Executive summary

An understanding of science, and of science-based technology, is necessary not only for those whose careers depend on it directly, but also for any citizen who wishes to make informed decisions related to the many controversial issues under debate today. From maintaining a healthy diet, to managing waste in big cities, to weighing the costs and benefits of genetically modified crops or mitigating the catastrophic consequences of global warming, science is ubiquitous in our lives.

Science was the major domain assessed in PISA 2015. PISA views science literacy as skills that are required to engage in reasoned discourse about science-related issues. Competency in science is influenced both by knowledge of and about science, and by attitudes towards science.

WHAT THE DATA TELL US

Students' performance in science and attitudes towards science

- Singapore outperforms all other participating countries/economies in science. Japan, Estonia, Finland and Canada are the four highest-performing OECD countries.
- Some 8% of students across OECD countries (and 24% of students in Singapore) are top performers in science, meaning that they are proficient at Level 5 or 6. Students at these levels are sufficiently skilled in and knowledgeable about science to creatively and autonomously apply their knowledge and skills to a wide variety of situations, including unfamiliar ones.
- For the majority of countries with comparable data, science performance remained essentially unchanged since 2006, despite significant developments in science and technology over that period. However, mean performance in science improved between 2006 and 2015 in Colombia, Israel, Macao (China), Portugal, Qatar and Romania. Over this period, Macao (China), Portugal and Qatar grew the share of students performing at or above Level 5 and simultaneously reduced the share of students performing below the baseline level of proficiency (Level 2). At Level 2, students can draw on their knowledge of basic science content and procedures to identify an appropriate explanation, interpret data, and identify the question being addressed in a simple experiment. All students should be expected to attain Level 2 by the time they leave compulsory education.
- Even though gender differences in science performance tend to be small, on average, in 33 countries and economies, the share of top performers in science is larger among boys than among girls. Finland is the only country in which girls are more likely to be top performers than boys.
- On average across OECD countries, 25% of boys and 24% of girls reported that they expect to work in a science-related occupation. But boys and girls tend to think of working in different fields of science: girls envisage themselves as health professionals more than boys do; and in almost all countries, boys see themselves as becoming ICT professionals, scientists or engineers more than girls do.

Students' performance in reading and mathematics

- About 20% of students in OECD countries, on average, do not attain the baseline level of proficiency in reading. This proportion has remained stable since 2009.
- On average across OECD countries, the gender gap in reading in favour of girls narrowed by 12 points between 2009 and 2015: boys' performance improved, particularly among the highest-achieving boys, while girls' performance deteriorated, particularly among the lowest-achieving girls.
- More than one in four students in Beijing-Shanghai-Jiangsu-Guangdong (China), Hong Kong (China), Singapore and Chinese Taipei are top-performing students in mathematics, meaning that they can handle tasks that require the ability to formulate complex situations mathematically, using symbolic representations.

Equity in education

- Canada, Denmark, Estonia, Hong Kong (China) and Macao (China) achieve high levels of performance and equity in education outcomes.
- Socio-economically disadvantaged students across OECD countries are almost three times more likely than advantaged students not to attain the baseline level of proficiency in science. But about 29% of disadvantaged students are considered resilient – meaning that they beat the odds and perform at high levels. And in Macao (China) and Viet Nam, students facing the greatest disadvantage on an international scale outperform the most advantaged students in about 20 other PISA-participating countries and economies.
- While between 2006 and 2015 no country or economy improved its performance in science and equity in education simultaneously, the relationship between socio-economic status and student performance weakened in nine countries where mean science scores remained stable. The United States shows the largest improvements in equity during this period.
- On average across OECD countries, and after taking their socio-economic status into account, immigrant students are more than twice as likely as their non-immigrant peers to perform below the baseline level of proficiency in science. Yet 24% of disadvantaged immigrant students are considered resilient.
- On average across countries with relatively large immigrant student populations, attending a school with a high concentration of immigrant students is not associated with poorer student performance, after accounting for the school's socio-economic intake.

WHAT PISA RESULTS IMPLY FOR POLICY

Most students who sat the PISA 2015 test expressed a broad interest in science topics and recognised the important role that science plays in their world; but only a minority of students reported that they participate in science activities. Boys and girls, and students from advantaged and disadvantaged backgrounds, often differ in the ways they engaged with science and envisaged themselves working in science-related occupations later on. Gender-related differences in science engagement and career expectations appear more related to disparities in what boys and girls think they are good at and is good for them, than to differences in what they actually can do. Parents and teachers can challenge gender stereotypes about science-related activities and occupations to allow girls and boys to achieve their potential. To support every student's engagement with science, they can also help students become more aware of the range of career opportunities that are made available with training in science and technology.

For disadvantaged students and those who struggle with science, additional resources, targeted to students or schools with the greatest needs, can make a difference in helping students acquire a baseline level of science literacy and develop a lifelong interest in the subject. All students, whether immigrant or non-immigrant, advantaged or disadvantaged, would also benefit from a more limited application of policies that sort students into different programme tracks or schools, particularly if these policies are applied in the earliest years of secondary school. Giving students more opportunities to learn science will help them to learn to "think like a scientist" – a skill that has become all but essential in the 21st century, even if students choose not to work in a science-related career later on.