

Japan, 25 February 2022



Digitalisation in education: country examples

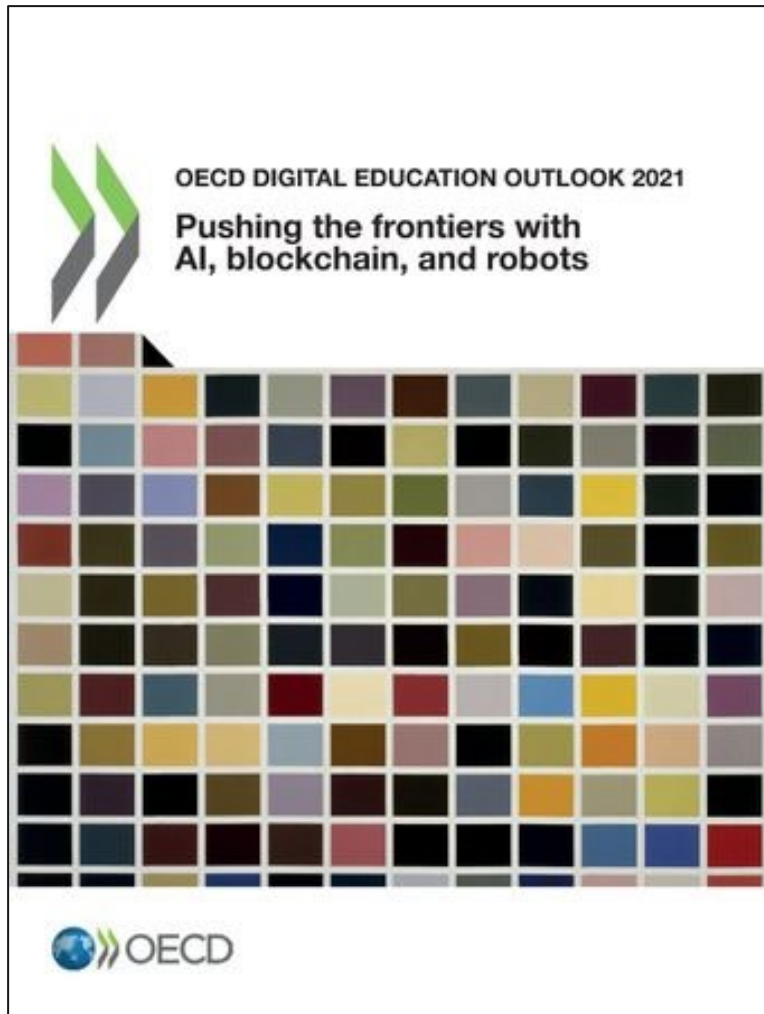
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Senior Analyst and Team Leader

Centre for Educational Research and Innovation,
Directorate for Education and Skills



Digital Education Outlook 2021



- What are the current frontiers of AI and other technologies in education?
- What are the upcoming challenges?
- Watch key experts and policy makers talk about it:

