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Who and Where are the Low-Performing Students?

Poor performance at school has long-term consequences for both the individual and for society as a whole. This chapter discusses how low performance is measured in PISA and describes the incidence of low performance across countries and over time. It also explains how some countries have managed to reduce their share of low-performing students.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Failure, it is often said, is a necessary step on the way towards success. But for far too many students around the world, failure at school is a dead end. These students get trapped in a vicious circle of poor performance and demotivation that leads only to more bad marks and further disengagement from school. Worse, poor performance at school has long-term consequences, both for the individual and for society as a whole. Students who perform poorly at age 15 face a high risk of dropping out of school altogether. The Canadian longitudinal study, *Youth In Transition*, in which students who had participated in PISA 2000 were surveyed every two years following the PISA test, found that students who scored in the bottom quartile in the PISA reading assessment were much more likely to drop out of secondary school and less likely to have completed a year of schooling beyond grade 12 than those in the top quartile (OECD, 2010).

Another survey, conducted in Denmark using data from PISA and from the 2012 Survey of Adult Skills (a product of the OECD Programme for the International Assessment of Adult Competencies, or PIAAC), found that students who are poor readers at school are unlikely to improve much by the time they become young adults. Of all Danish 15-year-olds who scored among the lowest third in reading proficiency in PISA 2000, about 61% also scored among the lowest third in literacy proficiency in the Survey of Adult Skills (PIAAC) 12 years later; only 39% of them had improved their reading skills over the intervening years to attain scores in the middle or top third in literacy proficiency (Danish Ministry of Education, 2014).

The 2012 Survey of Adult Skills (PIAAC) also found that poor proficiency in numeracy and literacy not only limits access to better-paying and more-rewarding jobs, but is also linked to poorer health and less social and political participation (OECD, 2013a). Extensive research confirms the impact of low academic performance on future educational and socio-economic attainment (e.g. Erickson et al., 2005; Rose and Betts, 2004).

What the data tell us

- On average across OECD countries, some 28% of students score below the baseline level of proficiency in at least one of the three core subjects that PISA assesses (reading, mathematics and science). The share of low performers is greater in mathematics (23%) than in reading or science (18% in each). Some 12% of students are low performers in all three subjects, and 3% of students perform below Level 1 in all three subjects.
- Almost four million 15-year-old students across OECD countries are low performers in mathematics, and almost three million are low performers in reading and science. Across the 64 countries and economies that participated in PISA 2012, 11.5 million 15-year-old students are low performers in mathematics, 8.5 million are low performers in reading, and 9 million are low performers in science.
- Nine countries reduced their share of low performers in mathematics between the 2003 and 2012 PISA assessments. Four of them (Brazil, Mexico, Tunisia and Turkey) improved by reducing the share of students who perform below Level 1, while in five (Germany, Italy, Poland, Portugal and the Russian Federation), the share of students at Level 1 and below Level 1 shrank simultaneously.

Based on results from PISA 2012, more than one in four 15-year-old students in OECD countries end their schooling without having attained a baseline level of proficiency in at least one of the three core subjects PISA assesses: reading, mathematics and science. In OECD partner countries and economies, the proportion of these students can be much larger. In absolute numbers, this means that about 13 million 15-year-old students in the 64 countries and economies that participated in PISA 2012 were low performers in at least one subject (Figure 1.1).

When a large share of the population lacks basic skills, a country's long-term economic growth is severely compromised. According to a recent estimate based on PISA data, if reforms were implemented today to raise the level of all low-performing students to baseline proficiency in reading, mathematics and science, the long-term economic gains for OECD countries would cover most, if not all, of the cost of these countries' education systems. Among middle-income countries, many of which also participate in PISA, the economic gains from achieving universal basic skills would average more than eight times their current GDP (OECD, Hanushek and Woessmann, 2015).

Reducing the number of low-performing students is not only a goal in its own right but, as PISA results over the years have shown, it is also an effective way to improve an education system's overall performance – and equity, since low performers are disproportionately from socio-economically disadvantaged families. Brazil, Germany, Italy, Mexico, Poland, Portugal, Tunisia and Turkey, for example, improved their performance in mathematics between 2003 and 2012 by reducing the share of low performers in this subject. Albania, Chile, Germany, Indonesia, Israel, Latvia, Peru and Poland raised their reading scores between 2000 and 2012 largely by reducing the proportion of low performers in reading. And Israel, Korea, Poland, Qatar, Romania, Thailand and Turkey improved their science performance between 2006 and 2012 largely because they reduced the share of poor performers in that subject (OECD, 2014a; OECD, 2015; OECD, 2011).

What do these countries have in common? Not very much; as a group, they are about as socio-economically and culturally diverse as can be. But therein lies the lesson: *all* countries can improve their students' performance, given the right policies and the will to implement them.

HOW PISA DEFINES LOW PERFORMERS

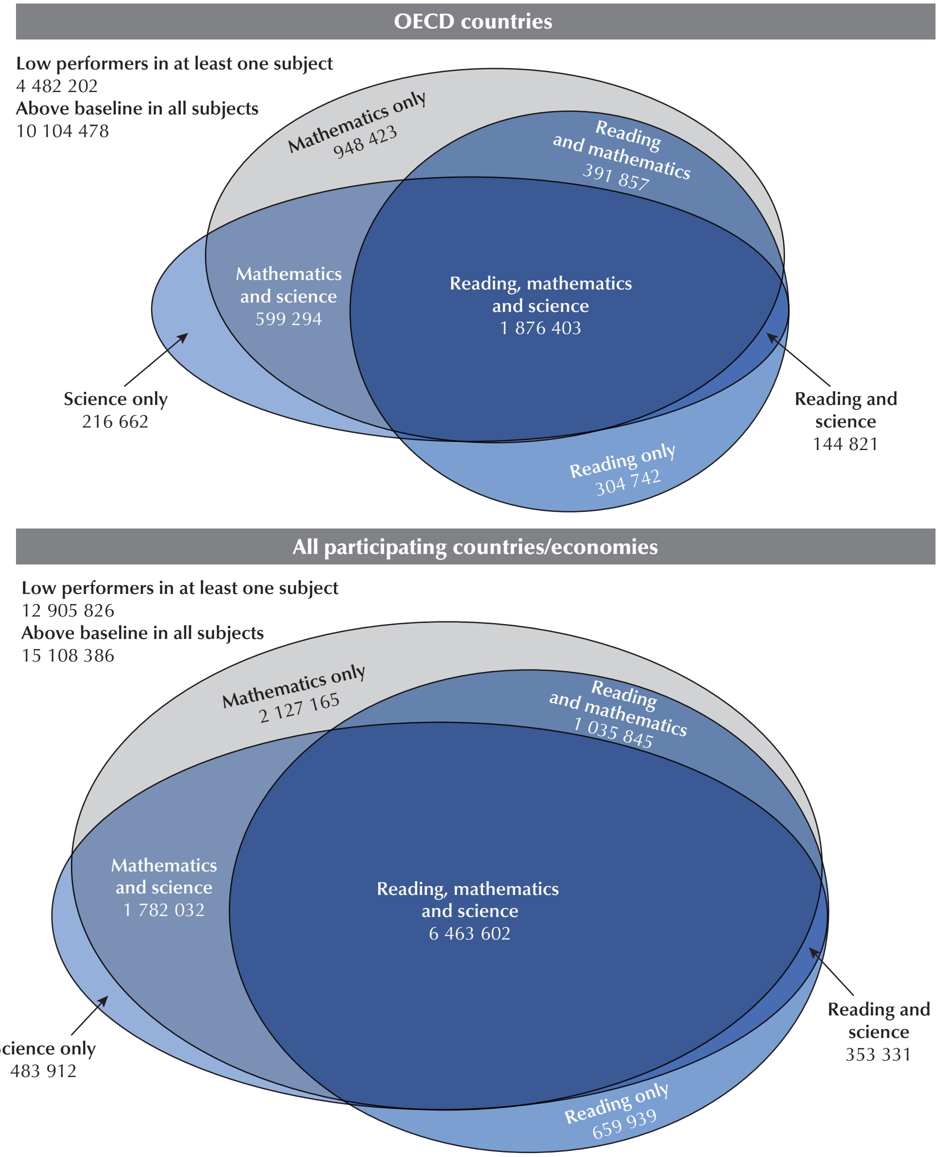
In each of the three core subjects PISA assesses – reading, mathematics and science –, proficiency is measured on a continuous numerical scale in score points. On average across OECD countries, these scales have a mean of 500 score points and a standard deviation of 100 points. To allow for more nuanced interpretations of the assessment results, the proficiency scales are divided into six levels, ranging from lowest (Level 1) to highest (Level 6) proficiency. As shown in Figure 1.2, low-performing students in mathematics are those who score under 420 points, low performers in reading are those who score under 407 points, and low performers in science are those who score below 410 points.

The range of scores within each proficiency level also varies slightly across subjects (62 score points in mathematics, 72 score points in reading, and 74 score points in science). As a reference, 40 score points is considered the equivalent of a full year of schooling. In 2009, PISA further subdivided Level 1 on the reading scale into Levels 1a and 1b to allow for a more precise assessment of skills among the lowest performers in reading.

