DATA-DRIVEN POLICY ANALYSIS AND INNOVATION IN EDUCATION: AN OECD PERSPECTIVE

Carlos González-Sancho
OECD Directorate for Education and Skills
Centre for Educational Research and Innovation (CERI)

25 October 2018
Dushanbe, Republic of Tajikistan
1. Role of data for education policy planning and evaluation
   - OECD work on SDG 4 monitoring
   - Some examples of analysis with PISA data

2. Longitudinal information systems in education in OECD countries: current state and future directions
   - Insights from the OECD/CERI survey of information systems
   - A typology: four model approaches to using longitudinal systems
   - Some challenges
Key messages

OECD is strongly engaged in 2030 Agenda and SDG 4 monitoring

Education SDG architecture, TCGs, reporting, data collection, capacity building

EMIS development should enable a wider range of uses of education data

From statistical reporting and evaluation, to research and innovation for improvement
Requires enhancing the capacities of information systems, most importantly with student longitudinal identifiers, new types of data and more flexible access

Longitudinal education information systems in OECD countries provide examples of what is possible for EMIS going forward

Many good models and solutions can already be found in the education sector
No need to restart from scratch – strong longitudinal information systems can often be built from legacy systems
OECD role in SGD 4 framework and monitoring
Not all OECD countries are at the same level when it comes to meeting the SDG 4 targets

General overview of selected SDG indicators

Indicators for which higher values are desirable

Indicators for which lower values are desirable

- 4.a.1. % of students with access to computers and Internet
- 4.2.2. Enrolment rate a year before primary entry age
- 4.c.7. % of teachers who received in-service training
- 4.7.5. Proficiency of 15-year-olds in science
- 4.6.1. Adult proficiency in literacy and numeracy
- 4.1.1. Proficiency of 15-year-olds in maths and reading
- 4.a.2. % of students experiencing bullying
- 4.1.5. Out-of-school rate
OECD’s support for the Education SDG Action Plan

- Leverage OECD indicators and collect data for the SDG 4 UN database
- Joint validator of SDG 4 indicators and advisor within the SDG 4 framework
- Reporter of progress towards SDG 4
- SGD lens to education strategies and support for education policy-making at country level
1. Leverage OECD data to analyse progress on SDG4 and collect data for UN database

Some indicators produced and/or with input by OECD teams:

- PISA: SDG Target 4.1
- Early Learning and Child Well-being Study: SDG Target 4.2
- PIAAC: SDG Target 4.6
- TALIS: SDG Target 4.c
- UOE questionnaires and additional data collections: e.g. on Indicator 4.a.1 on the infrastructure of schools

Collecting data for the UN database (UIS) for OECD and partner countries

- About 90% coverage of global indicators currently
2. Joint validator of SDG 4 indicators and advisor within the SDG 4 framework

A common SDG 4 database requires agreement on methodology and sources for calculation of SDG indicators

TCG Working Group 1 on Indicator Development
- Provide feedback on relevant indicators, esp. refinement
- Examples classified as “requires further development”: 4.3.1; 4.6.3; 4.7.1; 4.7.2; 4.a.2; 4.a.3.

TCG Working Group 3 on Data Reporting, Validation and Dissemination
- Terminology document
- Data validation package
3. Reporter of progress towards SDG 4

- **EAG**: a vehicle for reporting on SDG 4 on OECD and partner countries, with a dedicated chapter

- **EAG 2018** focus on equity SDG4 Target 4.5

- Dedicated sections in other publications as well
4. Apply SDG lens to OECD education strategies and policy tools, including capacity building

- PISA for Development is enhancing PISA to make it relevant for low-and-middle-income countries
- Successful pilot: Bhutan, Cambodia, Ecuador, Guatemala, Honduras, Panama, Paraguay, Senegal and Zambia
- Mainstreamed in PISA from 2021 onwards
- Assistance to countries in building national assessment and data-collection systems
- Peer-to-peer partnerships (e.g. Korea and Cambodia)
- Integrate SDG4 and its targets and indicators in on-going and future support for education policy-making at the country level, e.g. country reviews
some examples of analysis with PISA data
Comparing average system performance:
Students’ proficiency in science

