The long-run economic impact of improvements in learning outcomes

Lisbon Council, 25 January 2010

Andreas Schleicher
Education Policy Advisor of the OECD Secretary-General
In the current economic environment...

... Labour-market entry becomes more difficult
  - as young graduates compete with experienced workers

... Job prospects for less qualified deteriorate

... Young people with lower qualifications who become unemployed are likely to spend long time out of work
  - In most countries over half of low-qualified unemployed 25-34-year-olds are long-term unemployed

... Higher risks for systems with significant work-based training

... Gaps in educational attainment between younger and older cohorts likely to widen

... Opportunity costs for education decline
  - Dominated by lost earnings.
Economic impact of improvements

1. Know why you are looking
   - The yardstick for success is no longer just improvement by national standards...
     ... but the best performing education systems globally

2. Know what you are looking for
   - The kind of ‘human capital’ that makes a difference for individuals and nations

3. How do we know that we found it?
   - Measuring the impact of human capital

4. Implications
   - Understanding what contributes to the success of education and learning.
Know why you are looking

The yardstick for success is no longer just improvement by national standards...

...but the best performing education systems globally
A world of change – higher education

1995

Cost per student

Graduate supply

Tertiary-type A graduation rate

Expenditure per student at tertiary level (USD)
A world of change – higher education

1995

Expenditure per student at tertiary level (USD)

Tertiary-type A graduation rate

Graduate supply

Cost per student

United States

Germany

Finland

New Zealand

Norway

Poland

Portugal

Slovak Republic

Spain

Sweden

United Kingdom

United States

Australia

Austria

Czech Republic

Denmark

Finland

Germany

Greece

Hungary

Iceland

Ireland

Italy

Japan

Netherlands

Poland

Portugal

Slovak Republic

Spain

Sweden

United Kingdom

United States
A world of change – higher education

2000

Expenditure per student at tertiary level (USD)

Tertiary-type A graduation rate
A world of change – higher education

2001

Expenditure per student at tertiary level (USD) vs. Tertiary-type A graduation rate
A world of change - higher education

2002

Expenditure per student at tertiary level (USD)

Tertiary-type A graduation rate
A world of change – higher education

2003

Expenditure per student at tertiary level (USD)

Tertiary-type A graduation rate

Australia
Austria
Czech Republic
Denmark
Finland
Germany
Greece
Hungary
Iceland
Ireland
Italy
Japan
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
United Kingdom
United States
A world of change – higher education

2004

Expenditure per student at tertiary level (USD)

Tertiary-type A graduation rate
A world of change – higher education

2005

Expenditure per student at tertiary level (USD)

Tertiary-type A graduation rate

Australia
Austria
Czech Republic
Denmark
Finland
Germany
Greece
Hungary
Iceland
Ireland
Italy
Japan
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
United Kingdom
United States
A world of change – higher education

2006

Expenditure per student at tertiary level (USD)

Tertiary-type A graduation rate

Australia
Austria
Czech Republic
Denmark
Finland
Germany
Greece
Hungary
Iceland
Ireland
Italy
Japan
Netherlands
New Zealand
Norway
Poland
Portugal
Slovak Republic
Spain
Sweden
United Kingdom
United States

United States
Australia
Finland
Poland

0 5000 10000 15000 20000 25000 30000
0 10 20 30 40 50 60 70
Moving targets

Future supply of college graduates

- China
- EU
- US

- 2006
- 2010
- 2015
- 2020
Know what you are looking for

Defining and measuring the kind of human capital that makes a difference for people and nations
Components of the private net present value for a male with higher education

<table>
<thead>
<tr>
<th>Country</th>
<th>Foregone earnings</th>
<th>Direct cost</th>
<th>Gross earnings benefits</th>
<th>Income tax effect</th>
<th>Social contribution effect</th>
<th>Transfers effect</th>
<th>Unemployment effect</th>
<th>Net present value in USD equivalent</th>
</tr>
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<tbody>
<tr>
<td>Portugal</td>
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Net present value in USD equivalent
## Public cost and benefits for a male obtaining upper secondary or post-secondary non-tertiary education and tertiary education