■ Figure 1.1 ■

Overlap of low performers in mathematics, reading and science

Absolute number



Notes: Low performers are students who score below the baseline level of proficiency, that is, who are proficient at Level 1 or below.
Numbers in the figures are point estimates based on the total enrolled population of 15-year-olds and the percentage of low performers in each country and economy. Because these estimations have a margin of error, see confidence intervals in Table 1.7b.
Source: OECD, PISA 2012 Database, Table 1.7b.

■ Figure 1.2 ■

Proficiency levels in mathematics, reading and science

	Proficiency level	Lowest score point in the level			
		Mathematics	Reading		Science
Students who score above the baseline proficiency level	Level 6	669	698		708
	Level 5	607	626		633
	Level 4	545	553		559
	Level 3	482	480		484
	Level 2 (baseline)	420	407		410
Low-performing students (below baseline)	Level 1	358	Level 1a	335	335
			Level 1b	262	
	Below Level 1	.	.		.

PISA defines "low performers" (or "low achievers", as they are also referred to in this report) as those students who score below Level 2 on the PISA mathematics, reading and/or science scales (for a more detailed description of how PISA defines and measures low performance, see the *PISA 2012 Technical Report* [OECD, 2014b]). Level 2 is considered the baseline level of proficiency that is required to participate fully in society. Students who score at Level 1 can answer questions involving clear directions and requiring a single source of information and simple connections; but these students cannot engage in more complex reasoning to solve the kinds of problems that are routinely faced by today's adults in modern societies. Figure 1.3 offers a description of the skills that students who perform just above or just below the baseline level of proficiency could be expected to demonstrate in each of the subjects assessed by PISA.

Box 1.1. **Examples of mathematics tasks at Level 2, Level 1 and below Level 1 in PISA 2012**

An illustration of the kinds of tasks that low performing students typically can and cannot solve correctly is provided below through items that were included in the PISA 2012 mathematics assessment. The unit *CHARTS* presents a bar chart showing 6 months of sales data for music. The complication of the bar chart is that is displays four separate data series (four different bands), and some bands do not have data for all periods. Students have to read values from the graphical representation of data and draw conclusions.

Each one of the three questions making up the unit CHARTS corresponds to a different proficiency level. Question 1, with a difficulty of 347.7, is the easiest of the three questions included in the unit, and is classified as Below Level 1 in the PISA mathematics scale. It requires students to find the bars for April, identify the bar for a particular music band, and read the corresponding number of CDs sold by that band in that month. No scale reading or interpolations is required.

Question 2 is a little more difficult than Question 1, with a difficulty of 415, and is classified as Level 1 in the PISA mathematics scale. This is an example of one of the more difficult mathematics task that low performers are typically able to answer correctly. Students need to identify the bars for two bands and compare their height, starting from January and then for the following months. No reading of the vertical scale is required, only to make a visual comparison of a very simple characteristic (which is bigger).

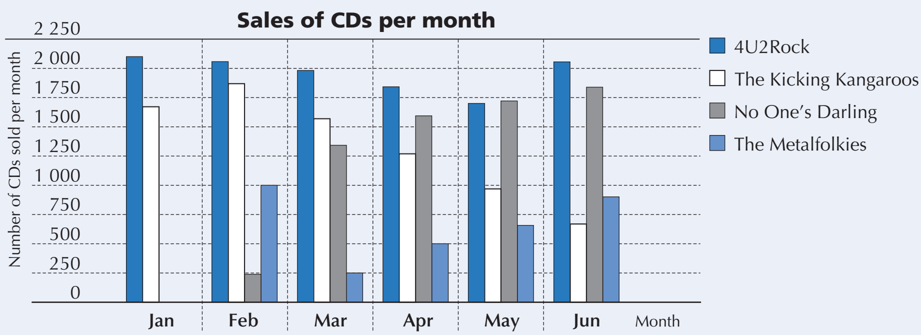
...

Question 5, with a difficulty of 428.2, is just above the baseline of proficiency and is thus classified as Level 2. In this question, students must identify the data series for a particular band and observe the negative trend noted in the lead-in to the item stimulus. It involves some work with numbers and an appreciation that the correct answer to choose may be an approximation to a calculated answer. There are several ways to solve the question. A student might work out each monthly decrease and average them, which involves a lot of calculation. Another student might take one fifth of the total decrease from February to June. Another student might place a ruler along the tops of the bars and find that the July bar would show something between 250 and 500. The question was classified as part of the *employing process* category because it was judged that most students at this level are likely to take the calculation routes, and that carrying these out accurately is likely to present the greatest difficulty for the item.

■ Figure 1.a ■

Charts

In January, the new CDs of the bands *4U2Rock* and *The Kicking Kangaroos* were released. In February, the CDs of the bands *No One's Darling* and *The Metalfolkies* followed. The following graph shows the sales of the bands' CDs from January to June.



CHARTS: Question 1

How many CDs did the band *The Metalfolkies* sell in April?

A. 250
B. 500
C. 1 000
D. 1 270

Scoring

Description: Read a bar chart
Mathematical content area: Uncertainty and data
Question format: Simple multiple choice
Difficulty: 347.7 ***(Below Level 1)***

Full credit

B. 500

No credit

Other responses
Missing

...

CHARTS: Question 2

In which month did the band *No One's Darling* sell more CDs than the band *The Kicking Kangaroos* for the first time?

A. No month
B. March
C. April
D. May

Scoring

Description: Read a bar chart and compare the height of two bars
Mathematical content area: Uncertainty and data
Question format: Simple multiple choice
Difficulty: 415 ***(Level 1)***

Full credit

C. April

No credit

Other responses
Missing

CHARTS: Question 5

The manager of *The Kicking Kangaroos* is worried because the number of their CDs that sold decreased from February to June.
What is the estimate of their sales volume for July if the same negative trend continues?

A. 70 CDs
B. 370 CDs
C. 670 CDs
D. 1 340 CDs

Scoring

Description: Interpret a bar chart and estimate the number of CDs sold in the future assuming that the linear trend continues
Mathematical content area: Uncertainty and data
Question format: Simple multiple choice
Difficulty: 428.2 (***Level 2***)

Full credit

B. 370 CDs

No credit

Other responses
Missing

For other examples of items and more information on the PISA assessment, see *PISA 2012 Assessment and Analytical Framework* (OECD, 2013b).

■ Figure 1.3 ■

Typical skills of students at PISA proficiency Levels 1 and 2 in mathematics, reading and science

	What students can do in mathematics
Level 2	Students can interpret and recognise situations in contexts that require no more than direct inference. They can extract relevant information from a single source and make use of a single representational mode. Students at this level can employ basic algorithms, formulae, procedures, or conventions to solve problems involving whole numbers. They are capable of making literal interpretations of the results.
Level 1	Students can answer questions involving familiar contexts where all relevant information is present and the questions are clearly defined. They are able to identify information and to carry out routine procedures according to direct instructions in explicit situations. They can perform actions that are almost always obvious and follow immediately from the given stimuli.

	What students can do in reading
Level 2	Tasks at this level require the reader to locate one or more pieces of information, which may need to be inferred and may need to meet several conditions. Others require recognising the main idea in a text, understanding relationships, or construing meaning within a limited part of the text when the information is not prominent and the reader must make low-level inferences. Tasks at this level may involve comparisons or contrasts based on a single feature in the text. Typical reflective tasks at this level require readers to make a comparison or several connections between the text and outside knowledge, by drawing on personal experience and attitudes.
Level 1a	Tasks at this level require the reader to locate one or more independent pieces of explicitly stated information; to recognise the main theme or author's purpose in a text about a familiar topic, or to make a simple connection between information in the text and common, everyday knowledge. Typically the required information in the text is prominent and there is little, if any, competing information. The reader is explicitly directed to consider relevant factors in the task and in the text.
Level 1b	Tasks at this level require the reader to locate a single piece of explicitly stated information in a prominent position in a short, syntactically simple text with a familiar context and text type, such as a narrative or a simple list. The text typically provides support to the reader, such as repetition of information, pictures or familiar symbols. There is minimal competing information. In tasks requiring interpretation, the reader may need to make simple connections between adjacent pieces of information.

	What students can do in science
Level 2	Students can provide possible scientific explanations in familiar contexts or draw conclusions based on simple investigations. They are capable of direct reasoning and making literal interpretations of the results of scientific inquiry or technological problem solving.
Level 1	Students can apply scientific knowledge to only a few, familiar situations. They can present scientific explanations that are obvious and follow explicitly from given evidence.

Note: There is no summary description of skills below Level 1 because PISA cannot reliably measure that level of proficiency.

UNDERSTANDING LOW PERFORMANCE: ANALYTICAL FRAMEWORK

There are many factors that influence the likelihood that a student will perform below the proficiency baseline in a particular subject. PISA reports, as well as previous research on a range of specialised topics, including academic achievement (e.g. Hanushek and Woessmann, 2011), and grade repetition and dropout (e.g. Rumberger, 1995; Jimerson, Anderson and Whipple, 2002; Stearns et al., 2007), have explored, albeit indirectly, some of these factors. This corpus of research suggests that there is no single or universal factor that accounts for low performance, but rather an interaction and accumulation of experiences and processes over time that hinder learning and thus increase the probability of low performance (e.g. DiPrete and Eirich, 2006; Alexander, Entwisle and Horsey, 1997; Hao, Hu and Lo, 2014; Bernardi, 2014).

