Excellence and equity

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In 2015, over half a million students...
- representing 28 million 15-year-olds in 72 countries/economies

... took an internationally agreed 2-hour test...
- Goes beyond testing whether students can reproduce what they were taught to assess students’ capacity to extrapolate from what they know and creatively apply their knowledge in novel situations
- Total of 390 minutes of assessment material

... and responded to questions on...
- their personal background, their schools, their well-being and their motivation

Parents, principals, teachers and system leaders provided data on:
- school policies, practices, resources and institutional factors that help explain performance differences
- 89,000 parents, 93,000 teachers and 17,500 principals responded
Map of PISA countries and economies

PISA 2015

OECD Partners
“the ability to engage with science-related issues, and with the ideas of science, as a reflective citizen”
Drag Ragworms and Common Sole into Tank 2 and Marsh Grass and Shellfish into Tank 3

This question requires students to understand a system and the role of several organisms within that system. In order to answer correctly, students must understand the goal of the fish farm, the function of each of the three tanks therein, and which organisms will best fulfill each function. Students must use information provided in the stimulus and the diagram, including a footnote under the diagram.
Trends in science performance

OECD average

Student performance

2006

2009

2012

2015
Science performance in PISA (2015)

- High performance
  - High equity
  - Sweden
  - Finland
  - Norway
  - Denmark

- High performance
  - Low equity
  - Singapore
  - Japan
  - Hong Kong (China)
  - Korea

- Low performance
  - High equity
  - Latvia
  - Czech Rep.
  - Luxembourg

- Low performance
  - Low equity
  - United States
  - United Kingdom
  - Germany

More equity
Some countries combine excellence with equity.

- Brazil
- Bulgaria
- Chile
- Mexico
- Montenegro
- Slovenia
- Thailand
- United States

Some countries improved equity.
Science performance, by international deciles of the PISA index of economic, social and cultural status (ESCS)

Figure I.6.7

Score points

OECD median student

% of students in the bottom international deciles of ESCS
Resilient students come from the bottom 25% of the ESCS index within their country/economy and perform among the top 25% across all countries/economies, after accounting for socio-economic status.
Excellence and baseline performance
Percentage of top-performers and low-achieving students in science (2006 and 2015)
The global pool of top performers: A PISA perspective

Share of top performers among 15-year-old students:

- **Less than 1%**
- **1 to 2.5%**
- **2.5 to 5%**
- **5% to 7.5%**
- **7.5% to 10%**
- **10% to 12.5%**
- **12.5% to 15%**
- **More than 15%**

**United States (8.5%); 300k**
**B-S-J-G (China) (13.6%); 181k**
**Japan (15.3%); 174k**
**Germany (10.6%); 79k**
**Viet Nam (8.3%); 72k**
**United Kingdom (10.9%); 68k**
**Korea (10.6%); 60k**
**France (8.0%); 59k**
**Russia (3.7%); 42k**
**Canada (12.4%); 41k**
**New Zealand (12.8%); 39k**
**Singapore (24.2%); 300k**
**China (13.6%); 300k**
**Belgium (9.0%); 300k**
**Switzerland (9.8%); 300k**
**Sweden (8.5%); 300k**
**Finland (14.3%); 300k**
**Brazil (0.7%); 300k**
**Poland (7.3%); 300k**
**Australia (11.2%); 300k**
**Chinese Taipei (15.4%); 300k**
**Italy (4.1%); 300k**
**Spain (5.0%); 300k**
**Netherlands (11.1%); 300k**
**Portugal (7.4%); 300k**
**Others**
Science and careers
Students’ career expectations

Percentage of students who expect to work in science-related professional and technical occupations when they are 30

- Science-related technicians and associate professionals
- Information and communication technology professionals
- Health professionals
- Science and engineering professionals
Expectations of a science career by gender