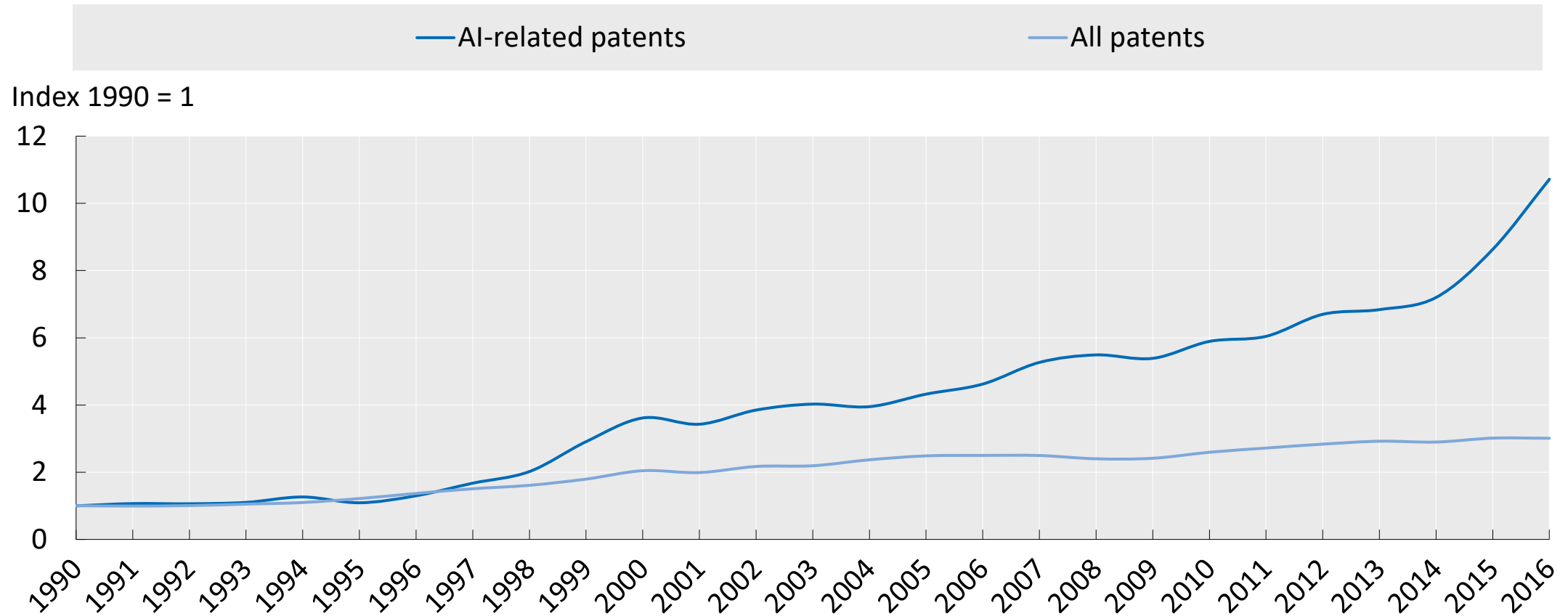
<https://oecd-events.org/digital-education>