Throughout this report, low performance at age 15 is considered to be related to various factors observed at the student, school and education-system levels (see Figure 1.4).

■ Figure 1.4 ■

Analytical framework and structure of the report

Level of analysis	Chapter	Potential areas of risk	Risk/Protective factors
Students	Chapter 2	Socio-economic status	Socio-economic disadvantage
		Demographic background	Gender, immigrant background, language spoken at home, geographic location, family structure
		Progress through education	Pre-primary education, grade repetition, curricular track in secondary school
	Chapter 3	Attitudes and behaviours towards and at school	Truancy, time on learning activities, self-beliefs, perseverance
Schools	Chapter 4	School socio-economic composition	Concentration of disadvantaged students
		School learning environment	School leadership, teaching practices, after-school opportunities, parents' involvement in school
		School resources and administration	Quality of school's educational resources and teacher shortages
Education systems	Chapter 5	Resources	Physical infrastructure, educational resources, qualified teachers, class size, equity in resource allocation within the system
		Selecting and grouping students	Vertical and horizontal stratification
		Governance	School autonomy, public/private management and funding

Variables that are associated with greater odds of low performance are referred to as "risk factors". At the student level, these include not only the socio-economic status of the family, but a range of other family characteristics, such as its immigration and linguistic background, geographic location and family structure. Similarly, a student's low performance at one particular point in time may stem from an accumulation of key experiences in his or her education career that have led to a disengagement from school.

Readers should bear in mind two caveats when interpreting the results of this report. First, the PISA design does not include randomised assignments and therefore does not allow for claims of causality. Nonetheless, statistical correlations may indicate potential causal relationships (Carnoy et al., 2007). Second, the OECD average is commonly used throughout this report as a reference for comparison. While averages reveal commonalities across countries, the situation in any given country or economy may differ greatly from the average.

LOW PERFORMANCE IN MATHEMATICS, READING AND SCIENCE IN PISA 2012

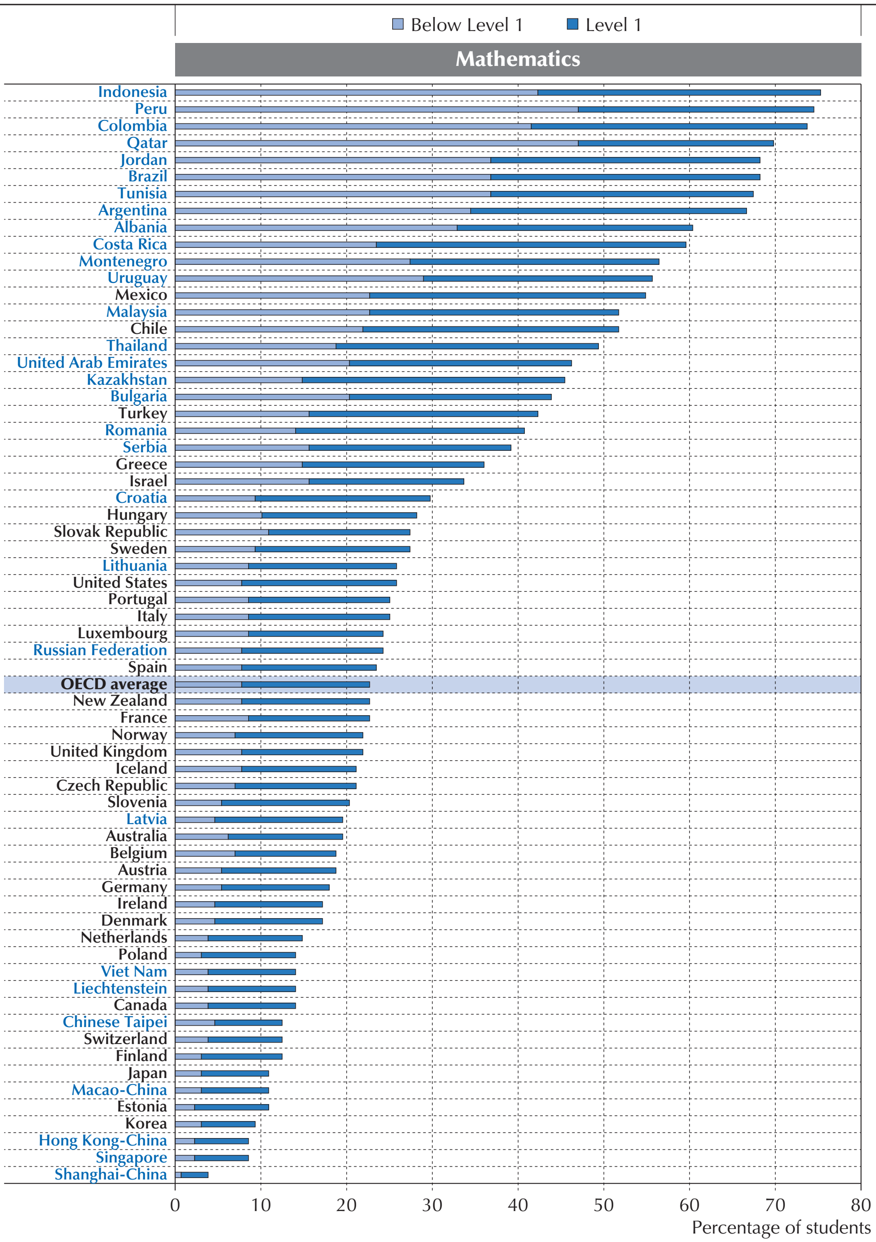
All countries that participated in PISA 2012, even those with the highest performance and equity outcomes, have a sizable share of low performers, as shown in Figure 1.5. Across OECD countries, 23% of students are low performers in mathematics, on average, but the shares of low performers in mathematics vary significantly across countries. In 15 countries that participated in PISA 2012, at least one in two students are low performers in mathematics, while in Hong Kong-China, Korea, Shanghai-China and Singapore, fewer than one in ten students is a low performer in mathematics.

The picture is slightly better when it comes to reading and science. On average across OECD countries, 18% of students were low performers in these two subjects in PISA 2012. There are ten countries where at least one in two students are low performers in reading, and nine countries where at least one in two students are low performers in science. In eight countries, one in ten (or fewer) students performs poorly in reading, and in 11 countries, one in ten (or fewer) students performs poorly in science (Figure 1.5 and Table 1.2).

Not all low performers are proficient at the same level. In addition to the total percentage of low performers, Figure 1.5 distinguishes between students who score at Level 1 and those who score below Level 1 in mathematics and science, and between students scoring at Level 1a, Level 1b or below Level 1b in reading. On average across OECD countries, 15% of students are proficient at Level 1 in mathematics, 12% are proficient at Level 1a in reading and 13% are proficient at Level 1 in science. Some 8% of students score below Level 1 in mathematics, 6% are proficient at Level 1b and below Level 1b, combined, in reading, and 5% score below Level 1 in science. In countries/economies with a large total share of low performers, the percentage of students who score below Level 1 is much higher (Figure 1.5 and Table 1.2).

■ Figure 1.5 [Part 1/3] ■

Share of low performers in mathematics, reading and science



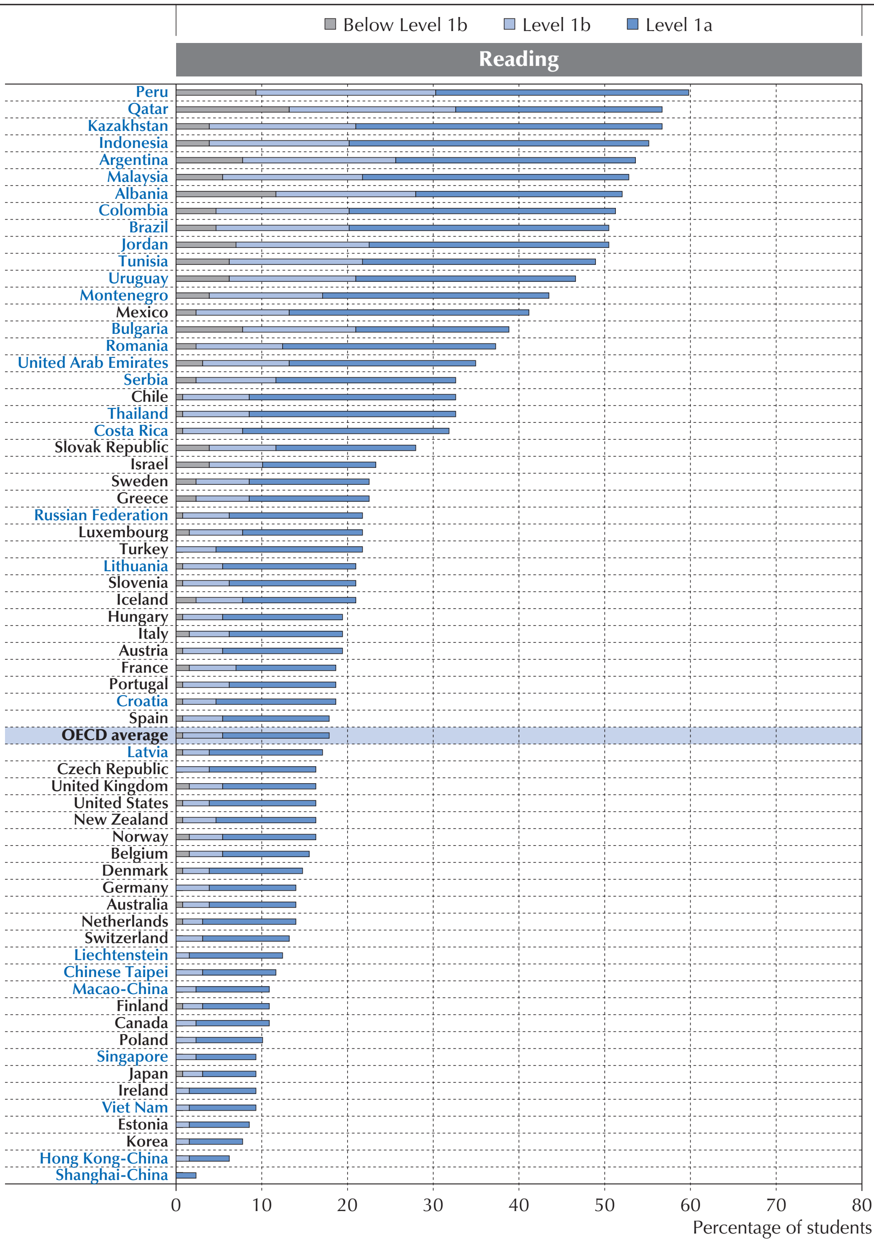
For each domain, countries and economies are ranked in descending order of the percentage of students who are low performers.