### Upper secondary and post-secondary non-tertiary education

<table>
<thead>
<tr>
<th>Country</th>
<th>Public costs</th>
<th>Public benefits</th>
<th>Net present value, USD equivalent</th>
</tr>
</thead>
<tbody>
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<td>Czech Republic</td>
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<td>32,257</td>
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<td>3,711</td>
<td>51,954</td>
<td>55,665</td>
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<td>Poland</td>
<td>18,058</td>
<td>50,271</td>
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<td>47,368</td>
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<td>30,613</td>
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<td>Turkey</td>
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<td>350,000</td>
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</table>

Note: Numbers in orange show negative values.
The high cost of low educational performance

<table>
<thead>
<tr>
<th>Region</th>
<th>GDP/pop 1960</th>
<th>Years schooling</th>
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<tr>
<td>Asia</td>
<td>1891</td>
<td>4</td>
</tr>
<tr>
<td>Sub-Saharan Africa</td>
<td>2304</td>
<td>3.3</td>
</tr>
<tr>
<td>MENA</td>
<td>2599</td>
<td>2.7</td>
</tr>
<tr>
<td>Latin America</td>
<td>4152</td>
<td>4.7</td>
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<tr>
<td>Europe</td>
<td>7469</td>
<td>7.4</td>
</tr>
<tr>
<td>Orig. OECD</td>
<td>11252</td>
<td>9.5</td>
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Hanushek 2009
### Latin America then and now...

<table>
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<tr>
<th></th>
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<tbody>
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<td>Asia</td>
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<td>4</td>
<td>4.5</td>
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<td>Sub-Saharan Africa</td>
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</table>

Hanushek 2009
Latin America then and now...

<table>
<thead>
<tr>
<th>Region</th>
<th>Years</th>
<th>GDP/pop 1960</th>
<th>Years</th>
<th>GDP/pop 2000</th>
<th>Test score 1960</th>
<th>Test score 2000</th>
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</thead>
<tbody>
<tr>
<td>Asia</td>
<td>1891</td>
<td>1.8</td>
<td>4</td>
<td>4.5</td>
<td>13571</td>
<td>480</td>
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<td>Sub-Saharan Africa</td>
<td>2304</td>
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<td>3.3</td>
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<td>9.5</td>
<td>2.1</td>
<td>26147</td>
<td>500</td>
</tr>
</tbody>
</table>

Conditional growth vs. Conditional test score graph.
Andreas Schleicher
25 January 2010

The high cost of low educational performance

OECD’s PISA assessment of the knowledge and skills of 15-year-olds

Coverage of world economy 87%
Andreas Schleicher
25 January 2010

The high cost of low educational performance

High science performance
- Finland
- Hong Kong-China
- Canada
- Japan
- New Zealand
- Australia
- Netherlands
- Korea
- Slovenia
- Germany
- Switzerland
- Austria
- Belgium
- Hungary
- Sweden
- Denmark
- Poland
- Croatia
- Estonia
- Chinese Taipei