digitalisation: a general ongoing trend



Technology development in artificial intelligence, 1990-2016



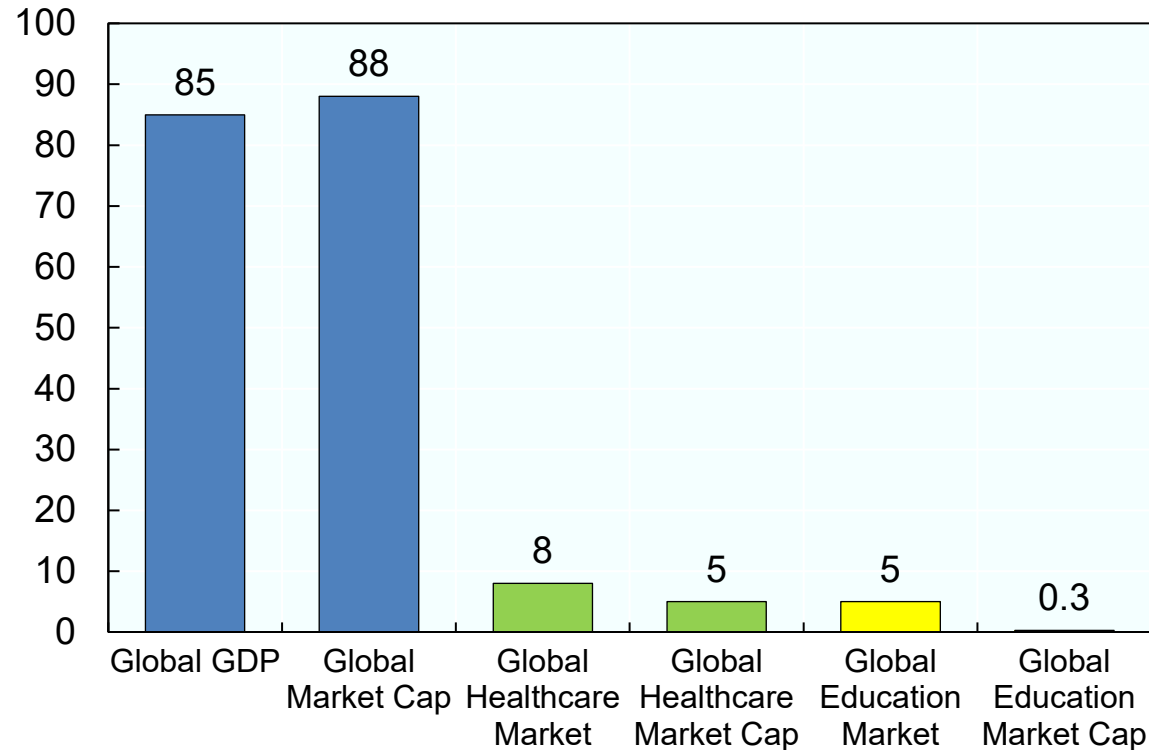


Capital flows for digitalisation of education still limited

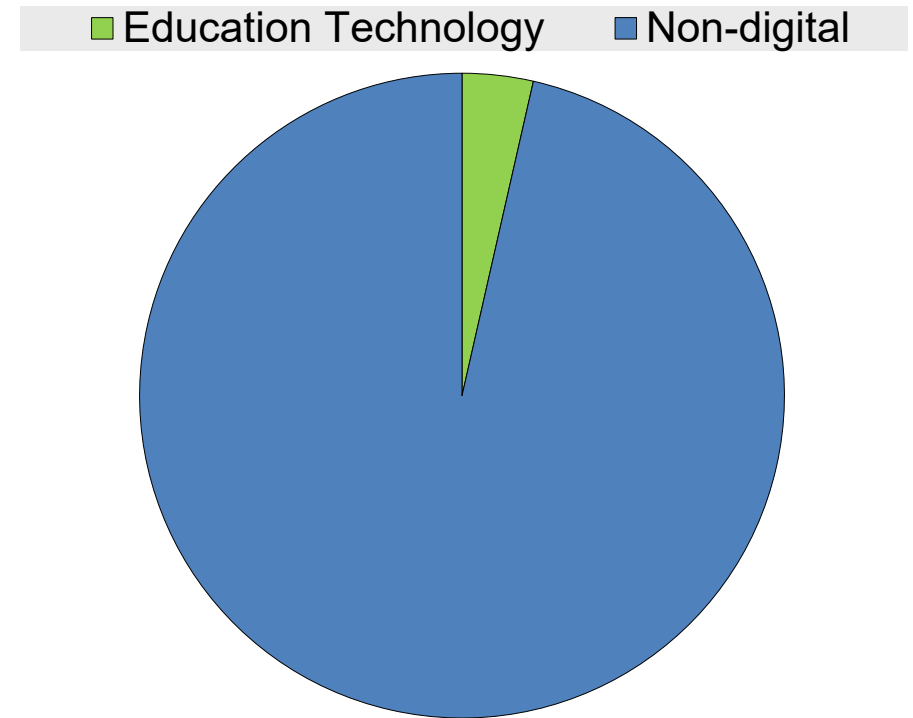
The education sector is still at an early technology adoption stage compared to other sectors, with comparatively little market capitalisation

Global markets in USD (trillion)

