They can analyse financial products involving features that are not immediately evident, such as transaction costs, solve non-routine financial problems, such as calculating the balance in a bank statement while accounting for transfer fees, and demonstrate an understanding of the wider financial landscape, such as the implications of income-tax brackets.
- Some 15% of students, on average, score **below the baseline level of performance** on the PISA financial literacy scale. At best, these students can recognise the difference between needs and wants, make simple decisions about everyday spending, recognise the purpose of common financial documents, such as an invoice, and apply single and basic numerical operations (addition, subtraction or multiplication) in contexts that they are likely to have encountered personally.
- Although financial literacy skills are positively **correlated with mathematics and reading skills**, high performance in one of those core subjects does not necessarily signal proficiency in financial literacy.
- A more **socio-economically advantaged student** scores 41 points higher in financial literacy than a less-advantaged student, on average across participating OECD countries and economies. Estonia is the only participating country that combines above-average performance with a weaker-than-average association between financial literacy performance and socio-economic status.
- **Gender gaps** in financial literacy among 15-year-olds are narrow, unlike those found in adult populations. In all participating countries and economies, except Italy, there are no differences in average financial literacy scores between boys and girls. However, across OECD countries and economies, there are more top-performing boys than girls, and more low-performing boys than girls, in financial literacy.
- In 9 out of 13 OECD participating countries and economies, after adjusting for socio-economic status, **students who hold a bank account** perform as well as those who do not, while in the Flemish Community of Belgium, Estonia, New Zealand, and Slovenia, students who hold a bank account score higher in financial literacy than students of similar socio-economic status who do not.
- Students' **attitudes towards learning**, such as perseverance and openness to problem solving, are positively associated with performance in the PISA financial literacy assessment.

WHAT THIS MEANS FOR POLICY AND PRACTICE

Performance in financial literacy among participating countries and regions

	Mean score	Range of ranks: All countries/economies: Upper rank	Lower rank
Shanghai-China	603	1	1
Flemish Community (Belgium)	541	2	2
Estonia	529	3	4
Australia	526	3	5
New Zealand	520	4	6
Czech Republic	513	5	7
Poland	510	6	7
Veneto (Italy)	501		
Friuli Venezia Giulia (Italy)	501		
Latvia	501	8	9
OECD average-13	500		
Bolzano (Italy)	500		
Trento (Italy)	498		
United States	492	8	12
Lombardia (Italy)	491		
Russian Federation	486	9	14
France	486	9	14
Slovenia	485	9	14
Spain	484	10	15
Emilia Romagna (Italy)	481		
Piemonte (Italy)	481		
Croatia	480	11	16
Israel	476	11	17
Valle d'Aosta (Italy)	476		
Marche (Italy)	474		
Umbria (Italy)	474		
Toscana (Italy)	471		
Slovak Republic	470	15	17
Liguria (Italy)	468		
Italy	466	16	17
Puglia (Italy)	462		
Lazio (Italy)	460		
Molise (Italy)	453		
Abruzzo (Italy)	449		
Basilicata (Italy)	446		
Sardegna (Italy)	446		
Campania (Italy)	439		
Sicilia (Italy)	429		
Manizales (Colombia)	417		
Calabria (Italy)	415		
Medellin (Colombia)	414		
Bogota (Colombia)	397		
Cali (Colombia)	389		
Colombia	379	18	18
Rest of the country (Colombia)	372		

Notes: OECD countries and subnational entities that are not included in national results are shown in bold black. Partner countries and subnational entities that are not included in national results are shown in bold blue. Regions are shown in black italics (OECD countries) or blue italics (partner countries).

Countries, economies and subnational entities are ranked in descending order of the mean score in financial literacy.