Low science performance
- Portugal
- Greece
- Israel

Average performance of 15-year-olds in science - extrapolate and apply

18 countries perform below this line
<table>
<thead>
<tr>
<th>OECD Level 2</th>
<th>OECD Level 6</th>
<th>OECD Level 6</th>
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</thead>
<tbody>
<tr>
<td>Students can determine if scientific measurement can be applied to a given variable in an investigation. Students can appreciate the relationship between a simple model and the phenomenon it is modelling.</td>
<td>Students can demonstrate ability to understand and articulate the complex modelling inherent in the design of an investigation.</td>
<td>Identifying issues that can be investigated scientifically</td>
</tr>
<tr>
<td>Students can recall an appropriate, tangible, scientific fact applicable in a simple and straightforward context and can use it to explain or predict an outcome.</td>
<td>Students can draw on a range of abstract scientific knowledge and concepts and the relationships between these in developing explanations of processes.</td>
<td>Identifying keywords in a scientific investigation</td>
</tr>
<tr>
<td>Students can point to an obvious feature in a simple table in support of a given statement. They are able to recognise if a set of given characteristics apply to the function of everyday artifacts.</td>
<td>Students demonstrate ability to compare and differentiate among competing explanations by examining supporting evidence. They can formulate arguments by synthesising evidence from multiple sources.</td>
<td>Recognising the key features of a scientific investigation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Explaining</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Applying knowledge of science in a situation</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Describing or interpreting phenomena scientifically or predicting change</td>
</tr>
<tr>
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<td>Using evidence</td>
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<tr>
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<td>Interpreting scientific evidence and drawing conclusions</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Identifying the assumptions, evidence and reasoning behind conclusions</td>
</tr>
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</table>
Top and bottom performers in science

These students can consistently identify, explain and apply scientific knowledge, link different information sources and explanations and use evidence from these to justify decisions, demonstrate advanced scientific thinking in unfamiliar situations...

These students often confuse key features of a scientific investigation, apply incorrect information, mix personal beliefs with facts in support of a position...

Large proportion of top performers

New Zealand 530  
Finland 474  
United Kingdom 475  
Australia 424  
Japan 410  
Canada 489  

OECD average 522  

Large prop. of poor perf.

Portugal 530  
Italy 474  
Turkey 475  
Mexico 424  
United States 410  
Korea 522  

The high cost of low educational performance

Andreas Schleicher  
25 January 2010
How do we know that we found it?

To what extent knowledge and skills matter for the success of individuals and economies
Increased likelihood of tertiary participation at age 19/21 associated with PISA reading proficiency at age 15 (Canada) after accounting for school engagement, gender, mother tongue, place of residence, parental, education and family income (reference group PISA Level 1)

Increased chance of successful tertiary participation

PISA performance at age 15
School marks at age 15
Level 2 Level 3 Level 4 Level 5
How knowledge and skills can impact on economic performance

- **Different theories**

  1. An aggregate production function where the output of the macro economy is a direct function of the capital and labour in the economy

     - The human capital component of growth comes through accumulation of more education that implies the economy moves from one steady state level to another; once at the new level, education exerts no further influence on growth

     - Model is estimated by relating changes in GDP per worker to changes in education (and capital)
How knowledge and skills can impact on economic performance

Different theories

(2) Endogenous growth models

- Education increases the innovative capacity of the economy through developing new ideas and new technologies. A given level of education can lead to a continuing stream of new ideas, thus making it possible for education to affect growth even when no new education is added to the economy.

- Estimated through models that relate changes in GDP per worker to the level of education.
How knowledge and skills can impact on economic performance

- Different theories

(3) Diffusion of technologies

- If new technologies increase firm productivity, countries can grow by adopting these new technologies more broadly. Education may facilitate the transmission of knowledge needed to implement new technologies.
Estimating the relationship

- Link PISA to previous international assessments in order to obtain historical data
  - Requires tests to be put on a common scale
- Estimate the impact of test performance on economic growth through growth regressions.
Modelling the impact

- Programmes to improve cognitive skills through schools take time to implement and to have their impact on students.
  - Assume that it will take 20 years to implement reform

- The impact of improved skills will not be realised until the students with greater skills move into the labour force.
  - Assume that improved PISA performance will result in improved skill-based of 2.5% of the labour-force each year

- The economy will respond over time as new technologies are developed and implemented, making use of the new higher skills.
  - Estimate the total gains over the lifetime of the generation born this year.
Relationship between test performance and economic outcomes

Annual improved GDP from raising performance by 25 PISA points

Percent addition to GDP

2010 2020 2030 2040 2050 2060 2070 2080 2090 2100 2110
Increase average performance by 25 PISA points (Total 115 trillion $)

Potential increase in economic output (bn $)