Source: OECD, PISA 2012 Database, Table 1.2.

StatLink *http://dx.doi.org/10.1787/888933315197*

■ Figure 1.5 [Part 2/3] ■

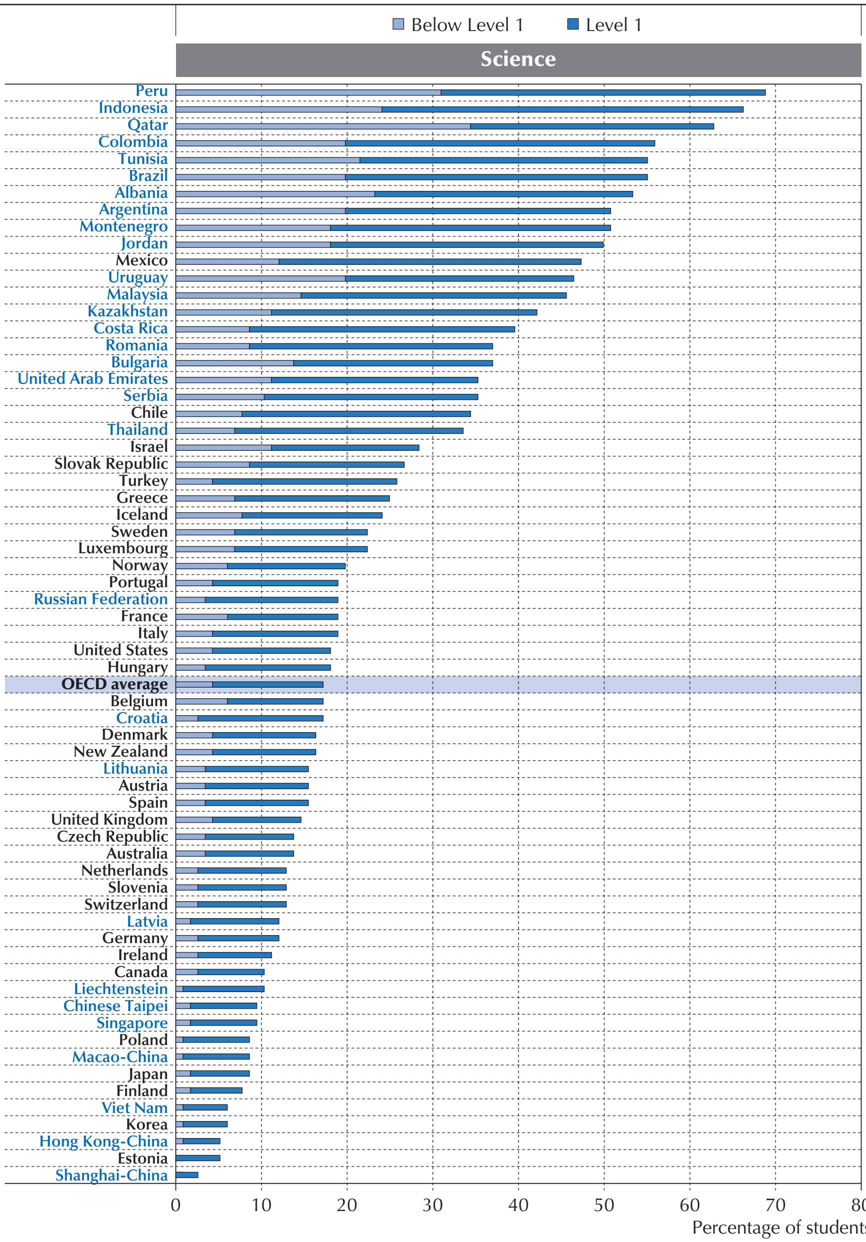
Share of low performers in mathematics, reading and science



For each domain, countries and economies are ranked in descending order of the percentage of students who are low performers.
Source: OECD, PISA 2012 Database, Table 1.2.
StatLink http://dx.doi.org/10.1787/888933315197

■ Figure 1.5 [Part 3/3] ■

Share of low performers in mathematics, reading and science



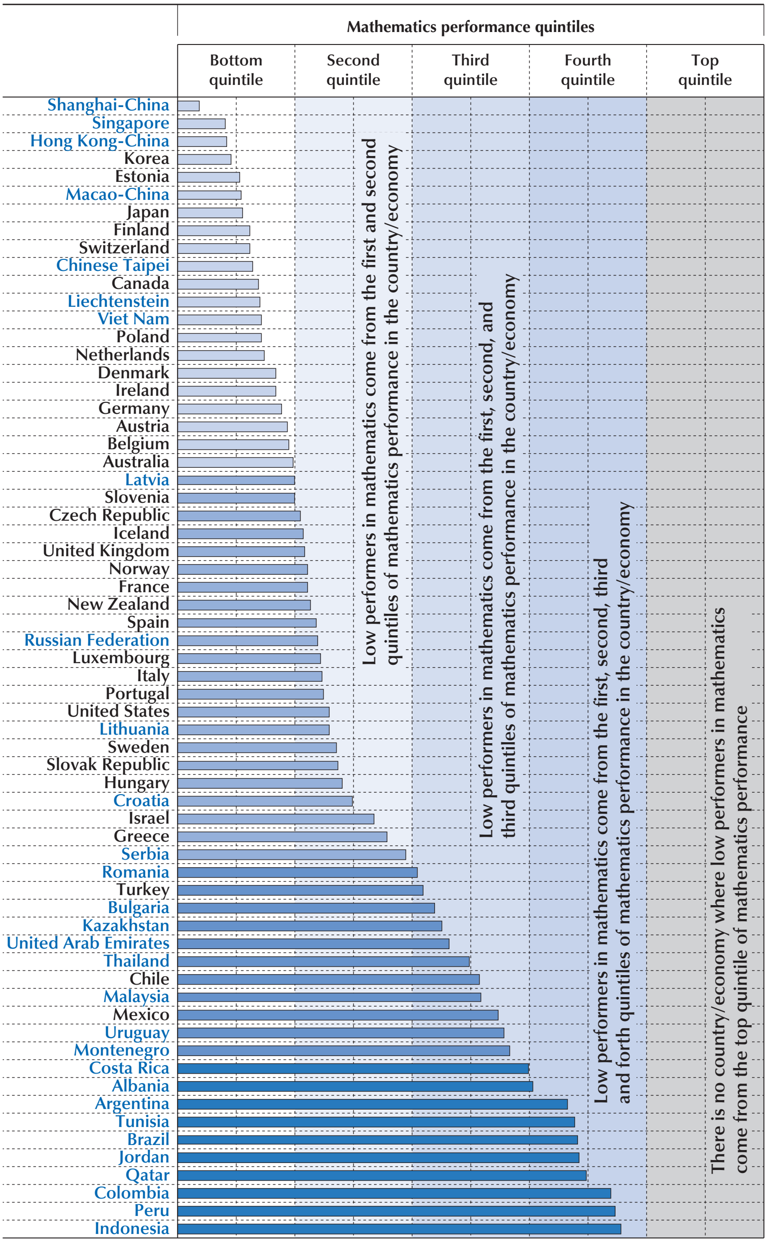
For each domain, countries and economies are ranked in descending order of the percentage of students who are low performers.

Source: OECD, PISA 2012 Database, Table 1.2.