Figure I.3.5

<table>
<thead>
<tr>
<th>Profession</th>
<th>United States</th>
<th>OECD average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Science and engineering professionals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Boys</td>
<td>15%</td>
<td>20%</td>
</tr>
<tr>
<td>Health professionals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>10%</td>
<td>15%</td>
</tr>
<tr>
<td>Boys</td>
<td>15%</td>
<td>20%</td>
</tr>
<tr>
<td>Information and communication technology (ICT) professionals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>Boys</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Science-related technicians or associate professionals</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>1%</td>
<td>2%</td>
</tr>
<tr>
<td>Boys</td>
<td>5%</td>
<td>10%</td>
</tr>
</tbody>
</table>
Students’ enjoyment of learning science

Percentage of students who reported that they "agree" or "strongly agree" with the following statements

- I enjoy acquiring new knowledge in <broad science>
- I am interested in learning about <broad science>
- I generally have fun when I am learning <broad science> topics
- I am happy working on <broad science> topics
- I like reading about <broad science>

Figure I.3.9

OECD average  United States

<table>
<thead>
<tr>
<th>Statement</th>
<th>OECD Average</th>
<th>United States</th>
</tr>
</thead>
<tbody>
<tr>
<td>I enjoy acquiring new knowledge in &lt;broad science&gt;</td>
<td>65%</td>
<td>75%</td>
</tr>
<tr>
<td>I am interested in learning about &lt;broad science&gt;</td>
<td>65%</td>
<td>75%</td>
</tr>
<tr>
<td>I generally have fun when I am learning &lt;broad science&gt; topics</td>
<td>55%</td>
<td>75%</td>
</tr>
<tr>
<td>I am happy working on &lt;broad science&gt; topics</td>
<td>55%</td>
<td>70%</td>
</tr>
<tr>
<td>I like reading about &lt;broad science&gt;</td>
<td>55%</td>
<td>60%</td>
</tr>
</tbody>
</table>
Change between 2006 and 2015 in students’ enjoyment of learning science

Figure I.3.10
Students expecting a career in science
by performance and enjoyment of learning

Figure I.3.17

Percentage of students expecting a career in science

- Low enjoyment of science
- Moderate enjoyment of science
- High enjoyment of science

Score points in science
Above-average science performance

Japan
Estonia
Finland
Macao (China)
Viet Nam
B-S-J-G (China)
Korea
Germany
Netherlands
Switzerland
Belgium
Poland

Stronger than average epistemic beliefs

Sweden
Lithuania
Croatia
Iceland
Georgia
Malta

Above-average percentage of students expecting to work in a science-related occupation

Singapore
Canada
Slovenia
Australia
United Kingdom
Ireland
Portugal
Norway
United States
Spain
Israel
United Arab Emirates

Multiple outcomes

Brazil
Bulgaria
Chile
Colombia
Costa Rica
Dominican Republic
Jordan
Kosovo
Lebanon
Mexico
Peru
Qatar
Trinidad and Tobago
Tunisia
Turkey
Uruguay
Spending per student from the age of 6 to 15 and science performance

![Graph showing spending per student and science performance](image)

- **R² = 0.04**
- **R² = 0.36**

**Figure II.6.2**
Horizontal stratification: ability grouping

Percentage of students in schools where students are grouped by ability into different classes:

- One form of grouping for all subjects
- One form of grouping for some subjects
- No ability grouping for any subject

Figure II.5.8
Public and private schools

Across OECD countries, 84% of students attend public schools, 12% government-dependent private schools and 4% independent private schools. PISA generally observes no systematic net performance differences.
Science performance in public and private schools

Figure II.4.14

After accounting for socio-economic status
Before accounting for socio-economic status

Students in **public** schools perform better

Students in **private** schools perform better
Differences in educational resources between advantaged and disadvantaged schools

Disadvantaged schools have more resources than advantaged schools.

