Seeing education through the prism of international comparisons
Maryland Commission on Excellence and Innovation in Education

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Trends in science performance (PISA)
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)

Figure I.6.7

% of students in the bottom international deciles of ESCS
Top performers

Students who can develop and work with models for complex science situations, identifying constraints and specifying assumptions. They can select, compare and evaluate appropriate problem-solving strategies for dealing with complex problems related to these models.
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%

Figure I.2.18

- United States (8.5%); 300k
- B-S-J-G (China) (13.6%); 181k
- Japan (15.3%); 174k
- New Zealand (12.8%)
- Others

- Others
- Italy (4.1%)
- Russia (3.7%); 42k
- France (8.0%); 59k
- Korea (10.6%); 60k
- United Kingdom (10.9%); 68k
- Viet Nam (8.3%); 72k
- Germany (10.6%); 79k
- Finland (14.3%)
- Brazil (0.7%)
- Singapore (24.2%)
- Switzerland (9.8%)
- Belgium (9.0%)
- Spain (5.0%)
- Netherlands (11.1%)
- Poland (7.3%)
- China (13.6%, 181k)
- Thailand (8.3%, 72k)
- Others
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- Others
Lessons from PISA

- **High impact on outcomes**
  - Quick wins
  - Low hanging fruits
- **Low impact on outcomes**
  - Must haves
  - Money pits

- **Low feasibility**
- **High feasibility**
Lessons from PISA

- Low impact on outcomes
  - Low feasibility
    - Money pits
  - High feasibility
    - Gateways, instructional systems

- High impact on outcomes
  - Quick wins
    - Resources where they yield most
  - A learning system
    - Incentive structures and accountability
  - Commitment to universal achievement
    - Must haves
      - Capacity at point of delivery
    - Coherence

- Coherence
- Incentive structures and accountability
- Resources where they yield most
Spending per student from the age of 6 to 15 and science performance

Figure II.6.2

- **Figure Description**: The scatter plot illustrates the relationship between average spending per student from the age of 6 to 15 (in thousands USD, PPP) and science performance score points. Each country is represented by a data point, with the x-axis showing spending per student and the y-axis showing science performance score points.

- **Countries and Corresponding Data Points**: Countries are marked with specific symbols and colors, and each country's data point has an associated R² value indicating the strength of the relationship between spending and science performance. For example:
  - **Luxembourg**: R² = 0.41
  - **United States**: R² = 0.01
  - **Malta**: R² value is not shown

- **Key Observations**:
  - Countries like Australia, Germany, and Japan have high R² values, indicating a strong correlation between spending and science performance.
  - Countries like Brazil, Thailand, and Costa Rica show lower R² values, suggesting less strong correlations.

- **Legend**: The legend provides a visual reference for the countries and their corresponding symbols.

- **Axes Labels**:
  - X-axis: Average spending per student from the age of 6 to 15 (in thousands USD, PPP)
  - Y-axis: Science performance (score points)

This visual representation helps in understanding the economic impact on educational outcomes across different countries.
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.

UK England: Pupil Premium (2011)

Netherlands: School funding formulae; sensitive to socio-economic background students.
Spending choices on secondary schools

Contribution of various factors to upper secondary teacher compensation costs per student as a percentage of GDP per capita

Percentage points
Countries that invest more public funds in privately managed schools tend to have less of a difference between the socio-economic profiles of publicly and privately managed schools.
Attendance at pre-primary school by schools’ socio-economic profile

Number of years in pre-primary education among students attending socio-economically disadvantaged or advantaged schools.

