Executive summary

Many of the scientific principles and theories that 15-year-olds are familiar with were learned at school. As with any other subject, the way science is taught in school can influence not only whether students do well in science, but also whether they become interested enough in the subject to want to pursue it later on, in further education or in a career. Given the impact of science and technology on our daily lives, the expected growth in science-related employment worldwide, and students' declining interest in science as they progress through school, it is important to examine why some students are better prepared for and more interested in science-related careers than others.

PISA 2015 analyses in detail how effective schools and school systems are in providing opportunities to learn science. It examines the financial, material, human and time resources available to schools and students in those schools, how students are selected into different schools and education programmes within schools, and how schools are governed. Students' engagement with and motivation for learning is also explored. The analyses of PISA data describe how all of these factors are associated with student performance in and attitudes towards learning science.

WHAT THE DATA TELL US

Policies about learning science at school and performance in science

- The approximately 6% of students across OECD countries who reported not attending any regular science lessons score 25 points lower than students who reported attending at least one science lesson, after accounting for the socio-economic profile of students and schools. In 34 school systems, particularly in Austria, Belgium, Croatia, France, Germany, the Slovak Republic and Chinese Taipei, the students who reported not attending regular science lessons are more likely to attend socio-economically disadvantaged schools than advantaged schools.
- Across OECD countries, socio-economically advantaged schools are considerably more likely than disadvantaged schools to offer science competitions and a science club as school activities.
- How much time students spend learning and how science is taught are even more strongly associated with science performance and the expectations of pursuing a science-related career than how well-equipped and -staffed the science department is, which extracurricular science activities are offered at school and science teachers' qualifications.
- According to students' reports, and on average across OECD countries, teachers in advantaged schools explain or demonstrate a scientific idea (teacher-directed instruction) more frequently than do teachers in disadvantaged schools. Students who reported that their science teachers frequently use these methods and adapt their teaching to meet students' needs score higher in science, show stronger beliefs about the value of scientific enquiry, and are more likely to expect to pursue a science-related career than students who reported that their teachers use these methods less frequently.

The learning environment

- In most school systems, students in socio-economically disadvantaged schools are more likely to have skipped a day of school than students in advantaged schools. Between 2012 and 2015, the percentage of students who had skipped a whole day of school at least once in the two weeks prior to the PISA test increased by around 5 percentage points across OECD countries.
- Across OECD countries, school principals cited student truancy and staff resisting change as the problems that hinder student learning the most; they also reported that learning in their schools is least hindered by students' use of alcohol or illegal drugs, or students intimidating or bullying other students.
- Students in school systems that select students into different education programmes or types of schools at a later age reported receiving greater support from their teachers.

School governance, assessment and accountability

- Students in private schools score higher in science than students in public schools; but after accounting for the socio-economic profile of students and schools, students in public schools score higher than students in private schools on average across OECD countries and in 22 education systems.
- Standardised tests are used extensively across PISA-participating countries and economies. In about five out of six school systems, more than one in two students are assessed at least once a year with mandatory standardised tests, and in about three out of four countries, more than one in two students are assessed at least once a year with non-mandatory standardised tests.
- When choosing a school for their child, parents are more likely to consider important or very important that there is a safe school environment, that the school has a good reputation and that the school has an active and pleasant climate – even more so than their child's academic achievement at the school.

Selecting and grouping students

- Thirty countries and economies used grade repetition less frequently in 2015 than in 2009; in only five countries did the incidence of grade repetition increase during the period. The use of grade repetition decreased by at least 10 percentage points in Costa Rica, France, Indonesia, Latvia, Macao (China), Malta, Mexico and Tunisia.
- Across OECD countries, socio-economically disadvantaged students, students with an immigrant background and boys are more likely to have repeated a grade, even after accounting for their academic performance, and their self-reported motivation and behaviour.
- The later students are first selected into different schools or education programmes and the less prevalent the incidence of grade repetition, the more equitable the school system or the weaker the association between students' socio-economic status and their performance in science.

Resources invested in education

- Students in larger schools score higher in science and are more likely than students in smaller schools to expect to work in a science-related occupation in the future. But students in smaller schools reported a better disciplinary climate in their science lessons and they are less likely than students in larger schools to skip days of school and arrive late for school, after accounting for schools' and students' socio-economic status.
- On average across OECD countries, students in smaller classes reported more frequently than students in larger classes that their teachers adapt their instruction to their needs, knowledge and level of understanding.
- Students score five points higher in science for every additional hour spent per week in regular science lessons, after accounting for socio-economic status.
- School systems where students spend more time learning after school, by doing homework, receiving additional instruction or in private study, tend to perform less well in science.