PISA 2015, Figure I.2.15
Across OECD countries, disadvantaged students are 3 times more likely to not attain baseline proficiency in science – in France and Singapore, about 4 times.
Comparing the variation between and within schools in student performance (in science)

PISA 2015, Figure I.6.11
Comparing how learning time is associated with student performance in science

PISA 2015, Figure II.6.23
longitudinal education information systems in OECD countries: current state and future directions
Longitudinal information systems: a general-purpose technology supporting the innovation ecosystem

**Longitudinal systems** maintain and link individual-level data over time, provide detailed information on students’ learning outcomes, schooling environments and demographics; and facilitate access to data through reporting and analysis tools.

**Next-generation systems** integrate statistical data with learning management systems, including banks of digital resources.

**Data-driven innovation in education**: mainly about transforming information into actionable knowledge—much more than a technical issue.
The opportunities around longitudinal information systems in education

- **Improve efficiency** and **reduce administrative costs**
- **Creation of a better data infrastructure for educational research**
- **Faster and richer feedback to stakeholders:**
  - New conversations around evidence on the impact of policies and practices
  - More applications around formative assessment and instruction
- **Platforms to access and share digital resources** to support teachers and learners – and develop a stronger educational industry
- **Mobilise practical knowledge** - networks of educators and schools with similar concerns (learning communities)
the OECD/CERI survey of information systems in education
The OECD/CERI survey on information systems in education

As of 2016, it covers 67 systems from 32 countries/economies

Australia [3], Austria [2], Belgium [2], Brazil [2], Canada [2], Chile [2], Czech Republic, Estonia, France, Germany, Hungary, India, Israel, Italy, Japan, Korea [2], Lithuania, Mexico, Netherlands [3], New Zealand, Norway [2], Portugal, Slovak Republic [2], Slovenia [2], South Africa, Spain [2], Sweden [2], Turkey, UK [2], US [20]

Administered to systems managers

US state-wide systems: from DQC

Survey sections

1. Goals of the system
2. Data model
3. Coverage and frequency of collection
4. Data linkages
5. Quality processes
6. Access and privacy
7. Comparison possibilities
8. Accountability usage
9. Instructional support, networking facilities and PD
10. Other features
Longitudinal identifiers and linkages

All systems have school-level identifiers, and 4 in 5 can track students longitudinally.

Fewer systems provide teacher and course identifiers.

Student- and school-level data matched, but teacher and student data linked only by a third of the systems, mainly US.

Some cases where link does not exist despite availability of both identifiers.
**Problem Statement:**

Timeliness of feedback is a critical condition to maintain data value.

Many systems take more than 1 month to make data available, regardless of access rights.

- Many impose >6 months delays.

Cited reasons for delay include data cleaning and anonymization.
Many strengths but also areas of improvement for current information systems in OECD countries

No single model – wide variation in goals, data elements and functionalities enabled

Unique, student longitudinal identifiers are the most critical feature of effective information systems. Linkages to teacher data as well as to data from other agencies (e.g. labour market) would open more possibilities for innovative uses of data.

Cover a broader range of student outcomes. Summative and subject-based indicators fall short of capturing the set of skills that students are expected to develop.

Access policies remain highly restrictive. Generally open to policy makers and administrators, but not to researchers and educators.

Faster feedback is needed. Many take too long to report back and make data available. Feedback delays are at odds with aim of supporting timely decision-making.

More user-friendly analysis and visualisation tools needed. Compatible with tiered access policies and important to prevent that valuable data remain underused.

