Seeing US education through the prism of international comparisons
The OECD Programme for International Student Assessment (PISA)

Andreas Schleicher
OECD Director for Education and Skills
PISA in brief

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
Trends in science performance (PISA)
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
Multiple outcomes

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:
- Chinese Taipei
- Hong Kong (China)
- New Zealand
- Denmark

Above-average percentage of students expecting to work in a science-related occupation:
- Singapore
- Canada
- Slovenia
- Australia
- United Kingdom
- Ireland
- Portugal
- United States
- Spain
- Israel
- United Arab Emirates

Less achievement in science:
- Brazil
- Bulgaria
- Chile
- Colombia
- Costa Rica
- Dominican Republic
- Jordan
- Kosovo

Lower epistemic beliefs:
- Lebanon
- Mexico
- Peru
- Qatar
- Trinidad and Tobago
- Tunisia
- Turkey
- Uruguay

Lower percentage of students expecting to work in a science-related occupation:
- Sweden
- Lithuania
- Croatia
- Iceland
- Georgia
- Malta
Students expecting a career in science by performance and enjoyment of learning.
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%
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
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 and advantaged schools.
Countries spend their money differently
Contribution of various factors to salary cost of teachers per student in public institutions, lower secondary education (2015)
Student-teacher ratios and class size

The scatter plot illustrates the relationship between student-teacher ratios and class sizes across various countries. The x-axis represents the class size in the language of instruction, while the y-axis represents the student-teacher ratio. Each point on the graph corresponds to a country, with colors indicating whether the country has high or low student-teacher ratios and small or large class sizes.

Key points:
- High student-teacher ratios and small class sizes are represented in the upper-left quadrant of the graph.
- Low student-teacher ratios and large class sizes are represented in the lower-right quadrant of the graph.
- The line with the equation $R^2 = 0.25$ indicates the trend of the data, suggesting a moderate correlation between the variables.
Learning time and science performance

Figure II.6.23

[Graph showing the relationship between learning time and science performance for various countries, with OECD average highlighted.

- Countries on the graph include Finland, Germany, Switzerland, Japan, Estonia, Netherlands, New Zealand, Macao (China), Hong Kong (China), Chinese Taipei, Korea, Russia, Italy, United States, Singapore, Ukraine, United Arab Emirates, Tunisia, Dominican Republic, Brazil, Costa Rica, Mexico, Colombia, Peru, Montenegro, Qatar, Thailand, and United States.

The graph includes a trend line with the equation R² = 0.21, indicating the correlation between learning time and science performance.]
Learning time and science performance

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

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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 \textit{(OECD average)}.
Control strategies are always helpful but less so as problems become more difficult \((OECD\ average)\).
Elaboration strategies are more useful as problems become more difficult (OECD average)

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

![Graph showing variation in science performance between and within schools for different countries. The graph compares the percentage of variation attributed to between-school variation and within-school variation. The OECD average is marked at 30% and 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

Email: Andreas.Schleicher@OECD.org
Twitter: SchleicherOECD
Wechat: AndreasSchleicher