Global vs Education Capital Flows

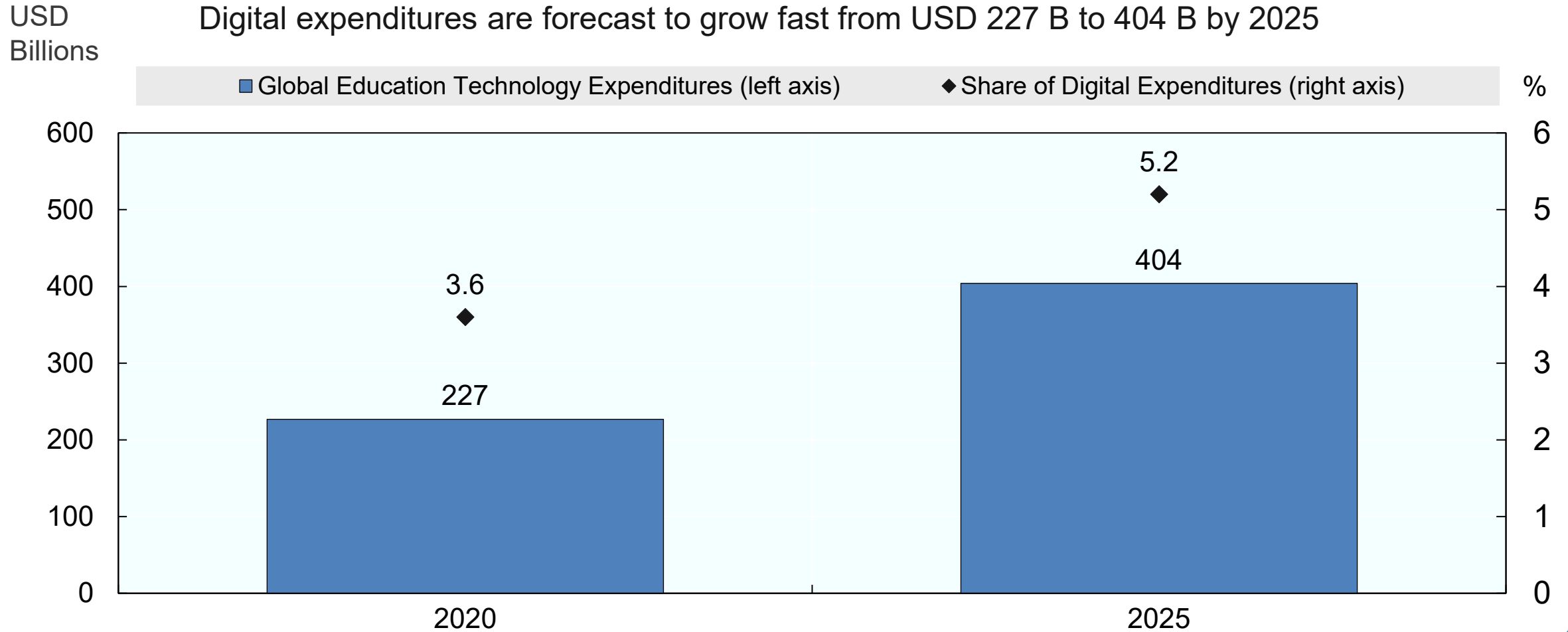


<4% of global education expenditure on technology





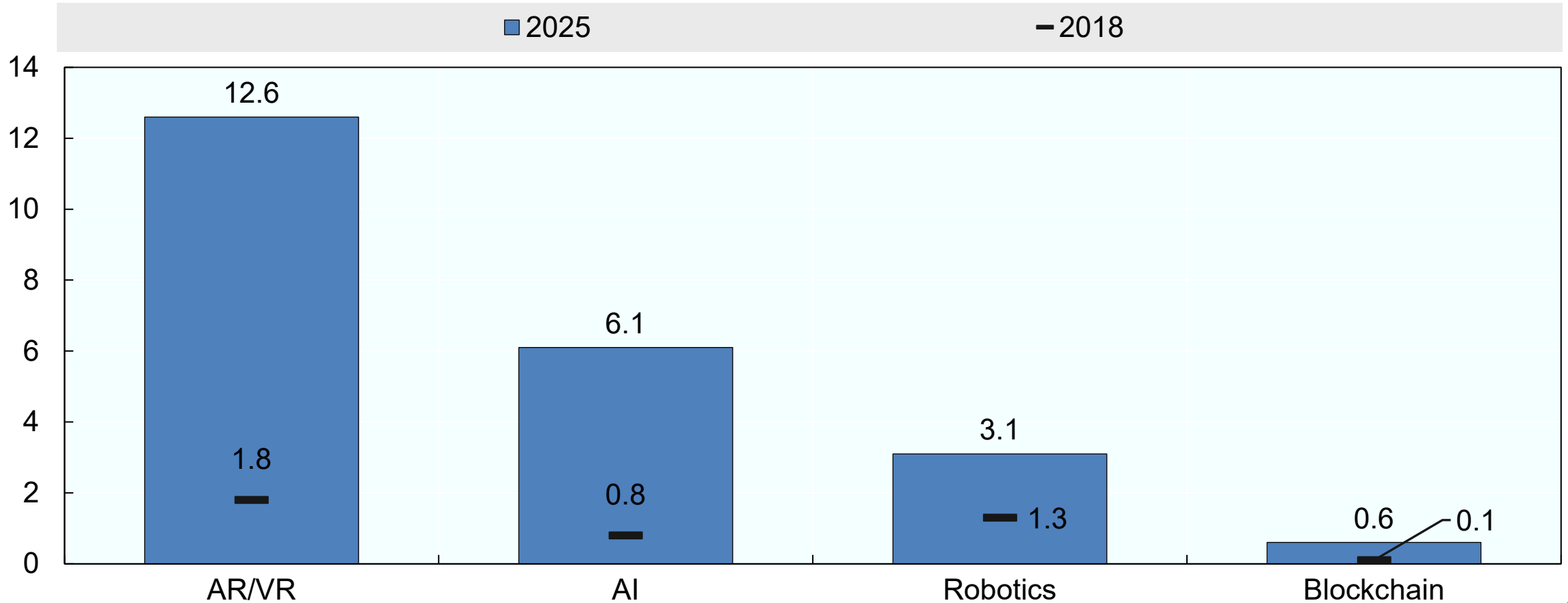
But growing global education technology expenditures