StatLink http://dx.doi.org/10.1787/888933315197

■ Figure 1.6 ■

Low performers in mathematics by quintile of performance in country/economy



Countries and economies are ranked in ascending order of the percentage of low performers in mathematics.
Source: OECD, PISA 2012 Database, Table 1.14.
StatLink http://dx.doi.org/10.1787/888933315200

Not all low performers come from the bottom of the performance distribution in their countries. Figure 1.6 shows that, because the share of low performers varies widely across education systems, in some systems low performers come exclusively from the very lowest achievers in the country, whereas in other systems low performers, as defined in PISA, might include students who perform relatively well relative to other students in their country/economy. For example, in 21 countries and economies, all low performers in mathematics are students who perform in the lowest 20% of their own country/economy. This group includes Hong Kong-China, Korea, Shanghai-China and Singapore, where fewer than one in two of the students in the bottom quintile of mathematics performance scores below the baseline level of proficiency in mathematics.

■ Figure 1.7 [Part 1/2] ■

Low performers in mathematics, reading and science, and in all subjects

Absolute number

	Total enrolled population of 15-year-olds at grade 7 or above	Total low performers			
		Mathematics	Reading	Science	All subjects
OECD					
Australia	288 159	56 673	40 897	39 322	26 218
Austria	89 073	16 617	17 361	14 059	9 540
Belgium	121 493	23 039	19 532	21 521	14 005
Canada	409 453	56 623	44 609	42 674	25 212
Chile	252 733	130 265	83 441	87 162	62 094
Czech Republic	93 214	19 541	15 721	12 846	8 307
Denmark	70 854	11 932	10 376	11 826	6 612
Estonia	12 438	1 312	1 135	627	404
Finland	62 195	7 630	7 059	4 785	3 327
France	755 447	168 875	142 904	141 574	95 647
Germany	798 136	141 579	115 658	97 487	69 907
Greece	105 096	37 508	23 781	26 817	16 547
Hungary	108 816	30 536	21 460	19 634	14 251
Iceland	4 491	964	943	1 077	609
Ireland	57 979	9 797	5 560	6 430	3 918
Israel	113 278	37 951	26 716	32 719	20 961
Italy	566 973	139 866	110 565	105 999	67 285
Japan	1 214 756	134 380	118 574	102 724	67 062
Korea	672 101	61 384	51 400	44 564	29 243
Luxembourg	6 082	1 480	1 348	1 351	876
Mexico	1 472 875	805 842	605 011	692 490	456 475
Netherlands	193 190	28 580	27 025	25 355	16 655
New Zealand	59 118	13 387	9 619	9 614	6 586
Norway	64 777	14 451	10 507	12 725	7 125
Poland	410 700	59 086	43 439	37 007	23 433
Portugal	127 537	31 764	23 994	24 219	16 021
Slovak Republic	59 367	16 304	16 752	15 943	11 144
Slovenia	18 935	3 803	4 003	2 439	1 881
Spain	404 374	95 454	74 174	63 480	41 947
Sweden	102 027	27 621	23 179	22 682	15 300
Switzerland	85 239	10 606	11 673	10 929	6 361
Turkey	965 736	405 418	208 930	254 513	150 317
United Kingdom	745 581	162 632	123 950	111 607	83 404
United States	4 074 457	1 053 080	676 526	738 980	497 730

Notes: Low performers are students who score below the baseline level of proficiency, that is, who are proficient at Level 1 or below.
Numbers in the figures are point estimates based on the total enrolled population of 15-year-olds and the percentage of low performers in each country and economy. Because these estimations have a margin of error, see confidence intervals in Tables 1.7a and 1.7b.
Source: OECD, PISA 2012 Database, Tables 1.7a and 1.7b.
StatLink *http://dx.doi.org/10.1787/888933315217*

■ Figure 1.7 [Part 2/2] ■

Low performers in mathematics, reading and science, and in all subjects

Absolute number

	Total enrolled population of 15-year-olds at grade 7 or above	Total low performers			
		Mathematics	Reading	Science	All subjects
Partners					
Albania	50 157	30 428	26 250	26 633	19 065
Argentina	637 603	423 910	341 531	324 298	264 105
Brazil	2 786 064	1 902 611	1 414 512	1 538 832	1 165 231
Bulgaria	59 684	26 116	23 510	22 023	17 051
Colombia	620 422	457 977	319 182	348 374	266 975
Costa Rica	64 326	38 514	20 830	25 303	15 042
Croatia	46 550	13 904	8 704	8 050	5 450
Hong Kong-China	77 864	6 632	5 287	4 331	3 058
Indonesia	3 599 844	2 724 864	1 988 767	2 397 566	1 722 829
Jordan	125 333	85 931	63 562	62 110	50 305
Kazakhstan	247 048	111 773	140 953	103 628	71 163
Latvia	18 389	3 667	3 122	2 273	1 524
Liechtenstein	383	54	47	40	22
Lithuania	35 567	9 254	7 540	5 718	4 292
Macao-China	5 416	584	620	474	273
Malaysia	457 999	237 034	241 464	208 417	167 345
Montenegro	8 600	4 872	3 724	4 359	3 082
Peru	508 969	379 596	304 758	348 515	269 774
Qatar	11 532	8 021	6 590	7 221	5 797
Romania	146 243	59 703	54 496	54 598	35 126
Russian Federation	1 268 814	303 909	282 937	237 954	144 693
Serbia	75 870	29 521	25 134	26 543	17 302
Shanghai-China	90 796	3 444	2 641	2 484	1 465
Singapore	52 163	4 306	5 147	5 003	2 909
Chinese Taipei	328 336	42 163	37 748	32 222	23 669
Thailand	784 897	390 387	258 776	263 724	181 490
Tunisia	132 313	89 642	65 236	73 200	52 103
United Arab Emirates	48 446	22 422	17 212	17 032	13 081
Uruguay	46 442	25 907	21 849	21 790	16 363
Viet Nam	1091 462	155 520	102 765	72 981	46 616

Notes: Low performers are students who score below the baseline level of proficiency, that is, who are proficient at Level 1 or below.

Numbers in the figures are point estimates based on the total enrolled population of 15-year-olds and the percentage of low performers in each country and economy. Because these estimations have a margin of error, see confidence intervals in Tables 1.7a and 1.7b.

Source: OECD, PISA 2012 Database, Tables 1.7a and 1.7b.

StatLink *http://dx.doi.org/10.1787/888933315217*

The group also includes Australia, Austria and Belgium, where almost all of the students in the countries' bottom quintile of mathematics performers are low performers.

At the other extreme, in Indonesia, Peru and eight other countries, low performers in mathematics, as defined in PISA, can be found in even the fourth quintile of the national performance distribution. Somewhere between these two groups are the 17 OECD countries where students in the second quintile of performance score below the baseline level of proficiency in mathematics (Figure 1.6 and Table 1.14).

To get an idea of what these percentages mean in human terms, Figure 1.7 reports estimates for the absolute number of students who are low performers in each subject, and in all subjects,

for each country and economy that participated in PISA 2012 (see Tables 1.7a, 1.7b and 1.8 for confidence intervals of these estimates).

HOW LOW PERFORMANCE OVERLAPS ACROSS SUBJECTS

Low performance is not always limited to a single subject; in fact, more often than not, a student who underachieves in mathematics, reading or science underachieves in other subjects as well. In Figure 1.8, students are grouped according to whether they score below the baseline level of proficiency in one subject only, in two subjects, or in all three of the core subjects PISA assesses.

The largest of these groups is the group of students who underachieve in all three subjects. On average across OECD countries, more than one in four students (28%) are low performers in mathematics, reading and/or science. This one finding indicates the magnitude of low performance around the world. Some 5% of students across OECD countries underachieve in mathematics only and around 3% are low achievers in reading only, in both mathematics and science, or in both mathematics and reading. An alarming 12% of students across OECD countries do not make the grade in all three core subjects: they score below the baseline proficiency level in mathematics, reading and science (Figure 1.8 and Table 1.3).

Even more worrying are the students who score below Level 1 in all three subjects (Figure 1.9). These students are at particularly high risk of failure in their education and future careers. Some 3% of students across OECD countries score at this lowest level in all three subjects PISA assesses. Among the students who are low performers in all three subjects, 22% of them score below Level 1 in all of those subjects, on average across OECD countries. This proportion varies widely among countries, ranging from 40% or more in Albania and Qatar to less than 10% in Estonia, Liechtenstein and Viet Nam.