Table II.6.51

OECD average
Learning time and science performance

Figure II.6.23

Total learning time in and outside of school

PISA science score

OECD average

OECD average

R² = 0.21
Learning time and science performance

Figure II.6.23

![Graph showing learning time and science performance across various countries.](image-url)
Student-teacher ratios and class size

Figure II.6.14

- High student-teacher ratios and small class sizes
- Low student-teacher ratios and large class sizes

Countries and their respective student-teacher ratios and class sizes are plotted on a scatter plot. The plot shows a positive correlation between student-teacher ratios and class sizes, with countries like CABA (Argentina), Jordan, Vietnam, Poland, United States, Chile, Denmark, and Hungary having high student-teacher ratios and small class sizes. Conversely, countries like Turkey, Georgia, Chinese Taipei, Macao (China), Vietnam, and B.S.G.J (China) have low student-teacher ratios and large class sizes.

The graph also highlights the OECD average, with a regression line indicating a coefficient of determination ($R^2 = 0.25$).
Students’ use of memorisation strategies

% of students who report they learn by heart

Source: Figure 4.1
Memorisation is less useful as problems become more difficult (OECD average)

R² = 0.81

Difficulty of mathematics item on the PISA scale

Source: Figure 4.3
There are large international differences in the use of control strategies

Source: Figure 5.1
Control strategies are always helpful but less so as problems become more difficult (OECD average).

Using control strategies is associated with a lower chance of success as problems become more difficult.

Source: Figure 5.2
Students’ use of elaboration strategies

% of students who understand new concepts by relating them to things they already know

More

Below the OECD average
At the same level as the OECD average
Above the OECD average

Less

United Kingdom     20
Iceland     18
Australia     20
Ireland     23
France     19
New Zealand     19
Israel     26
Canada     26
Austria     32
Japan     29
Belgium     22
Singapore     31
Uruguay     22
Germany     33
Netherlands     24
HK-China     30
Luxembourg     33
Costa Rica     33
Norway     23
Finland     23
United States     30
Portugal     29
OECD average     30

Source: Figure 6.1
Elaboration strategies are more useful as problems become more difficult (OECD average).

Using elaboration strategies is associated with a greater chance of success as problems become more difficult.

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

OECD average 69%

OECD average 30%

OECD average 69%
Percentage of lower secondary teachers who report doing the following activities at least once per month

Professional collaboration among teachers

Exchange and co-ordination

- Discuss individual students
- Share resources
- Team conferences
- Collaborate for common standards

Professional collaboration

- Team teaching
- Collaborative PD
- Joint activities
- Classroom observations

Average (OECD countries)
Teachers Self-Efficacy and Professional Collaboration

- Teach jointly as a team in the same class
- Observe other teachers’ classes and provide feedback
- Engage in joint activities across different classes
- Take part in collaborative professional learning

Teacher self-efficacy (level)

Less frequently: Never, Once a year or less, 2-4 times a year
More frequently: 5-10 times a year, 1-3 times a month, Once a week or more
Teachers’ skills

Numeracy test scores of tertiary graduates and teachers

Numeracy skills of middle half of college graduates
Teachers’ skills

Numeracy test scores of tertiary graduates and teachers

Numeracy skills of teachers

Japan
Finland
Flanders (Belgium)
Germany
Norway
Netherlands
Austria
Czech Republic
Sweden
Australia
France
Northern Ireland (UK)
Denmark
England/N. Ireland (UK)
England (UK)
Korea
Ireland
Canada
United States
Estonia
Poland
Spain

Numeracy score

215 235 255 275 295 315 335 355 375
Governance

Across the OECD, 70% of students attend schools whose principals have considerable responsibility for hiring teachers, and in half the cases also over budget allocations within the school.
Students score lower in science when the school governing board holds more responsibility for admissions policies.
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
System transformations

**The old bureaucratic system**

- **Some** students learn at high levels (sorting)
- Routine cognitive skills
- Standardisation and compliance
- ‘Tayloristic’, hierarchical
- Primarily to authorities

**The modern enabling system**

- **All** students need to learn at high levels
- Complex ways of thinking, complex ways of doing, collective capacity
- Curriculum, instruction and assessment
- Teacher quality
- Work organisation
- Accountability
- Primarily to peers and stakeholders
Thank you

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