Seeing US education through the prism of international comparisons
The OECD Programme for International Student Assessment (PISA)
Every three years since 2000, over half a million students...

- representing 15-year-olds in now over 80 countries

... take an internationally agreed 2-hour test...

- that goes beyond whether students can reproduce what they were taught to assess students’ capacity to extrapolate from what they know and creatively use and apply their knowledge
- Focus on mathematics, science and reading
- Problem-solving, collaborative problem-solving, creative thinking, financial literacy

... and respond to questions on...

- their personal background, their schools, their well-being and their motivation

Teachers, principals, parents and system leaders provide data on:

- school policies, practices, resources and institutional factors that help explain performance differences
Map of PISA countries and economies

PISA 2015
OECD Partners
Trends in science performance (PISA)
Trends in science performance (PISA)

- Score points

- OECD average
Science performance in PISA (2015)
Science performance and equity in PISA (2015)

Some countries combine excellence with equity.
Poverty is not destiny – Learning outcomes by international deciles of the PISA index of economic, social and cultural status (ESCS)
Students expecting a career in science

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

Dominican Rep. 12%
Costa Rica 11%
Jordan 6%
United Arab Em. 11%
Mexico 6%
Colombia 8%
Lebanon 15%
Brazil 19%
Peru 7%
Qatar 19%
United States 13%
Chile 18%
Tunisia 19%
Canada 21%
Slovenia 16%
Turkey 6%
Australia 15%
United Kingdom 17%
Malaysia 4%
Kazakhstan 14%
Spain 11%
Norway 21%
Uruguay 17%
Singapore 14%
Trinidad and T. 13%
Israel 25%
CABA (Arg.) 19%
Portugal 18%
Bulgaria 25%
Ireland 13
Iceland 22

OECD average 19
Belgium 16
Croatia 17
FYROM 20
Lithuania 21
Lithuania 21
Korea 7
Hungary 22
Slovak Republic 24
Japan 18
Finland 24
Georgia 27
Czech Republic 22
B-S-J-G (China) 31
Netherlands 19
Germany 33
Indonesia 19
Denmark 48

% of students with vague or missing expectations
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

Norway

Singapore
Canada
Slovenia
Australia
United Kingdom
Ireland
Portugal

United States
Spain
Israel
United Arab Emirates

Brazil
Bulgaria
Chile
Colombia
Costa Rica
Dominican Republic
Jordan
Kosovo

Lebanon
Mexico
Peru
Qatar
Trinidad and Tobago
Tunisia
Turkey
Uruguay

Multiple outcomes
Students expecting a career in science
by performance and enjoyment of learning

Figure I.3.17

![Graph showing the relationship between score points in science and percentage of students expecting a career in science, divided into low and high enjoyment of science categories.](chart.png)
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
Others

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

Triangulating data from students, parents, teachers, schools and systems
Spending per student from the age of 6 to 15 and science performance

Figure II.6.2

Average spending per student from the age of 6 to 15 (in thousands USD, PPP)

Science performance (score points)
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.
Attendance at pre-primary school
by schools’ socio-economic profile

Number of years in pre-primary education among students attending socio-economically ...

- **Disadvantaged schools**
- **Advantaged schools**

OECD average
Countries spend their money differently

Contribution of various factors to salary cost of teachers per student in public institutions, lower secondary education (2015)

- Contribution of teachers' salary
- Contribution of instruction time
- Contribution of teaching time
- Contribution of estimated class size
- Difference of salary cost of teachers per student from OECD average

<table>
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<th>Country</th>
<th>Contribution of teachers' salary</th>
<th>Contribution of instruction time</th>
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Student-teacher ratios and class size

![Graph showing student-teacher ratios and class size across different countries. The y-axis represents student-teacher ratio, and the x-axis represents class size in the language of instruction. Countries are plotted on the graph, with high student-teacher ratios and small class sizes on the upper left and low student-teacher ratios and large class sizes on the lower right. The OECD average is indicated by a vertical line. The R² value is 0.25.](image-url)
Learning time and science performance

Figure II.6.23

![Graph showing the relationship between total learning time in and outside of school and PISA science score for various countries. The OECD average is indicated by a linear regression line with an R² value of 0.21.]
Learning time and science performance

Figure II.6.23

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

Hours

Score points in science per hour of total learning time
What teachers say and what teachers do
95% of teachers: My role as a teacher is to facilitate students' own inquiry.
82%: Students learn best by finding solutions on their own.
85%: Thinking and reasoning is more important than curriculum content
Prevalence of memorisation
rehearsal, routine exercises, drill and
practice and/or repetition

Prevalence of elaboration
reasoning, deep learning, intrinsic
motivation, critical thinking,
creativity, non-routine problems
Memorisation is less useful as problems become more difficult *(OECD average)*

Source: Figure 4.3
Control strategies are always helpful but less so as problems become more difficult *(OECD average)*

**Source:** Figure 5.2
Elaboration strategies are more useful as problems become more difficult *(OECD average)*

Source: Figure 6.2
Variation in science performance between and within schools

**Figure I.6.11**

- Between-school variation
- Within-school variation

Total variation as a proportion of the OECD average: 69%
Some design choices and trade-offs
Design choices and trade-offs

• Balancing breadth and depth of framework coverage
  – **Core** assessments in reading, math and science every three years
    • With focus (increased sample) rotating
  – One **innovative** assessment area every three years
    • Digital literacy (2009)
    • Individual problem-solving (2012)
    • Collaborative problem-solving (2015)
    • Global competency (2018)
    • Creative thinking (2021)
  – **Optional** assessments
    • Financial literacy
  – Matrix sampling with adaptive assessment instruments
Design choices and trade-offs

• **Measuring change** while **changing the measures**
  – Every three years one of the frameworks is revised
    • Bridging studies for content and delivery
  – New measures are first explored through innovative assessment areas

• **As comparable** as possible and **as specific as necessary**
  – Adaptive assessment instruments
  – Modular context questionnaires

• Frameworks **informed** but not constrained by national standards and curricula
  – Curriculum validation studies
Thank you

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

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