Current and estimated expenditures in advanced education technology

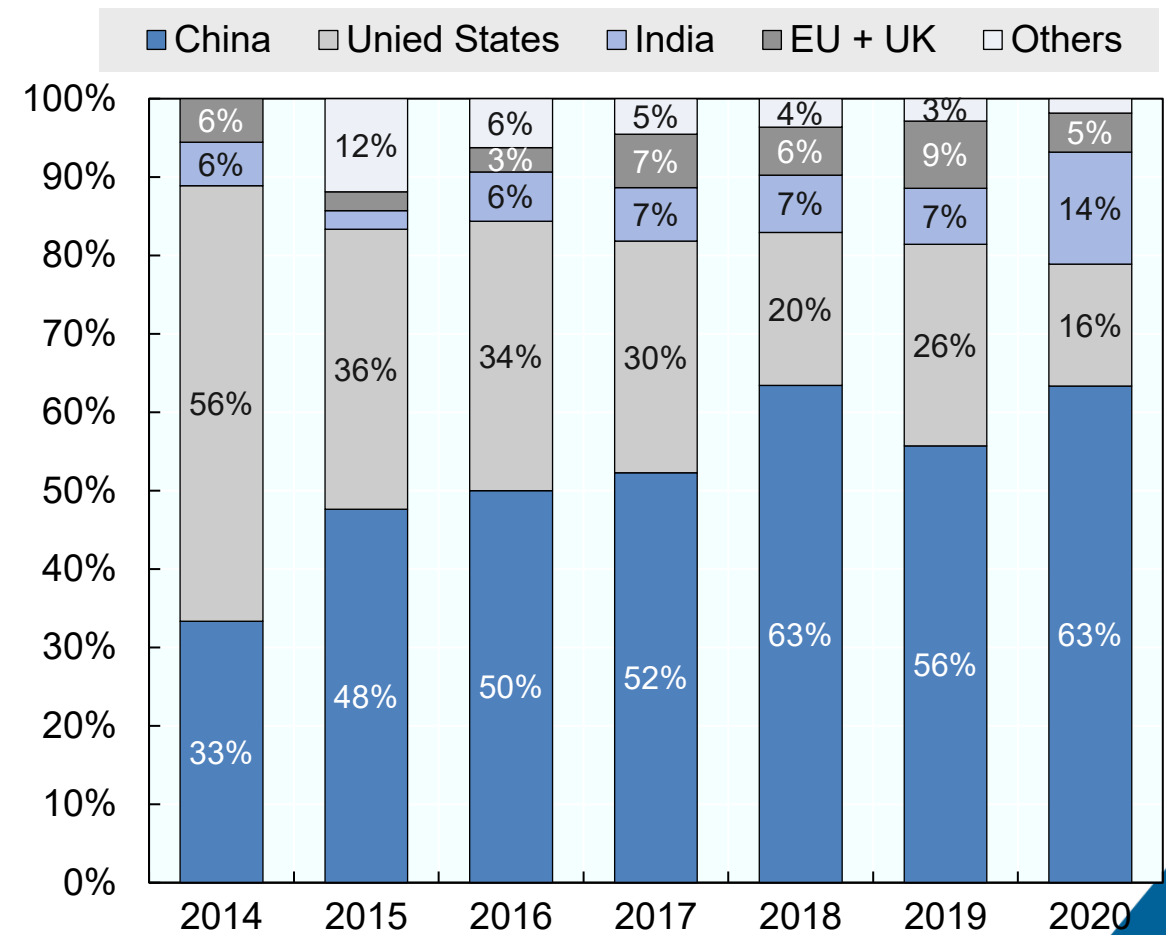
