



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

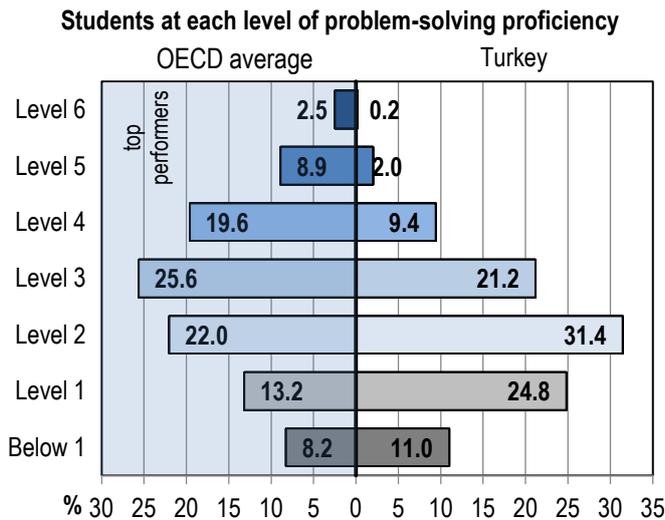
Turkey

Today's 15-year-olds will need to cope with a changing environment, and work in jobs that do not exist today, using tools to which they had no introduction in school. PISA's first 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, and whether they are open to novelty, able to turn real-life problems into learning opportunities, and willing to reason in order to reach their goals even outside of school.

- In Turkey, students perform significantly worse in problem solving, on average, than students in other countries who show similar performance in mathematics, reading and science, particularly among strong performers in mathematics.
- Students in Turkey found it particularly difficult to solve problems where the main cognitive challenge was to learn about the problem situation (e.g. setting up an experiment to understand the effect of their actions on an unfamiliar device, and representing the cause-effect linkages in a diagram). This may mean that students are not well-prepared to apply the learning strategies and the reasoning skills that they are taught in school when confronted with real-life challenges.
- With a mean score of 454 points, students in Turkey perform below the OECD average in problem solving (500 score points).
- More than one in three students (36%) in Turkey do not reach the baseline level of proficiency in problem solving – meaning that they are, at best, only able to solve very simple problems that do not require thinking ahead and that are cast in familiar settings. This proportion is significantly larger than the OECD average (21%). In contrast, only around 2% of students in Turkey (OECD average: 11%) are top performers, meaning that 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.
- Within Turkey, however, 38% of 15-year-old students attend a vocational study programme, and these students show better performance in problem solving, on average, than students with comparable performance in other subjects but who are in general study programmes. Better-than-expected results in problem solving are found among the 10% of students who attend *Anatolian vocational, Anatolian technical, and technical high schools*.

PISA 2012 defines problem-solving competence as “...an individual's capacity to engage in cognitive processing to understand and resolve problem situations where a method of solution is not immediately obvious. It includes the willingness to engage with such situations in order to achieve one's potential as a constructive and reflective citizen”. The problem-solving assessment focuses on students' general reasoning skills, their ability to regulate problem-solving processes, and their willingness to do so, by confronting students with problems that do not require expert knowledge to solve – such as buying the best ticket that satisfies all constraints at an unfamiliar vending machine. In contrast, when the regular assessments of mathematics, reading and science in PISA include problem-solving tasks, solving these problems requires curricular knowledge in addition to problem-solving skills.

Performance in problem solving in Turkey



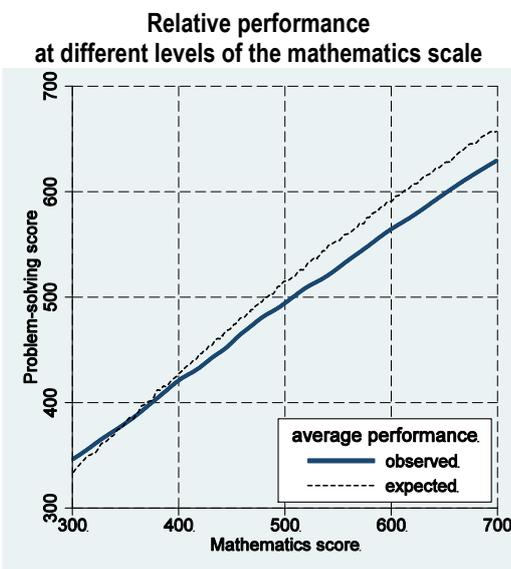
Source: Table V.2.1

Mean performance in problem solving		Range of ranks
	Mean score	
Singapore	562	1 – 2
Korea	561	1 – 2
Japan	552	3
...		
OECD average	500	
Russian Federation	489	23 – 27
Poland	481	26 – 31
Spain	477	27 – 31
Slovenia	476	28 – 31
Serbia	473	29 – 32
Croatia	466	31 – 33
Hungary	459	32 – 35
Turkey	454	33 – 36
Israel	454	33 – 37
Bulgaria	402	41 – 44

