Reform
November 18
Andreas Schleicher
Trends in science performance (PISA)
Money is necessary but not sufficient

Spending per student from the age of 6 to 15 and science performance

Figure II.6.2

Luxembourg

Switzerland

Norway

Austria

Singapore

United States

United Kingdom

Malta

Sweden

Belgium

Iceland

Denmark

Netherlands

Canada

Japan

Slovenia

Australia

Germany

Ireland

France

Italy

Portugal

New Zealand

Korea

Spain

Poland

Israel

Estonia

Czech Rep.

Latvia

Slovak Rep.

Russia

Croatia

Lithuania

Hungary

Costa Rica

Chinese Taipei

Chile

Brazil

Turkey

Uruguay

Bulgaria

Mexico

Thailand

Montenegro

Colombia

Dominican Republic

Peru

Georgia

R² = 0.01

R² = 0.41

Science performance (score points)

Average spending per student from the age of 6 to 15 (in thousands USD, PPP)
Learning time and science performance (PISA)

Figure II.6.23

- **Productivity**

- **Time in school**

- **Learning out of school**

---

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 learning time

- United Arab Emirates
- Dominican Republic
Changing education can be like moving graveyards

• The status quo has many protectors
  – Everyone supports reform – except for their own children
  – Even those who promote reforms often change their mind when they understand what change entails for them

• The frogs rarely clear the swamp
  – The loss of privilege is pervasive because of the extent of vested interests

• Asymmetry of costs and benefits of educational reform
  – Costs are certain and immediate, benefits are uncertain and long-term

• Lack of supportive ecosystems
  – Lack of an ‘education industry’ that pushes innovation and absorbs risks
  – A research sector that is often disengaged from the real needs of real classrooms

• You can lose an election but you don’t win one over education
  – Complexity and length of reform trajectory that extend electoral cycles
  – A substantial gap between the time when the cost of reform is incurred, and the time when benefits materialise
### When fast gets really fast, being slow to adapt makes education really slow

<table>
<thead>
<tr>
<th>Industrial systems</th>
<th>World class systems</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Some</strong> students learn at high levels</td>
<td><strong>All</strong> students need to learn at high levels</td>
</tr>
<tr>
<td>Routine cognitive skills</td>
<td>Complex ways of thinking and working</td>
</tr>
<tr>
<td>Standardisation and compliance</td>
<td>Teacher education</td>
</tr>
<tr>
<td>‘Tayloristic’, industrial</td>
<td>High-level professional knowledge workers</td>
</tr>
<tr>
<td>Primarily to authorities</td>
<td>Work organisation</td>
</tr>
<tr>
<td></td>
<td>Accountability</td>
</tr>
<tr>
<td></td>
<td>Flat, collegial, entrepreneurial</td>
</tr>
<tr>
<td></td>
<td>Primarily to peers and stakeholders</td>
</tr>
</tbody>
</table>
Some learn at high levels
All learn at high levels
Poverty need not be destiny:
PISA math performance by decile of social background (2012)
Poverty need not be destiny

Science learning outcomes by international deciles of economic, social and cultural status (ESCS) (2015)

Figure I.6.7

% of students in the bottom international deciles of ESCS

OECD median student

Score points

Bottom decile  Second decile  Middle decile  Ninth decile  Top decile
Aligning resources with needs

Average class size in 9th grade, by quarter of school socio-economic profile

<table>
<thead>
<tr>
<th>Social Background</th>
<th>Average Class Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Highly disadvantaged</td>
<td>United States: 22</td>
</tr>
<tr>
<td></td>
<td>OECD average: 24</td>
</tr>
<tr>
<td>Disadvantaged</td>
<td>United States: 26</td>
</tr>
<tr>
<td></td>
<td>OECD average: 26</td>
</tr>
<tr>
<td>Advantaged</td>
<td>United States: 25</td>
</tr>
<tr>
<td></td>
<td>OECD average: 27</td>
</tr>
<tr>
<td>Highly advantaged</td>
<td>United States: 25</td>
</tr>
<tr>
<td></td>
<td>OECD average: 28</td>
</tr>
</tbody>
</table>
Aligning resources with needs

Science teachers without a university major in science, by school socio-economic profile (OECD Average)

![Bar chart showing the percentage of science teachers without a university major in science by school socio-economic profile. The chart compares the United States and the OECD average. The percentages are higher in the highly disadvantaged and disadvantaged schools compared to advantaged and highly advantaged schools.](chart.png)
Students in disadvantaged schools have less exposure **conceptual understanding** in math.
Attendance at pre-primary school
by schools' socio-economic profile

Number of years in pre-primary education among students attending socio-economically ...
Reproducing knowledge
Creating knowledge
Think for yourself and work with others
The kind of things that are easy to teach are now easy to automate, digitize or outsource.