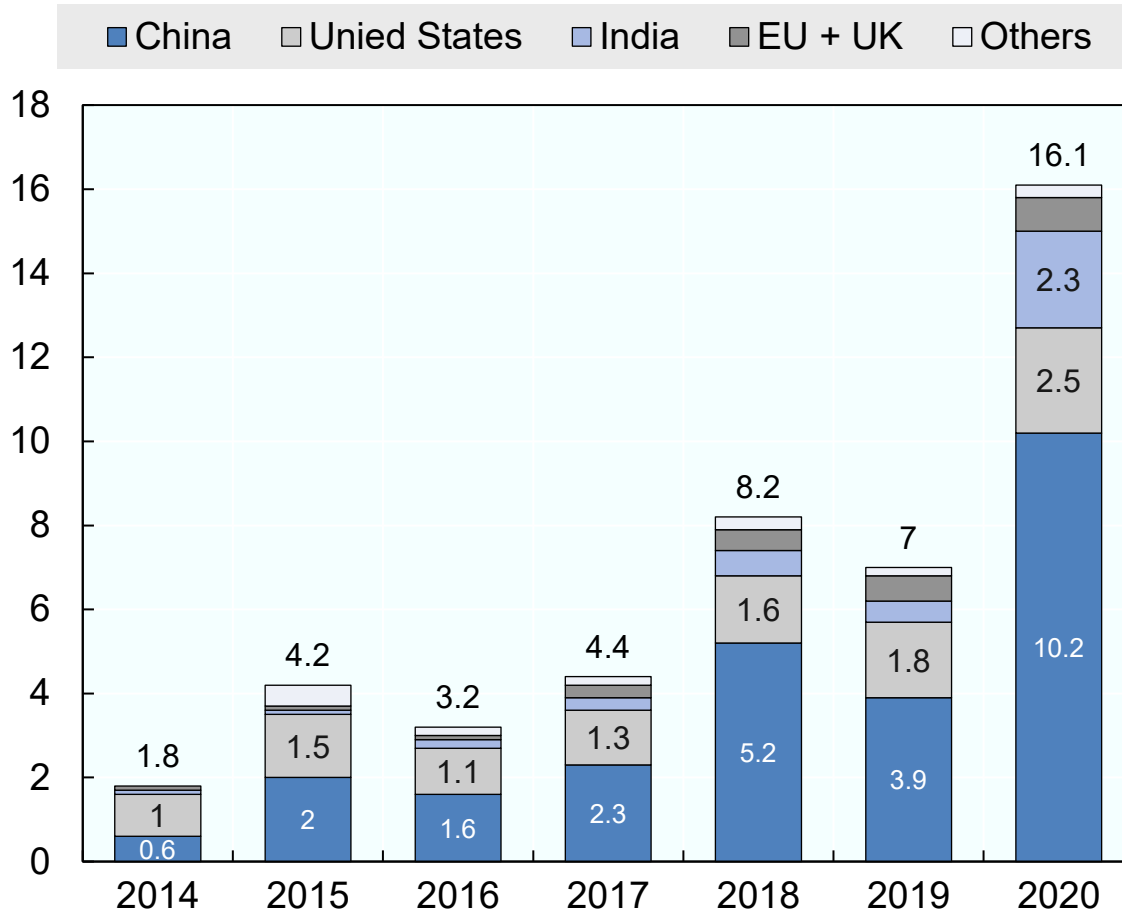
Advanced Education Technology Expenditure, 2018 and 2025 estimate, USD Billions