- United States
- Japan
- Germany
- France
- Italy
- Mexico
- Spain
- Korea
- Canada
- Turkey
- Australia
- Poland
- Netherlands
- Belgium
- Sweden
- Greece
- Czech Republic
- Austria
- Norway
- Switzerland
- Portugal
- Hungary
- Denmark
- Finland
- Ireland
- New Zealand
- Slovak Republic
- Luxembourg
- Iceland
Catching up with Finland (total 260 trillion $)

Potential increase in economic output (bn $)
Raise everyone to minimum of 400 PISA points

Potential increase in economic output (bn $)

- United States
- Mexico
- Turkey
- Germany
- Italy
- Japan
- France
- Spain
- United Kingdom
- Poland
- Canada
- Greece
- Korea
- Australia
- Portugal
- Belgium
- Netherlands
- Norway
- Sweden
- Austria
- Czech Republic
- Switzerland
- Hungary
- Denmark
- Ireland
- Slovak Republic
- New Zealand
- Luxembourg
- Finland

- United Kingdom
- Poland
- Canada
- Greece
- Korea
- Australia
- Portugal
- Belgium
- Netherlands
- Norway
- Sweden
- Austria
- Czech Republic
- Switzerland
- Hungary
- Denmark
- Ireland
- Slovak Republic
- New Zealand
- Luxembourg
- Finland
Raise everyone to minimum of 400 PISA points

% current GDP
Some caveats

- Do the statistical models used to characterise OECD growth between 1960 and 2000 accurately reflect the underlying determinants of growth?
- A changing impact of cognitive skills on technological change and economic growth would directly affect the specific estimates.
- The present value of improved growth depends on the general health and growth of individual economies, which again is simply projected according to the historic patterns of the OECD nations.
Evidence on causality

- Estimated relationship is little affected by including other possible determinants of economic growth.
- Measures of geographical location, political stability, capital stock, population growth, and school inputs (pupil-teacher ratios and various measures of spending) do not significantly affect the estimated impact of cognitive skills.
  - The only substantial effect on the estimates is the inclusion of various measures of economic institutions (security of property rights and openness of the economy) which reduces the estimated impact of cognitive skills by 15 percent.
Evidence on causality

- To tackle reverse-causality issues
  - Separate the timing of the analysis by estimating the effect of scores on tests conducted until the early 1980s on economic growth in 1980-2000
    - Estimate shows a significant positive effect that is about twice as large as the coefficient used in the simulations here
    - Reverse causality from growth to test scores is also unlikely because additional resource in the school system (which might become affordable with increased growth) do not relate systematically to improved test scores
  - Compare performance of immigrants
  - Verify that changes in test scores over time lead to changes in growth rates
    - To eliminate country-specific and cultural factors.
Some conclusions

- The higher economic outcomes that improved student performance would entail dwarfs the dimensions of economic cycles.
- Even if the estimated impacts of skills were twice as large as the true underlying causal impact on growth, the resulting present value of successful school reform still far exceeds any conceivable costs of improvement.
Implications

Understanding what contributes to the success of education systems and improving performance
Money matters - but other things do too

Question: If better education results in more money, does more money result in better education?
Spending choices on secondary schools
Contribution of various factors to upper secondary teacher compensation costs per student as a percentage of GDP per capita (2004)

- Salary as % of GDP/capita
- Instruction time
- 1/teaching time
- 1/class size
- Difference with OECD average

Percentage points

Countries: Portugal, Spain, Switzerland, Turkey, Belgium, Korea, Luxembourg, Germany, Greece, Japan, Australia, United Kingdom, France, Netherlands, Denmark, Italy, Austria, Czech Republic, Hungary, Ireland, Mexico, Poland, United States, Sweden, Finland, Portugal, Spain, Switzerland, Turkey, Belgium, Korea, Luxembourg, Germany, Greece, Japan, Australia, United Kingdom, France, Netherlands, Denmark, Italy, Austria, Czech Republic, Hungary, Ireland, Mexico, Poland, United States, Sweden, Finland.
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25 January 2010

The high cost of low educational performance

High ambitions and universal standards

Rigor, focus and coherence

Great systems attract great teachers and provide access to best practice and quality professional development
The high cost of low educational performance