Integration with digital educational resources and automated analysis and recommendations will be important features of next-generation systems.
a typology of information systems in education
Current features and uses suggest 4 ideal-types or approaches:

1. Reporting and research data systems
2. E-government data systems
3. School improvement data systems
4. Expert data systems
1. Reporting and research approach

- Statistical and evaluation approach – from the traditional focus on reporting and accountability requirements

- Accountability of systems and school performance cards enriched thanks to longitudinal, individual-level data

- Reports seek to inform mainly policy makers and the public

- In some cases, also designed to develop research capacity about educational issues
Ontario (Canada): Ontario School Information System (OnSIS)

Examples: Board Interface reports (left) and Ontario Notable Education Trends (right)
Mexico: Sistema Integral de Resultados de las Evaluaciones (SIRE)

Consultas dinámicas
Selecciona el tema que te interesa explorar utilizando las herramientas de consulta dinámica.
Estas te permiten manipular la información de manera versátil, a distintos niveles de agregación o desagregación de los datos utilizando tablas, gráficas, análisis de tendencias y pronósticos.

Consulta y explora los resultados de PLANEA - ELSEN

Consulta y explora datos sobre la estructura y dimensión del Sistema Educativo Nacional a nivel obligatorio

Consulta y explora datos sobre la matrícula y avance en el Sistema Educativo Nacional a nivel obligatorio

Portal Geoestadístico del Sistema Integral de Resultados de las Evaluaciones
Para ingresar al portal es necesario tener una cuenta de usuario. A continuación puedes:
Iniciar sesión o bien Crear una cuenta
2. e-Government data systems

- Inspired by e-government approach promoting automated data integration across government agencies

- Takes advantage of data trails generated by the use of digital ID-cards and digital signatures

- Major objectives include making administrative processes more efficient (e.g. school transfer, school choice, university application, etc.) and informing resource allocation (e.g. school funds)

- Great potential for linkage of education data with data from other sectors (e.g. labour market, taxation, health, etc.)
Estonia: Estonian Education Information System (EHIS)

Estonian education information system

Data from the Estonian Education Information System (EHIS)

This service is intended for persons acquiring general, vocational, higher or hobby education, as well as teachers and academic staff working on the same level.

The service allows to request personal data and returns the data in three blocks:
- general personal data
- data on studies
- data on working as a teacher/academic.

The request also returns data on qualification and additional training of a teacher/academic.

The Estonian Education Information System (EHIS) stores data entered from the year 2005 on, older data is not included.
Korea: National Education Information System (NEIS)

Expected Economic Benefits - Summary

<table>
<thead>
<tr>
<th>Classification</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Faculty</td>
<td>- Automation of manual working</td>
</tr>
<tr>
<td></td>
<td>. Teachers : USD27Million/year</td>
</tr>
<tr>
<td></td>
<td>. Administration : USD5Million/year</td>
</tr>
<tr>
<td>Students</td>
<td>- On-line acceptance of university entrance admission : USD105Million/year</td>
</tr>
<tr>
<td>Parents</td>
<td>. Providing more than 4Million cases /year</td>
</tr>
<tr>
<td>University</td>
<td>- Saving time for verifying and collecting data : USD10Million/year</td>
</tr>
<tr>
<td>Citizens</td>
<td>- Issuance of internet Civil Applications : USD80Million/year</td>
</tr>
<tr>
<td></td>
<td>. Issuing more than 800,000/year</td>
</tr>
</tbody>
</table>
Systems designed to support school improvement efforts by putting data in the hands of principals and teachers

Key features include customisable school reports and visualisation tools such as dashboards

Enable new « improvement routines » (data teams, enquiry teams, etc.) and digital communities of practice

Try to provide information at the individual level and with a granularity that makes data more relevant to teachers
England: **RAISEonline** - now replaced by the new Analyse School Performance (ASP) system