For the complete ranking of countries/economies, see Figure V.2.4

- Students in Turkey perform below the average of the 28 OECD countries that assessed students' problem-solving skills in 2012. With a mean score of 454 points, the rank of Turkey among all 44 countries and economies is estimated to lie between ranks 33 and 36.
- Average performance in Turkey is not significantly different from average performance in Chile, Hungary and Israel.

Relative performance in problem solving in Turkey



Relative performance is defined as the difference between the observed score in problem solving and the expected score, based on performance in core subjects. Lower-than-expected performance in problem solving may indicate that the learning opportunities available to students do not prepare them well for handling complex, real-life problems in contexts that they do not usually encounter at school.

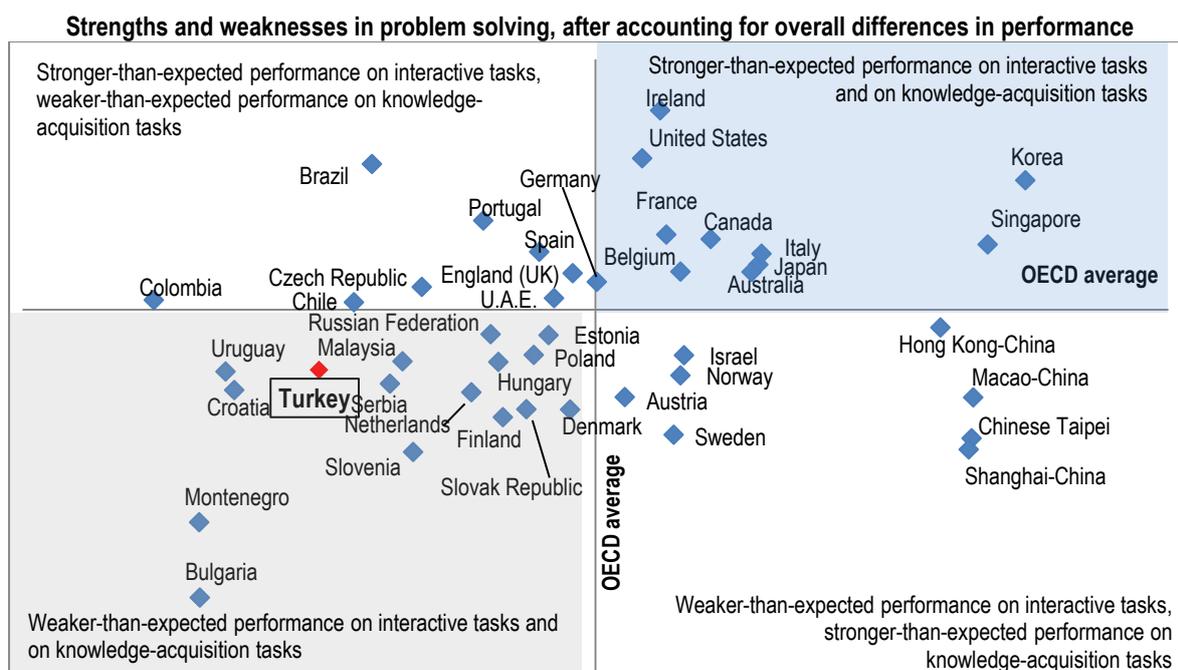
Relative performance in problem solving		Score dif.
Accounting for performance in all core subjects		
...among all students		-14
Accounting for performance in mathematics only		
...among all students		-12
...among strong and top performers in mathematics		-28
...among moderate and low performers in mathematics		-9

Note: Statistically significant differences are marked in bold. Source: Table V.2.6

- Students in Turkey perform worse than expected in problem solving, based on their performance in mathematics, reading and science. The difference between observed and expected performance is particularly large among students with strong performance in mathematics. While Turkey and Serbia perform at the same level in mathematics (with 448 and 449 score points respectively), Serbia has a mean score in problem solving of 473 (11 points above its expected level of performance) while Turkey a mean score of 454 (14 points below expected performance).