China represents over 50% of global education venture capital investment

Venture capitalists have invested USD 16B in 2020, up from USD 2B in 2014 – mainly from China



Source: HolonIQ, January 2021



smart data and digital technology in education



Digitalisation and the « AI » galaxy



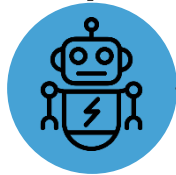
◆ **Learning analytics**



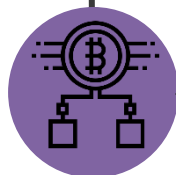
◆ **Artificial intelligence (AI)**



◆ **Internet of Things (IoT)**



◆ **Robots**



◆ **Blockchain**



Different levels of application of « Learning Analytics »

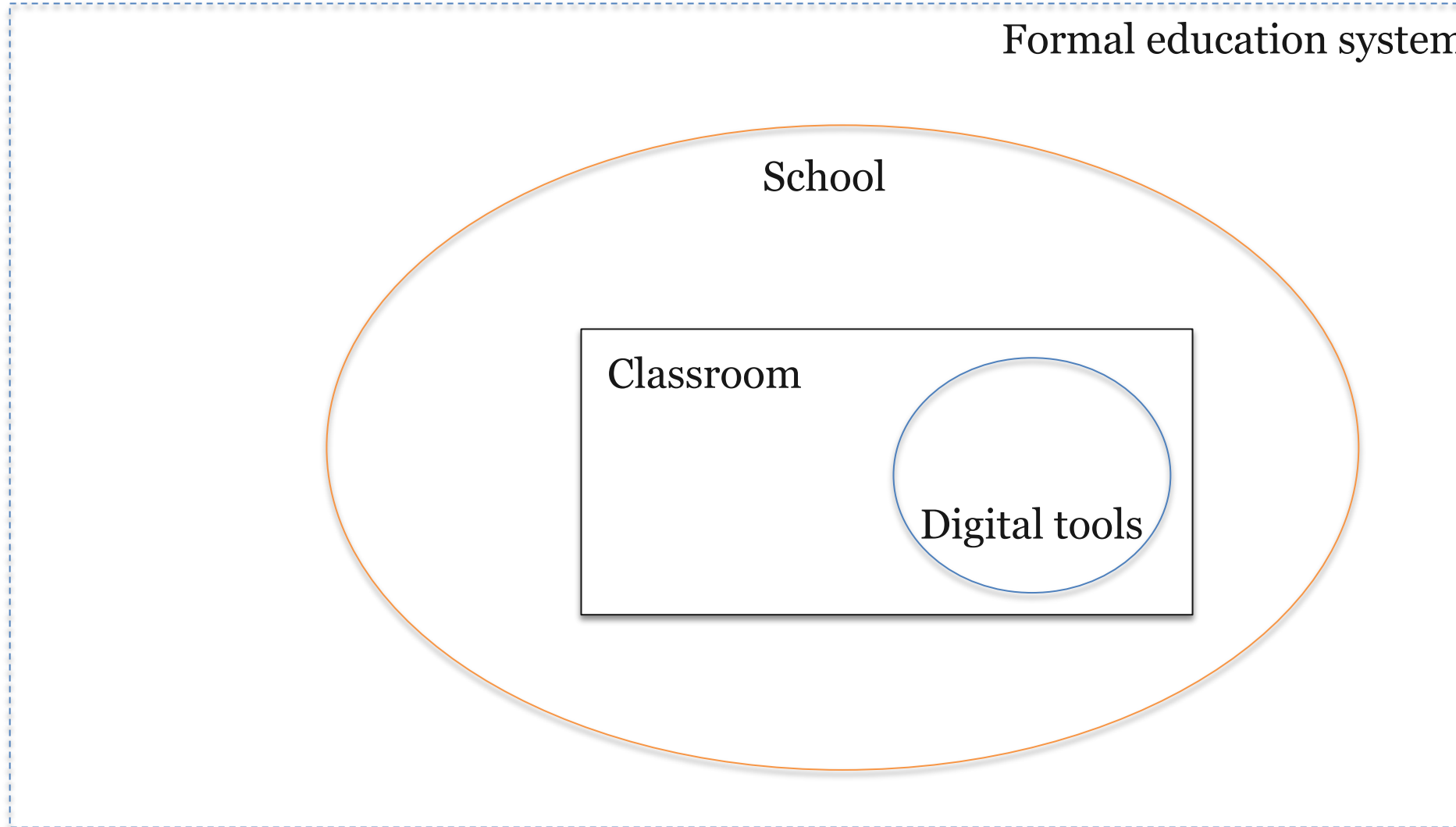
Formal education system

Informal education

School

Classroom

Digital tools





Different levels of application of « Learning Analytics »

Formal education system

School

Classroom

Digital tools

Informal education

- Parenting
- Career guidance
- Lifelong learning
- Tutoring
- Exam preparation
- Informal learning in diverse areas
- Peer to peer learning