<table>
<thead>
<tr>
<th></th>
<th>Number of pupils in latest year</th>
<th>Contextual Value Added</th>
<th>CYA By Subject 2009</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>2007</td>
<td>2008</td>
</tr>
<tr>
<td><strong>All Pupils</strong></td>
<td>26</td>
<td>101.9</td>
<td>99.4</td>
</tr>
<tr>
<td><strong>Gender</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Girls</td>
<td>11</td>
<td>102.0</td>
<td>99.9</td>
</tr>
<tr>
<td>Boys</td>
<td>15</td>
<td>101.3</td>
<td>99.2</td>
</tr>
<tr>
<td><strong>Attainment at KS1</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Below Level 2</td>
<td>4</td>
<td>101.9</td>
<td>100.0</td>
</tr>
<tr>
<td>At Level 2</td>
<td>15</td>
<td>101.7</td>
<td>99.3</td>
</tr>
<tr>
<td>Above Level 2</td>
<td>7</td>
<td>99.8</td>
<td>-</td>
</tr>
<tr>
<td><strong>Free School Meals</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-FSM</td>
<td>15</td>
<td>101.4</td>
<td>99.5</td>
</tr>
<tr>
<td>FSM</td>
<td>11</td>
<td>101.9</td>
<td>99.4</td>
</tr>
<tr>
<td><strong>English as a First Language</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>First Language - English</td>
<td>14</td>
<td>102.0</td>
<td>99.6</td>
</tr>
<tr>
<td>First Language - Other</td>
<td>12</td>
<td>101.3</td>
<td>99.3</td>
</tr>
</tbody>
</table>

**KS1 ASP Performance Report** – Infant/Primary

Analyse School Performance (ASP) is the DfE's key system for reporting school performance data. The KS1 assessments and phonics results are published on ASP during the autumn term. We are accredited by the DfE to receive the ASP database and so can directly produce reports for schools using their pupil level data and ranking their results against other schools nationally.
Portugal: Escola 360° (E-360°)

Indique o perfil com que pretende iniciar a sessão.

- Docente
- Direção
- Serviços Escolares
- Colaborador do Ministério da Educação
4. Expert data systems

- Aim to help personalise teaching and learning and to provide real-time feedback to teachers, students and principals

- Combine administrative data with process and formative assessment data from learning management systems

- Learning analytics and other diagnosis techniques

- Allow adjustments in ongoing instruction cycles – vs. end-of-year feedback

- Advanced features: links to banks of educational resources, recommendations and networking platforms for teachers
Colorado (US) state-wide longitudinal system and SchoolView website
some challenges
The interoperability challenge

- The data ecosystem is **highly fragmented**: “silos” systems that cannot communicate with each other
  - **Legacy systems**, designed for specific functions (accounts, registration, VLEs...)
  - **Inconsistent** definitions, formats, coding procedures, etc.

- **Interoperability**: *capacity to combine and use data from disparate systems and content platforms with ease, coherence and efficiency*
  - **Technical layer**: software and connectivity
  - **Semantic layer**: data models, consistent definitions and coding rules

European Interoperability Framework (EIF)
The privacy challenge

- Greater data integration and increasing involvement of technology and data service providers raise stakes for privacy protection
  - Potential harms: profiling and discrimination, commercial uses, etc.

- Blurring distinction between personal and non-personal data: more possibilities for re-identification

- Informed consent and over-restrictive access are inefficient solutions

- Need to combine data-focused and governance-focused solutions
  - Anonymization techniques – make re-identification more difficult
  - Control access and use for legitimate purposes (e.g. research)
Towards a new generation of systems: from statistical reporting to timely and actionable feedback

<table>
<thead>
<tr>
<th>Old/current data systems</th>
<th>Next-generation systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate-level indicators</td>
<td>Individual-level indicators</td>
</tr>
<tr>
<td>Cross-sectional snapshots</td>
<td>Longitudinal perspective</td>
</tr>
<tr>
<td>Data silos</td>
<td>Interoperability</td>
</tr>
<tr>
<td>Local, isolated data points</td>
<td>Benchmarking, contextual data</td>
</tr>
<tr>
<td>End-of-year feedback</td>
<td>“Real time” feedback</td>
</tr>
<tr>
<td>Statistical reports</td>
<td>Learning analytics and suggestions</td>
</tr>
<tr>
<td>Use by administrators mainly</td>
<td>Extended to educators, students, and researchers</td>
</tr>
<tr>
<td>Privacy protected by limited access and data redaction</td>
<td>Risk assessment, tiered access, privacy-enabling technologies</td>
</tr>
</tbody>
</table>
Thank you for your attention

Carlos González-Sancho
carlos.gonzalez-sancho@oecd.org

OECD Directorate for Education and Skills
http://www.oecd.org/edu
Centre for Educational Research and Innovation (CERI)
http://www.oecd.org/edu/ceri