LOW PERFORMERS AND COUNTRIES' MEAN PERFORMANCE

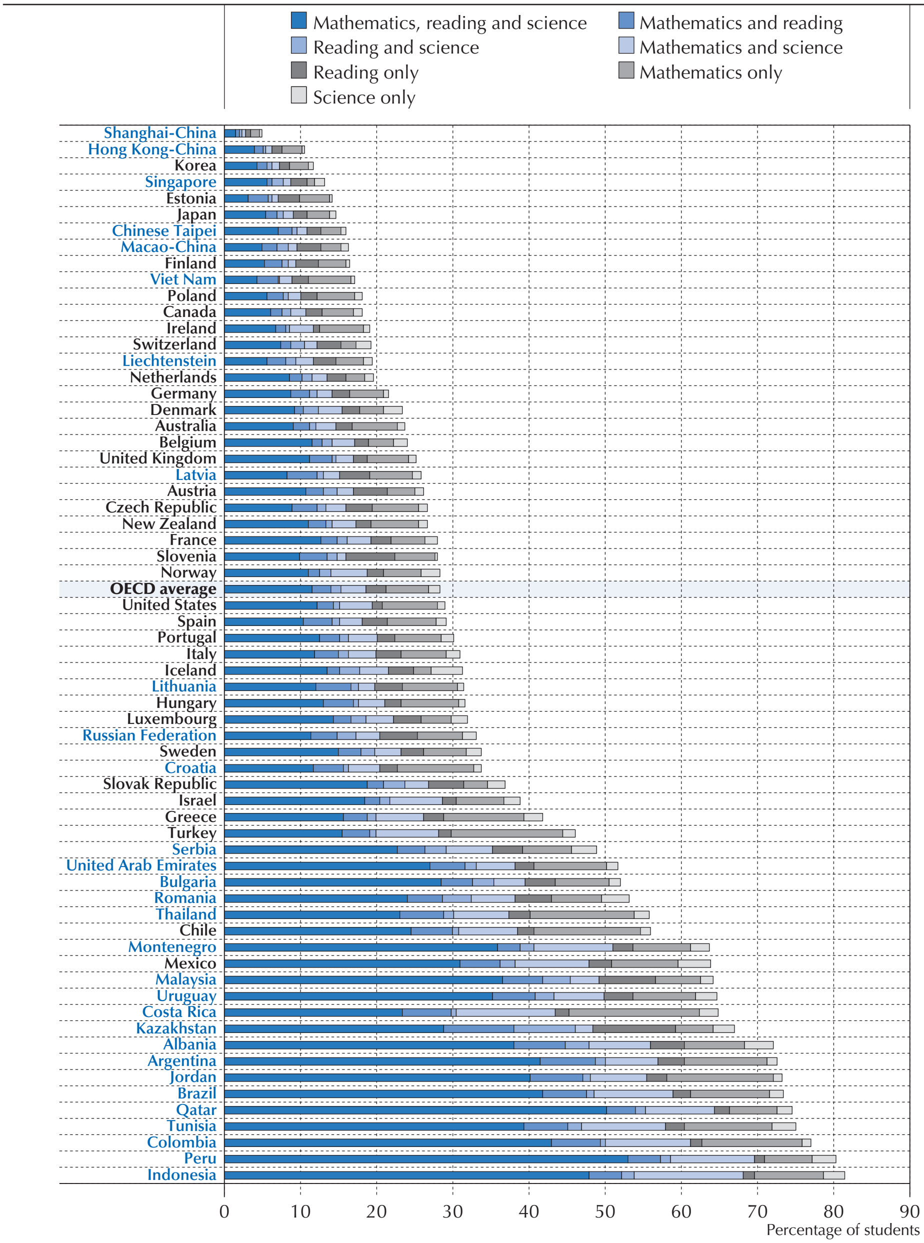
In most countries and economies, the share of low performers is closely related to that country's/economy's mean score in PISA. The correlation coefficient between the share of low performers in mathematics and an education system's mean score in mathematics is -0.9 for both OECD countries and partner countries and economies that participated in PISA 2012 (Table 1.13).

If a country's share of low performers in mathematics was based solely on its mean score in mathematics, the prediction would be fairly accurate for a large number of countries. Figure 1.10 suggests that, among low-performing countries and economies, small improvements in mean mathematics performance might be associated with large decreases in their shares of low performers; or, inversely, that reducing the share of low performers can be an effective way of improving the average performance of an education system (see also OECD, 2015). The figure also suggests that as countries improve their mean mathematics performance it becomes increasingly difficult to greatly reduce the share of low performers – most likely because the proportions of low performers are already small.

Shanghai-China, the best-performing economy in PISA 2012, with a mean mathematics score of 613 points, is a case in point. In 2009, some 5% of students in Shanghai-China were low performers; in 2012, after an increase of 13 score points in the economy's mathematics performance, the share of low performers decreased to 4% (Table 1.9).

■ Figure 1.8 ■

Overlap of low performers in mathematics, reading and science, by country/economy



Countries and economies are ranked in ascending order of the total percentage of students who are low performers in at least one subject.

Source: OECD, PISA 2012 Database, Table 1.3.

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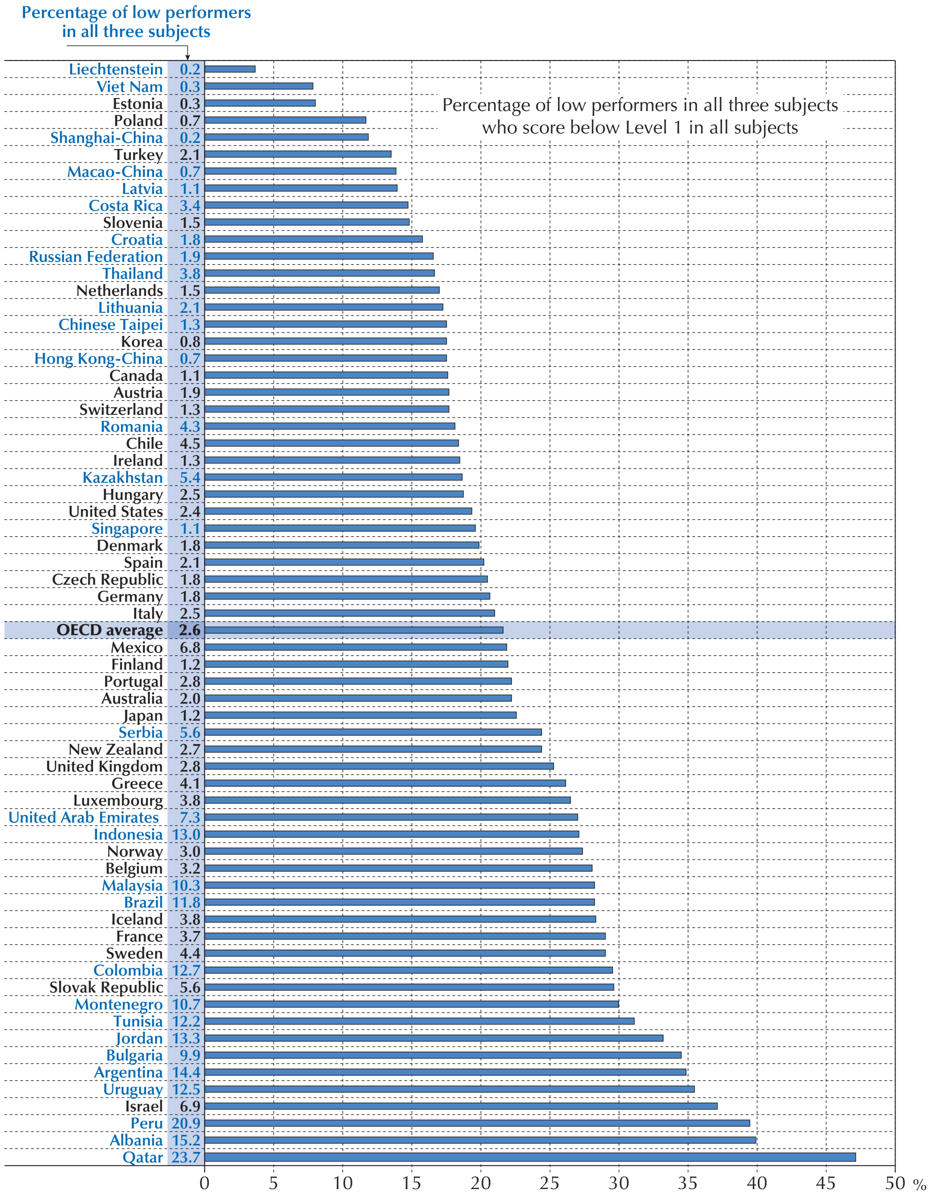
■ Figure 1.9 ■

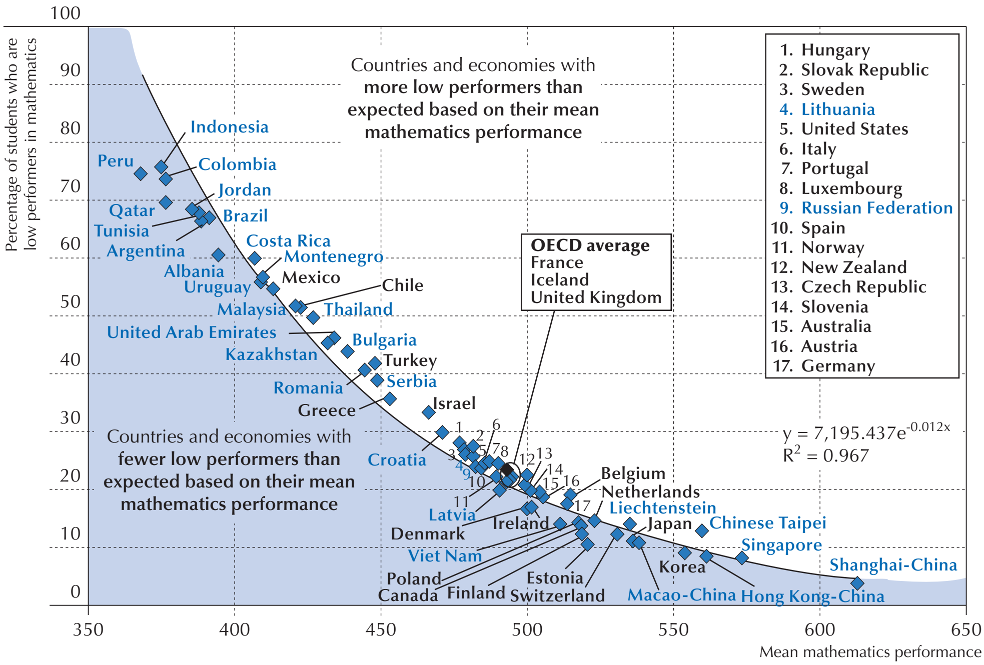
Percentage of low performers (students who perform below Level 2) in all three subjects who score below Level 1 in all subjects