Mean task input in percentiles of 1960 task distribution

- Routine manual
- Nonroutine manual
- Routine cognitive
- Nonroutine analytic
- Nonroutine interpersonal

- 1960
- 1970
- 1980
- 1990
- 2000
- 2006
- 2009
Digitalisation

Participating

Concentrating

Particularizing

Empowering

Homogenizing

Disempowering
15-year-olds feeling bad if not connected to the Internet (PISA)
Students are using more time online outside school on a typical school day (PISA)

Figure III.13.3

Percentage of High Internet Users (spending 2 to 6 hours on line per day), during weekdays

<table>
<thead>
<tr>
<th>Country</th>
<th>Minutes per day</th>
<th>2015</th>
<th>2012</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chile</td>
<td>39</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sweden</td>
<td>56</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uruguay</td>
<td>33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Costa Rica</td>
<td>44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Spain</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Italy</td>
<td>52</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Australia</td>
<td>50</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Estonia</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>New Zealand</td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hungary</td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Russia</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Netherlands</td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Denmark</td>
<td>55</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovak Republic</td>
<td>43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Czech Republic</td>
<td>43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Austria</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Latvia</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Singapore</td>
<td>44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Belgium</td>
<td>44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>44</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Iceland</td>
<td>46</td>
<td></td>
<td></td>
</tr>
<tr>
<td>OECD average-27</td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ireland</td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Croatia</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Portugal</td>
<td>42</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finland</td>
<td>48</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Israel</td>
<td>34</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Macao (China)</td>
<td>45</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Switzerland</td>
<td>40</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Greece</td>
<td>41</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mexico</td>
<td>30</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Slovenia</td>
<td>37</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Japan</td>
<td>31</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Korea</td>
<td>20</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Skills to manage complex digital information

- Young adults (16-24 year-olds)
- Older adults (55-65 year-olds)

Countries: Turkey, Greece, Chile, Lithuania, Israel, United States, Poland, Russian Federation, Ireland, Slovak Republic, England (UK), Northern Ireland (UK), Japan, OECD average, Slovenia, Netherlands, Denmark, Austria, Australia, Canada, New Zealand, Germany, Czech Republic, Norway, Flanders (Belgium), Netherlands, Sweden, Finland, Singapore, Korea, Slovenia, Estonia, Denmark, Austria, Australia, Canada, New Zealand, Germany, Czech Republic, Norway, Flanders (Belgium), Netherlands, Sweden, Finland, Korea, Singapore.
Education won the race with technology throughout history, but there is no automaticity it will do so in the future.

The future will be about pairing the artificial intelligence of computers with the cognitive, social and emotional skills and values of humans.

Inspired by “The race between technology and education” Pr. Goldin & Katz (Harvard)
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).

\[ R^2 = 0.81 \]

Source: Figure 4.3
Elaboration strategies are more useful as problems become more difficult (*OECD average*).

Source: Figure 6.2
Some lessons from high performers

• Rigor, focus and coherence
• Remain true to the disciplines
  – but aim at interdisciplinary learning and the capacity of students to see problems through multiple lenses
  – Balance knowledge of disciplines and knowledge about disciplines
• Focus on areas with the highest transfer value
  – Requiring a theory of action for how this transfer value occurs
• Authenticity
  – Thematic, problem-based, project-based, co-creation in conversation
• Some things are caught not taught
  – Immersive learning propositions
The past was divided

Teachers and content divided by subjects and student destinations

Schools designed to keep students inside, and the rest of the world outside
The future is integrated

Integrated: Emphasising integration of subjects, integration of students and integration of learning contexts

Connected: with real-world contexts, and permeable to the rich resources in the community

Less subject-based, more project-based
Prescription
Ownership of professional practice

Powerful learning environments are constantly creating synergies and finding new ways to enhance professional, social and cultural capital with others. They do that with families and communities, with higher education, with other schools and learning environments, and with businesses.
Making teaching not just financially, but intellectually more attractive

- Public confidence in profession and professionals
- Professional preparation and learning
- Collective ownership of professional practice
- Decisions made in accordance with the body of knowledge of the profession
- Professional responsibility in the name of the profession and accountability towards the profession
Policy levers to teacher professionalism

Autonomy: Teachers’ decision-making power over their work (teaching content, course offerings, discipline practices)

Teacher professionalism

Peer networks: Opportunities for exchange and support needed to maintain high standards of teaching (participation in induction, mentoring, networks, feedback from direct observations)

Knowledge base for teaching (initial education and incentives for professional development)
Teacher professional collaboration
Percentage of lower secondary teachers who report doing the following activities at least once per month

- Discuss individual students
- Share resources
- Team conferences
- Collaborate for common standards
- Team teaching
- Collaborative PD
- Joint activities
- Classroom observations

Exchange and co-ordination

United States

(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

Less frequently

More frequently
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

R² = 0.25
Countries spend their money differently

Contribution of various factors to salary cost of teachers per student in public institutions, lower secondary education (2015)
Teachers’ job satisfaction and class size

Class size (number of students)

15 or less
16-20
21-25
26-30
31-35
36 or more

Teachers’ job satisfaction (level)
Teacher job satisfaction and professionalism

- Perceptions of teachers’ status
- Satisfaction with the profession
- Satisfaction with the work environment
- Teachers’ self-efficacy