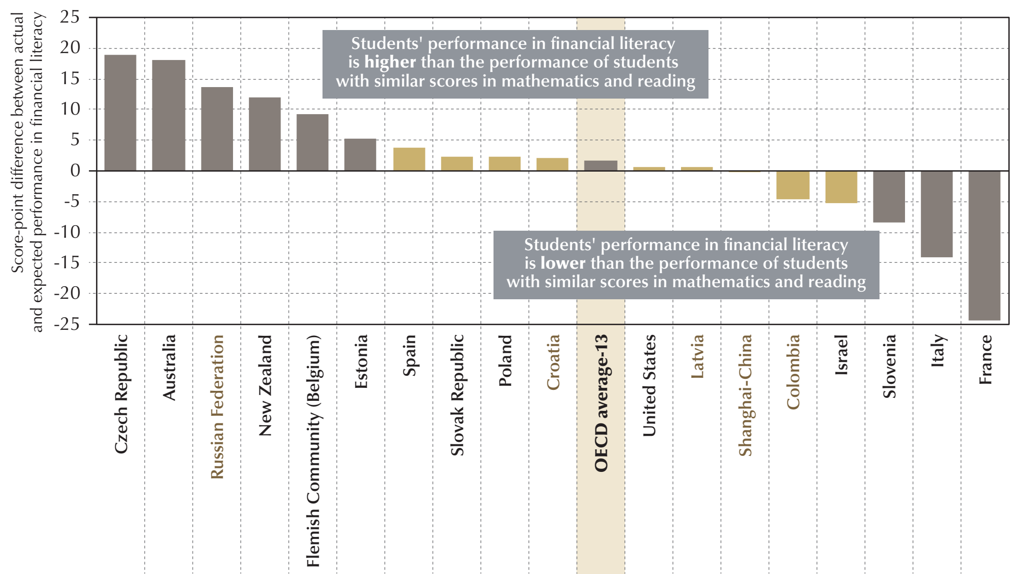
Source: OECD, PISA 2012 Database.

Improving students' financial literacy can be accomplished in a variety of ways.

While performance in financial literacy is strongly correlated with performance in mathematics and reading, the strength of that relationship varies across countries. Students in some countries that perform well in financial literacy, such as Australia, the Czech Republic, Estonia, the Flemish Community of Belgium and New Zealand, score higher in financial literacy, on average, than their performance in mathematics and reading would predict. In contrast, in France, Italy and Slovenia, students' scores in financial literacy are lower than those of students in other countries with similar mathematics and reading proficiency. This evidence suggests that, in this latter group of countries, students need a different set of skills, in addition to those they acquire in school, to perform well in financial literacy.

Some countries seek to improve financial literacy skills among their students by incorporating specific financial literacy content into the curriculum, either by identifying how it fits within existing subjects within the curriculum or – less frequently – by creating a stand-alone subject; others focus on strengthening fundamental skills, like mathematics, with the expectation that students who have a better understanding of mathematical concepts will also be able to apply that understanding to financial contexts. As dedicated financial literacy approaches are relatively new (where they exist), the PISA 2012 financial literacy assessment cannot provide conclusive evidence on which of these strategies, or what combination of them, yields superior outcomes in financial literacy. The next PISA survey of financial literacy, scheduled for 2015, should provide further insights for policy.

Relative performance in financial literacy



Note: Significant differences are shown in darker tones.
Countries and economies are ranked in descending order of the score-point difference between actual and expected performance.
Source: OECD, PISA 2012 Database; Table VI.2.4.

Reinforcing positive attitudes towards learning, such as perseverance and openness to problem solving, may have a positive impact on acquiring not only core skills but also skills in financial decision making.

Many financial decisions require continued effort or patience over the long term. Perseverance is therefore important for many financial activities, such as saving for a future expense or repaying loans. Openness to problem solving, which includes the willingness to handle a lot of information and solve complex problems, is also a useful quality when young adults have to choose a loan or an insurance policy, such as when buying their first car. Openness to problem solving is positively related to performance in financial literacy across countries: on average across OECD countries and economies, the difference in financial literacy performance between students who agreed with the statement "I like to solve complex problems" and students who disagreed is equal to 31 score points, or almost half a proficiency level.

Evidence that there is a positive relationship between financial literacy and holding a bank account – albeit before adjusting for socio-economic background – may suggest that some kind of experience with financial products (at least with a bank account) may reinforce students' financial literacy or that students who are more financially literate are more motivated to use financial products – and perhaps more confident in doing so. It could also indicate parents' involvement in their child's education, as parents may have acquired a bank account for their child and taught him or her how to use it. More national and international research is needed to determine the extent and impact of different experiences in this area.

Policies should aim to enhance girls' and underperforming boys' abilities in financial literacy, and reduce inequities in financial literacy related to socio-economic status.