Note: This figure includes only students who perform below Level 2 (low performers) in all three core PISA subjects (mathematics, reading and science). Students who are low performers in only two, one or in no subject are not included.
Countries and economies are ranked in ascending order of the percentage of low performers in all subjects who score below Level 1 in all subjects.
Source: OECD, PISA 2012 Database, Table 1.4.
StatLink http://dx.doi.org/10.1787/888933315238

■ Figure 1.10 ■

Relationship between the percentage of low performers and countries'/economies' mean performance



Source: OECD, PISA 2012 Database, Table 1.13.
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In absolute terms, the reduction of 1 percentage point in the share of low performers is small and not statistically significant, but in relative terms, a change from 5% to 4% is equivalent to a 20% reduction of low performers, which is substantial. In any case, Shanghai-China's average performance improvement between 2009 and 2012 was largely the result of a significant increase in its share of top performers. Indeed, the percentage of students in Shanghai-China who scored at the highest levels of proficiency, Level 5 or 6, increased from 50% in 2009 to 55% in 2012 (OECD, 2014a). It is an open question whether Shanghai-China will sustain this improvement in its mean performance in the coming years and, if it does, whether it will be the result of growing the ranks of top performers or of ensuring that all of its students have acquired at least baseline level proficiency in mathematics.

The link between the share of low performers and mean mathematics score is also seen at the school level. On average across OECD countries, the correlation coefficient between a school's average share of low performers and the school's average mathematics score is 0.89. In Shanghai-China, Estonia and Singapore, where the correlation coefficient is the weakest, the link is still very strong (0.69, 0.76 and 0.76, respectively) (Table 1.13).

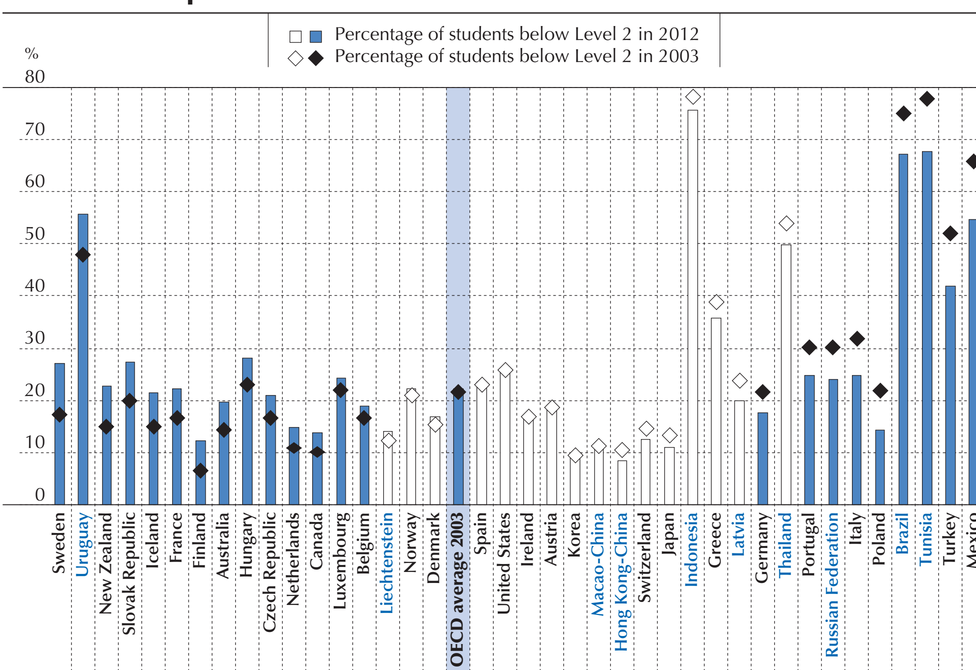
UNEVEN PROGRESS IN REDUCING THE SHARE OF LOW PERFORMERS

Countries have had mixed results in trying to reduce the share of low-performing students; and reducing low performance in mathematics has been particularly difficult. As shown in Figure 1.11, on average across OECD countries with comparable data, there was a small yet significant increase of 0.7 percentage point between 2003 and 2012 in the share of students who scored below the baseline level of proficiency in mathematics. The percentage of students who performed poorly in mathematics increased in 14 countries, and it was larger than 7 percentage points in New Zealand, the Slovak Republic, Sweden and Uruguay. By contrast, nine countries saw a reduction in the percentage of low performers in mathematics over the period, including Mexico, Tunisia and Turkey, where the share shrank by 10 percentage points or more (Table 1.9).

In reading, the OECD countries that participated in both PISA 2000 and PISA 2012 reduced their share of low performers by 1.6 percentage points, on average. Eleven countries reduced their share of low performers in reading significantly – six of them by more than 12 percentage points. Four countries saw an increase in the percentage of low performers in reading during this period; among them, only Sweden suffered an increase greater than 10 percentage points (Table 1.11).

■ Figure 1.11 ■

Trends in low performance in mathematics between PISA 2003 and PISA 2012



Notes: Statistically significant differences are marked in a darker tone.
OECD average 2003 compares only OECD countries with comparable data since 2003.
Countries and economies are ranked in descending order of the difference in the share of students who scored below Level 2 in mathematics between 2003 and 2012 (PISA 2012 - PISA 2003).
Source: OECD, PISA 2012 Database, Table 1.9.
StatLink http://dx.doi.org/10.1787/888933315258

The most progress has been made in improving student performance in science. The share of low performers in science shrank by 2.1 percentage points between 2006 and 2012, on average across OECD countries. Twenty countries and economies saw a significant reduction in the share of low performers in science; in three of these countries, the share was reduced by more than 12 percentage points. Six countries and economies saw an increase in the share of low performers in science. In four of these countries, the share grew by 5 percentage points or more (Table 1.12).

THE PATTERNS OF SUCCESS IN REDUCING THE INCIDENCE OF LOW PERFORMANCE

The countries that have managed to reduce their share of low performers have tackled the problem in different ways. Figure 1.12 shows the shares of students at proficiency Level 2, Level 1 and below Level 1 for the nine countries that significantly reduced their shares of low-performing students in mathematics between PISA 2003 and 2012.

These countries can be divided into two groups. In a first group of four countries – Brazil, Mexico, Tunisia and Turkey –, the share of students performing below Level 1 shrank considerably between 2003 and 2012 while the share of students scoring at Level 1 grew, but by a smaller margin. For example, in Turkey, the share of students performing below Level 1 fell by 12 percentage points while the share of students scoring at Level 1 grew by 2 percentage points. Similarly, in Brazil, the percentage of students scoring below Level 1 decreased by 18 percentage points while the share of students scoring at Level 1 increased by 10 percentage points. The net result of this dual trend is a decrease in the total share of low-performing students. Indonesia and Thailand show the same pattern, but in these countries the net reduction in low performers between 2003 and 2012 was not statistically significant (Tables 1.9 and 1.10).