Challenge and support

- Strong support
  - Strong performance
  - Systemic improvement

- Weak support
  - Poor performance
  - Improvements idiosyncratic

- High challenge
  - Conflict
  - Demoralisation

- Low challenge
  - Poor performance
  - Stagnation
Human capital

International Best Practice

- Principals who are trained, empowered, accountable and provide instructional leadership
- Attracting, recruiting and providing excellent training for prospective teachers from the top third of the graduate distribution
- Incentives, rules and funding encourage a fair distribution of teaching talent

The past

- Principals who manage 'a building', who have little training and preparation and are accountable but not empowered
- Attracting and recruiting teachers from the bottom third of the graduate distribution and offering training which does not relate to real classrooms
- The best teachers are in the most advantaged communities

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The high cost of low educational performance
Human capital (cont...)

**International Best Practice**
- Expectations of teachers are clear; consistent quality, strong professional ethic and excellent professional development focused on classroom practice
- Teachers and the system expect every child to succeed and intervene preventatively to ensure this

**The past**
- Seniority and tenure matter more than performance; patchy professional development; wide variation in quality
- Wide achievement gaps, just beginning to narrow but systemic and professional barriers to transformation remain in place
The high cost of low educational performance

High ambitions

Access to best practice and quality professional development

Accountability and intervention in inverse proportion to success

Devolved responsibility, the school as the centre of action

Devolved responsibility, the school as the centre of action

Devolved responsibility, the school as the centre of action
School autonomy, standards-based examinations and science performance

School autonomy in selecting teachers for hire

PISA score in science

- Standards based external examinations
- School autonomy in selecting teachers for hire

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The high cost of low educational performance

Public and private schools

Private schools perform better

Public schools perform better

Score point difference
Pooled international dataset, effects of selected school/system factors on science performance after accounting for all other factors in the model

OECD (2007), PISA 2006 - Science Competencies from Tomorrow's World, Table 6.1a
Integrated educational opportunities

Access to best practice and quality professional development

Strong ambitions

Devolved responsibility, the school as the centre of action

From prescribed forms of teaching and assessment towards personalised learning
The high cost of low educational performance

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Strong socio-economic impact on student performance

Low average performance
Large socio-economic disparities

High average performance
Low science performance

High science performance

High average performance

High social equity

Low average performance

Low science performance

High degree of stratification
Low degree of stratification

Early selection and institutional differentiation

High social equity

Socially equitable distribution of learning opportunities

Finland

Canada

Japan

Australia

Korea

New Zealand

Netherlands

Germany

Belgium

Czech Republic

Austria

Switzerland

United Kingdom

Ireland

Sweden

Denmark

Iceland

Norway

Turkey

United States

Spain

Portugal

Greece

Italy
Education needs to prepare students to...

- Deal with more rapid change than ever before...
  ... for jobs that have not yet been created...
  ... using technologies that have not yet been invented...
  ... to solve problems that we don’t yet know will arise

Its not about more of the same, but about new...

- Ways of thinking
  - involving creativity, critical thinking, problem-solving and decision-making
- Ways of working
  - including communication and collaboration
- Tools for working
  - including the capacity to recognise and exploit the potential of new technologies
- The capacity to live in a multi-faceted world as active and responsible citizens.
Paradigm shifts

The old bureaucratic system  The modern enabling system

Hit and miss  $\rightarrow$  Universal high standards

Uniformity  $\rightarrow$  Embracing diversity

Provision  $\rightarrow$  Outcomes

Bureaucratic look-up  $\rightarrow$  Devolved - look outwards

Talk equity  $\rightarrow$  Deliver equity

Prescription  $\rightarrow$  Informed profession

Conformity  $\rightarrow$  Ingenious
• www.oecd.org; www.pisa.oecd.org
  - All national and international publications
  - The complete micro-level database
• email: pisa@oecd.org

• Andreas.Schleicher@OECD.org

... and remember:

Without data, you are just another person with an opinion