Low professionalism
High professionalism
Teachers’ skills

Numeracy test scores of tertiary graduates and 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
Teachers’ skills
Numeracy test scores of tertiary graduates and teachers
Teachers perception of the value of teaching

Percentage of lower secondary teachers who "agree" or "strongly agree" that teaching profession is a valued profession in society

- Singapore
- Korea
- Finland
- Alberta (Canada)
- Flanders (Belgium)
- Shanghai (China)
- New Zealand
- Russia
- Netherlands
- Australia
- England (UK)
- United States
- Average
- Norway
- Japan
- Latvia
- Denmark
- Poland
- Iceland
- Estonia
- Czech Republic
- Portugal
- Sweden
- France

Netherlands, Singapore, Flanders, England (UK) have the highest percentage.
Countries where teachers believe their profession is valued show higher levels of excellence in learning outcomes (PISA)

Relationship between lower secondary teachers’ views on the value of their profession in society and the country’s share of top mathematics performers in PISA 2012.

Share of mathematics top performers

Percentage of teachers who agree that teaching is valued in society

Countries where teachers believe their profession is valued show higher levels of excellence in learning outcomes (PISA).
Bureaucratic Look-up
Devolved Look-outward
Correlations between the responsibilities for school governance and learning outcomes

PISA Figure II.4.8

Source: OECD, PISA 2015 Database.
Who decides?

Percentage of decisions taken at each level of government in public lower secondary education (2017)

- School
- Local
- Regional or Sub-regional
- Central or State
- Multiple levels

Countries included:
- Netherlands
- Czech Republic
- England (UK)
- Flemish community
- Iceland
- Estonia
- Australia
- New Zealand
- Scotland (UK)
- Chile
- Austria
- Ireland
- Slovak Republic
- Lithuania
- EU average
- Sweden
- OECD average
- Italy
- Hungary
- Denmark
- French community
- Russian Federation
- Japan
- Israel
- Germany
- Luxembourg
- Mexico
- United States
- Canada
- Korea
- Portugal
- Norway
- France
- Spain
- Switzerland
- Greece
- Turkey
- Finland
School autonomy and equity

Where school responsibility for hiring teachers and setting salaries is greater, teacher allocation tends to be more equitable.
Figure II.4.14

Science performance in public and private schools

- Students in public schools perform better
- Students in private schools perform better

Chart showing the comparison of science performance between public and private schools, with countries on the x-axis and score-point difference on the y-axis.
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.
Parents’ interest in their child's activities at school and well-being (average)

More likely

Students who say their parents are interested in their school activities are...

- 2.5 times more likely
- 1.9 times more likely

As likely

- 1.4 times less likely

Less likely

- Twice less likely

- Wanting top grades at school
- Being very satisfied with life
- Feeling lonely at school
- Being not satisfied with life
Standardisation and Conformity

Standardisation and compliance lead students to be educated in batches of age, following the same standard curriculum, all assessed at the same time.
Ingenious

Building instruction from student passions and capacities, helping students personalise their learning and assessment in ways that foster engagement and talents.
If I am more innovative in my teaching I will be rewarded (country average)
Ideosyncratic policy
Alignment of policies
Knowledge is only as valuable as our capacity to act on it, and the road of educational reform is littered with good ideas that were poorly implemented.
People are more likely to accept changes that are not solely in their own interests if they understand the reasons for these changes and can see the role they should play within the broad strategy.
Making reform happen

People are more likely to accept changes that are not solely in their own interests if they understand the reasons for these changes and can see the role they should play within the broad strategy.

Educational leaders are rarely successful with reform unless they build a shared understanding and collective ownership for change, and unless they build capacity and create the right policy climate, with accountability measures designed to encourage innovation rather than compliance.
Making reform happen

People are more likely to accept changes that are not solely in their own interests if they understand the reasons for these changes and can see the role they should play within the broad strategy.

Educational leaders are rarely successful with reform unless they build a shared understanding and collective ownership for change, and unless they build capacity and create the right policy climate, with accountability measures designed to encourage innovation rather than compliance.

Often the resource implications of reform are underestimated in scope, nature and timing. The main shortcoming is often not a lack of financial resources, but a dearth of human capacity at every level of the system.
Making reform happen

People are more likely to accept changes that are not solely in their own interests if they understand the reasons for these changes and can see the role they should play within the broad strategy.

Educational leaders are rarely successful with reform unless they build a shared understanding and collective ownership for change, and unless they build capacity and create the right policy climate, with accountability measures designed to encourage innovation rather than compliance.

Often the resource implications of reform are underestimated in scope, nature and timing. The main shortcoming is often not a lack of financial resources, but a dearth of human capacity at every level of the system.

School systems that feel threatened by alternative ways of thinking get trapped in old practice. The ones that progress are those that are open to the world and ready to learn from and with the world’s education leaders.
In conclusion

Universal high quality education is an attainable goal, and our task is not to make the impossible possible, but to make the possible attainable. It is entirely within our means to deliver a future for millions of learners who currently don’t have one.
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