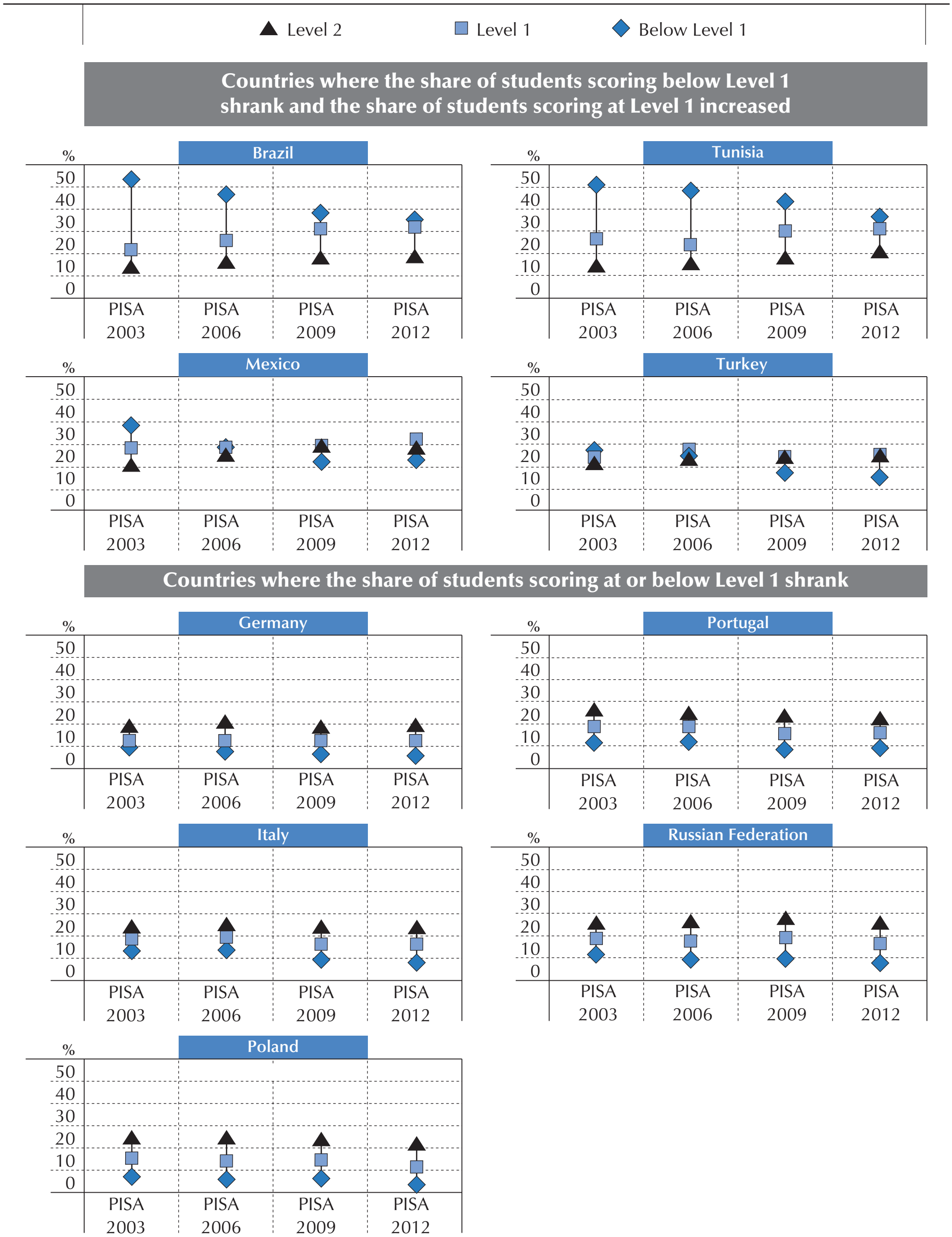
In a second group of countries – Germany, Italy, Poland, Portugal and the Russian Federation –, the shares of low-performing students at both Level 1 and below Level 1 were reduced simultaneously. As in the first group of countries, reductions in the share of students scoring below Level 1 were larger than the reductions in the share of students performing at Level 1 in mathematics. In Italy, for example, the share of students scoring below Level 1 decreased from 13% in 2003 to around 9% in 2012, and the share of Level 1 students fell from 19% in 2003 to 16% in 2012. In Poland, the share of students performing below Level 1 fell from 7% in 2003 to 3% in 2012, while the share of students scoring at Level 1 shrank from 15% in 2003 to 11% in 2012.

These differences in how improvements have been achieved are related to the initial size of the population of low performers in a country. As seen in Figure 1.12, in the countries that significantly reduced the share of students who performed below Level 1 (the first group), the share of low performers in PISA 2003 was large, ranging from 52% in Turkey to 78% in Tunisia – much larger than the OECD average that year (22%). Also, most of the low performers in these countries scored below Level 1 in PISA 2003, while on average across OECD countries that year, most low performers scored at, rather than below, Level 1 (Tables 1.9 and 1.10).

In the second group of countries, the share of low performers in mathematics in 2003 was similar to the OECD average – ranging from 22% in Germany and Poland to 32% in Italy – and larger proportions of students were proficient at Level 1 than below Level 1. In this group of countries, the reduction in the share of low performers ranged from 4 percentage points in Germany to 8 percentage points in Poland (Tables 1.9 and 1.10).

■ Figure 1.12 ■

Patterns of success in reducing the share of low performers in mathematics



Source: OECD, PISA 2012 Database, Table 1.10.
StatLink http://dx.doi.org/10.1787/888933315261

Box 1.2. What are the top-performing East Asian countries and economies doing to support their low-performing students and schools?

The East Asian countries and economies Shanghai-China, Singapore, Hong Kong-China, Chinese Taipei, Korea, Macao-China and Japan, in descending order of mean score, were at the top of the mathematics rankings in PISA 2012. They also had the smallest shares of low performers in mathematics of all participating countries and economies, ranging from 13% in Chinese Taipei to 4% in Shanghai-China.

Many researchers have wondered why East Asian students perform so well in PISA and other international comparisons. Some argue that the emphasis on education combined with a strong work ethic in these countries/economies imbues students with the motivation to attend school regularly and make their best effort while there. Others have pointed to various aspects of the education systems, such as the prevalence of high-stakes competitive examinations and out-of-school tutoring, teacher selection and quality, and school curricula (e.g. Jerrim, 2015).

What exactly are these top-performing countries doing to support their struggling and low-performing students?

Providing early diagnosis and additional support for struggling students

Singapore provides learning support for students who do not have the basic numeracy skills and knowledge needed to mathematics curriculum at school ("Learning Support for Maths" [LSM]). Students in need of support are identified through a screening test at the beginning of the first grade, and receive support by a specialist teacher for 4-8 periods per week. LSM teachers are provided as additional teachers to each school, based on need, and they receive additional training and teaching resources for LSM students, as required. In 2013, Singapore expanded the scope of this programme to cover students in second grade as well so that students could have more continuous support. The system is now considering providing this support for all the students up to secondary 4 level, which corresponds to 15-16 year-old students.

Holding high expectations for all students

Japan's educators hold high expectations for all students, including low performers. This belief that every student can achieve at high levels is reflected in the education policy decisions the country has taken. For example, there is almost no grade repetition and very little stratification between or within compulsory schools in Japan. As a result, teachers must work with students who have diverse needs and abilities to achieve common educational goals. Indeed, one of teachers' most important responsibilities is to ensure that all students keep up with the curriculum. Teachers are expected to identify students who are falling behind the rest of the class, and to give them extra support during regular school hours or, if necessary, after school.

In addition, Japan's national curriculum guideline is designed as a minimum standard of skills, so every student is expected to master its content. The mathematics curriculum, for example, stresses the understanding of fundamental mathematical concepts rather than memorisation of theorems or routine techniques.

Providing support for migrant/immigrant students

Hong Kong-China has a large population of migrants from mainland China and immigrants, and it provides various educational programmes to help them integrate into the education

...

system and prevent them from becoming low performers. One such initiative, the Full-time Initiation Program, is a six-month programme offered to students before they enter mainstream schools. The programme helps children to adjust to the schools and to local society. Similarly, the Induction Program is a 60-hour programme run by non-governmental organisations that is offered to migrant and immigrant children who are already enrolled in mainstream schools. It helps those students to adjust to their new community and tackle learning difficulties. Hong Kong-China also provides grants to schools that can be used to provide supplementary lessons and extracurricular activities, or to organise orientations for immigrant students.

Connecting and networking disadvantaged schools

Shanghai-China, where socio-economic disparities among schools are large, has been trying to connect rural schools to good urban schools through the Shanghai Rural Compulsory Education Management Program. In this programme, urban schools provide support to rural schools in developing their education projects and strategies, designing their management systems, and introducing effective teachers and educational resources to improve the quality of education.

In Japan, 15% of elementary and junior high schools are located in rural areas. In these schools, teachers often face difficulties that are unique to rural schools. To address these problems, teachers established the Research Network for Education in Rural Areas, through which participating schools and teachers exchange information and conduct research on relevant issues, such as how to teach more than one grade in the same classroom, how to provide students an opportunity to interact with the people outside their communities, and how to manage small-scale schools with limited numbers of teachers and staff.

Working with communities to help students who need support

The Study Support Volunteer Project in Japan subsidises voluntary activities, mostly undertaken by university students, that focus on studying at home, including homework, and offer advice on school choice for children from single-parent families. Japan's School Support Regional Headquarters Project invites local people to help low-performing students, including by providing after-school remedial lessons, in consultation with schools.

Sources:

Government of Hong Kong, Education Bureau, Special Administrative Region Research Network for Education in Rural Areas, www.zenhekiren.net/index.html; Government of Japan, Ministry of Education, Culture, Sports, Science and Technology, www.mext.go.jp/a_menu/01_l/08052911/004.htm; Government of Japan, Ministry of Health, Labour and Welfare, www.mhlw.go.jp/bunya/kodomo/pdf/shien.pdf; Government of Singapore, Ministry of Education, www.moe.gov.sg/media/press/2015/03/levelling-up-programmes-in-schools.php; Jerrim, J. (2015); OECD (2014c); OECD (2011b).

Again, what these data show is that improvement is possible, regardless of a country's/economy's starting point, regardless of its wealth, regardless of its culture. Once, universal access to primary education was little more than a rallying cry; today, every OECD country and nearly every partner country/economy can boast that it has achieved this objective. Tackling the problem of low performance requires the same will and sense of urgency. Nothing less than our futures are at stake.

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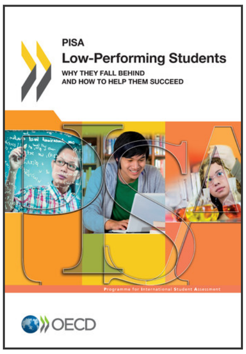

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