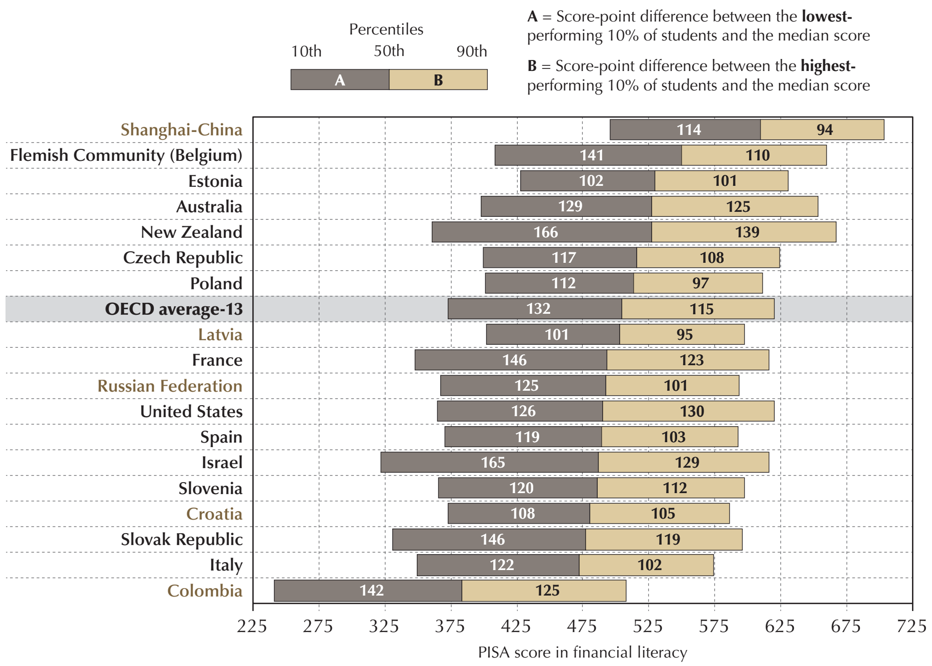
Gender differences in financial literacy among 15-year-olds are relatively small, on average, even when comparing students with similar mathematics and reading performance, although gender differences are larger among high- and low-performing students.

This finding is in contrast to the significant gender differences in financial knowledge among adults observed in a number of countries, including Australia, Colombia, France, Italy, New Zealand and the United States.

The PISA 2012 assessment of financial literacy highlights significant differences in financial literacy related to students' socio-economic status (particularly wealth and whether their parents work in finance, in some countries) and immigrant background. In some countries, students with an immigrant background (those either born abroad or with foreign-born parents) lack the financial literacy skills needed to participate fully in their society. On average, non-immigrant students perform slightly better in financial literacy than immigrant students, even after taking into account their socio-economic status, the language spoken at home, and their performance in mathematics and reading. This outcome may reflect immigrant students' lack of financial vocabulary or their parents' lack of experience with the financial system in their new country and thus their inability to offer guidance to their children. Or, it may suggest that students' schools or parents have emphasised the acquisition of core skills over a broader range of life skills.

These findings demonstrate the importance of providing all students with equal access to opportunities to develop their financial literacy skills. Without policy interventions that specifically target disadvantaged students, disparities in financial literacy related to socio-economic status, and their implications for social and economic inclusion, will be reproduced and possibly reinforced in the next generation.

Variation in financial literacy performance within countries and economies



Countries and economies are ranked in descending order of median performance (50th percentile) in financial literacy.
Source: OECD, PISA 2012 Database; Table VI.2.4.

PISA

PISA 2012 RESULTS

Volume I, *What Students Know and Can Do: Student Performance in Mathematics, Reading and Science*, summarises the performance of students in PISA 2012.

Volume II, *Excellence through Equity: Giving Every Student the Chance to Succeed*, defines and measures equity in education and analyses how equity in education has evolved across countries between 2003 and 2012.

Volume III, *Ready to Learn: Students' Engagement, Drive and Self-Beliefs*, explores students' engagement with and at school, their drive and motivation to succeed, and the beliefs they hold about themselves as mathematics learners.

Volume IV, *What Makes Schools Successful? Resources, Policies and Practices*, examines how student performance is associated with various characteristics of individual schools and school systems.

Volume V, *Creative Problem Solving: Students' Skills in Tackling Real-Life Problems*, presents student performance in the PISA 2012 assessment of problem solving, which measures students' capacity to respond to non-routine situations.

Volume VI, *Students and Money: Financial Literacy Skills for the 21st Century*, examines students' performance in financial literacy and their experience with money.

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PISA

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