Disadvantaged schools have fewer resources than advantaged schools.
Integrating immigrants
Figure I.7.4

Student performance in science by immigrant background

Score points

Non-immigrant students  Second-generation immigrant students  First-generation immigrant students
Concentration of immigrant students in schools

- **Index of current concentration**: i.e. percentage of students (immigrant and non-immigrant) that should be moved across schools to have an identical percentage of immigrant students within each school.

- **Index of maximum potential concentration**: i.e. minimum percentage of students that should be moved if all immigrant students were placed in the largest schools.

Figure I.7.11

Percentage of immigrant students in the country/economy.
Quality time

Making learning time productive so that students can build their academic, social and emotional skills in a balanced way
Student-teacher ratios and class size

Figure II.6.14

Countries are plotted based on their student-teacher ratios and class sizes. The chart shows a positive correlation between high student-teacher ratios and small class sizes versus low student-teacher ratios and large class sizes. Locations of countries include Hong Kong (China), Algeria, Jordan, Dominican Republic, Brazil, Colombia, Mexico, Poland, Hungary, Albania, Switzerland, and others.

The chart also indicates that countries like Germany (B-S-G-J (China)) and Turkey are positioned at the upper end of the student-teacher ratios and class sizes, while countries like Belgium, Finland, and Switzerland are at the lower end.

The correlation coefficient, $R^2 = 0.25$, suggests a moderate relationship between the variables.
Learning time and science performance

Figure II.6.23

Total learning time in and outside of school vs. PISA science score for various countries.
Learning time and science performance

Figure II.6.23

Hours

- Intended learning time at school (hours)
- Study time after school (hours)
- Score points in science per hour of total learning time

Score points in science per hour of total learning time
Figure II.4.7

Index of school autonomy by schools’ socio-economic status

Advantaged schools have more school autonomy

Disadvantaged schools have more school autonomy

Percentage-point difference between advantaged and disadvantaged schools

Index of school autonomy (%)

Macao (China) Czech Republic United Kingdom
Netherlands Slovak Republic Thailand Estonia
New Zealand Latvia Indonesia Russia Bulgaria
United States Poland Slovenia Georgia Austria
Israel Ireland Iceland China Taipei Singapore Japan
Lebanon Norway PRIMOE
OECD average Mexico Poland Sweden Switzerland
Belgium Romania Luxembourg Colombia Korea Canada
Peru Croatia Qatar Hungary
Germany Portugal United Arab Emirates France Spain
Australia Montenegro Italy
Brazil

Costa Rica Mexico Indonesia Turkey Greece

-20 -10 0 10 20 30 40 50 60

% 0 10 20 30 40 50 60 70 80 90 100
Correlations between the responsibilities for school governance and science performance

Students score lower in science when the school governing board holds more responsibility for admissions policies.
Student assessments and teacher appraisals are widely used

There are at least 19 education systems where there is a similar or higher percentage of 15-year-old students who attend schools where mandatory standardised tests are used at least once a year; and the percentage of students in the United States who are assessed with these tests more than once a month is similar to the OECD average.
Percentage of students in schools where mandatory standardised tests are used:

- Never
- 1-2 times a year
- 3-5 times a year
- Monthly
- More than once a month

Figure II.4.21
Starting strong
Attendance at pre-primary school

Percentage of students who attended pre-primary school...

- Did not attend
- Less than one year
- Between two and three years
- More than three years

Countries listed include Turkey, Montenegro, Lithuania, Croatia, United States, Poland, Qatar, Brazil, Japan, Hong Kong (China), and more. The chart shows the percentage of students in each country who attended pre-primary school for various durations.
Attendance at pre-primary school
by schools’ socio-economic profile

Table II.6.51

Number of years in pre-primary education among students attending socio-economically ...
Attendance at pre-primary school and science performance

Compared to students who did not attend pre-primary school, score-point difference in science when students attended ...

- Between two and three years
- Less than one year

Table II.6.52
Thank you

Find out more about our work at www.oecd.org/pisa
- All publications
- The complete micro-level database

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