Strengths and weaknesses in problem solving in Turkey

- Students in Turkey performed somewhat worse than expected on interactive items, based on their overall success. Interactive items require students to uncover useful information by exploring the problem situation and gathering feedback on the effect of their interventions. In order to reach a solution, students must be open to novelty, tolerate doubt and uncertainty, and dare to use intuitions to initiate a solution.
- Students in Turkey performed worse than expected on knowledge-acquisition tasks, after accounting for overall success on the test. The best-performing countries in problem-solving often do particularly well on knowledge-acquisition tasks that require high levels of reasoning skills and self-directed learning.



How performance in problem solving varies within Turkey

Performance in problem solving	
	Mean score/score dif.
Boys	462
Girls	447
Difference (Boys-Girls)	15
Program orientation and performance in problem solving	
General programs (% students)	62%
Vocational programs (% students)	38%
Performance advantage in problem solving (voc.– general) among students of equal performance in other subjects	14
Strength of the relationship between socio-economic status and performance	
Performance variation accounted for by socio-economic status (%)	
Problem solving	15.1
Mathematics	14.5
Difference (PS - M)	0.6

Statistically significant differences are marked in bold.

Source: Tables V.4.7, V.4.13, V.4.19

- In Turkey, boys score at a higher level in problem solving compared to girls, on average. The average gender gap in favour of boys is 7 score points while it is 15 score points in Turkey. There are more boys than girls among top performers and more girls than boys among low-achieving students.
- In Turkey, students who attend a vocational study programme show significantly better performance in problem solving, on average, than students with comparable performance in mathematics, reading and science but who are in general study programmes.
- In Turkey, the impact of socio-economic status on performance is equally strong in problem solving and in mathematics.
- In 2012, 68% of students in Turkey used computers at home, and 49% used them at school. Using computers at school is not associated with a significant difference in problem-solving performance.

What is PISA?

The Programme for International Student Assessment (PISA) is a triennial survey that assesses the extent to which 15-year-old students near the end of compulsory education have acquired the knowledge and skills that are essential for full participation in modern societies. The assessment does not just ascertain whether students can reproduce knowledge; it also examines how well students can extrapolate from what they have learned and apply that knowledge in unfamiliar settings, both in and outside of school.

PISA offers insights for education policy and practice, and helps monitor trends in students' acquisition of knowledge and skills across countries and in different demographic subgroups within each country. The findings allow policy makers 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 the PISA 2012 assessment of problem solving

In 2012, more than 40 countries and economies participated in the assessment of problem solving. **OECD countries:** Australia, Austria, Belgium, Canada, Chile, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Israel, Italy, Japan, Korea, the Netherlands, Norway, Poland, Portugal, the Slovak Republic, Slovenia, Spain, Sweden, Turkey, England (United Kingdom) and the United States. **Partner countries and economies:** Brazil, Bulgaria, Colombia, Croatia, Hong Kong-China, Macao-China, Malaysia, Montenegro, the Russian Federation, Serbia, Shanghai-China, Singapore, Chinese Taipei, the United Arab Emirates and Uruguay.

The assessment

- Problem solving was assessed on computers. The computer-based assessments lasted a total of 40 minutes, with different students taking different combinations of test items. A total of 80 minutes of problem-solving items were covered. Only basic computer familiarity and skills were required to complete the assessment.
- The use of computers made it possible to include interactive problems, in which students need to explore the (simulated) environment and gather feedback on the effect of their interventions in order to obtain all the information needed to solve a problem. Test questions were a mixture of multiple-choice questions and those requiring students to construct their own responses. Sample items can be explored online at <http://cbasq.acer.edu.au>.
- Students assessed in problem solving also completed a two-hour assessment of mathematics, reading and science. They also answered a background questionnaire, which took 30 minutes to complete, that sought information about themselves, their homes and their school and learning experiences. In addition, countries could choose an optional questionnaire for students, asking about their familiarity with and use of information and communication technologies.

The students

- Only a subsample of all students assessed in mathematics, reading and science in 2012 also participated in the computer-based assessment of problem solving. Around 85 000 students were assessed in problem solving, representing about 19 million 15-year-olds in the schools of the 44 participating countries and economies.

In Turkey, 1 995 students in 170 schools completed the assessment of problem solving.

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For more information on the Programme for International Student Assessment and to access the full set of PISA 2012 results, visit: www.oecd.org/pisa