learning analytics and artificial intelligence to
manage schools and systems

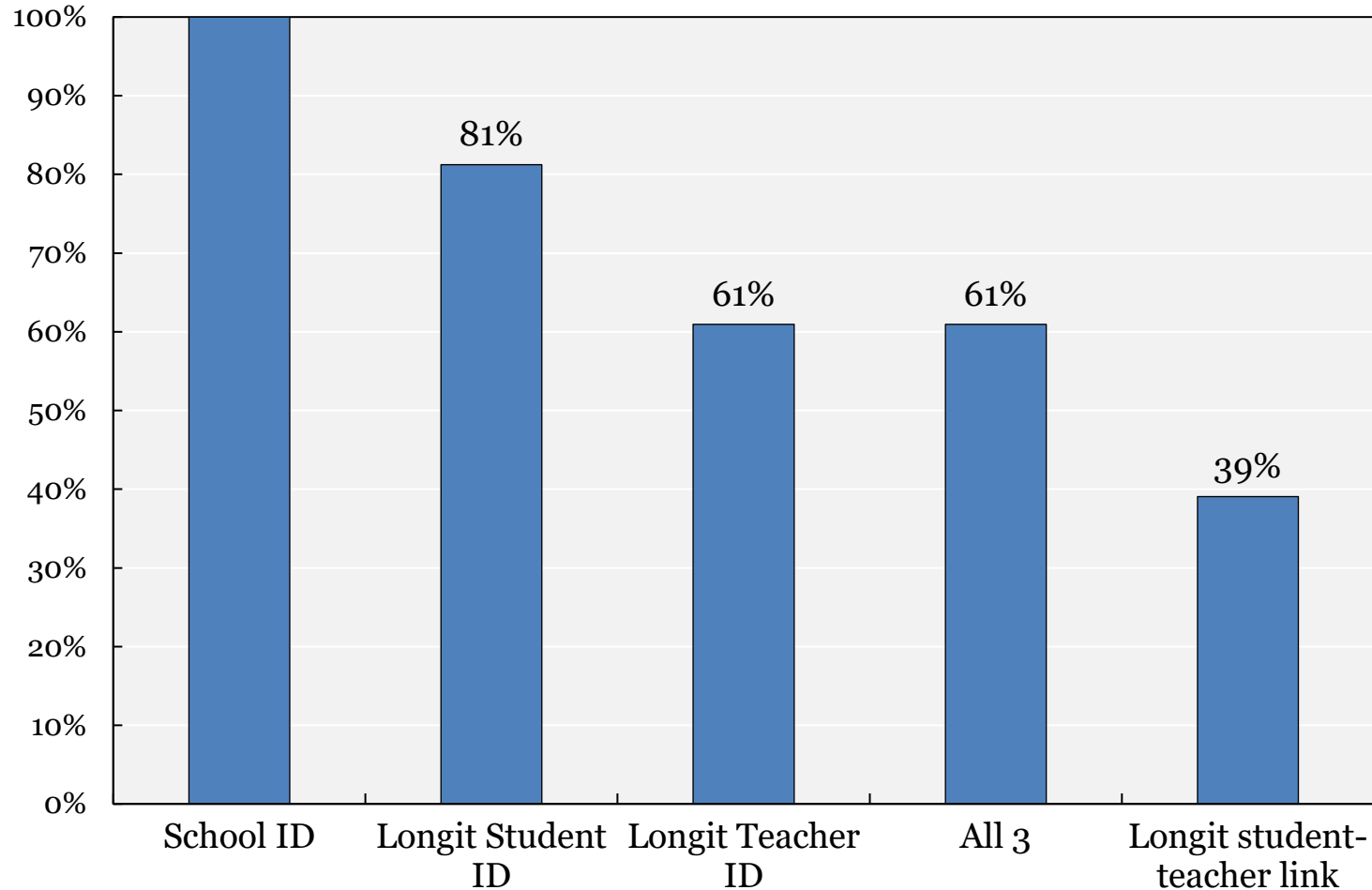


System and school levels

- **Longitudinal information systems** create an administrative data infrastructure providing new opportunities:
 - They link individual-level data over time and trace the academic and performance history of each student
- **Next-generation systems** integrate and link (more) administrative, including learning management system data:
 - incorporate visualisation and learning analytics tools
 - Provide recommendation/diagnosis tools
 - Bank of resources for all stakeholders



System and school levels



OECD/CERI survey covered **67 systems** from **33 countries/economies** (as of 2016):

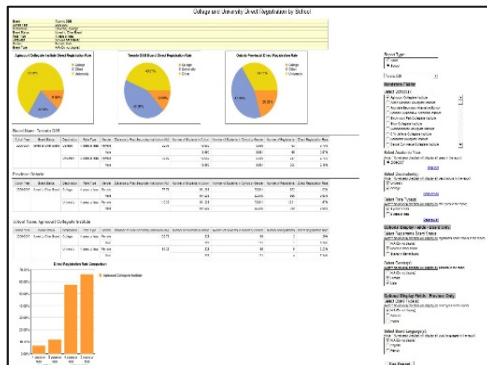
- A large majority of systems can track students longitudinally
- Less than two thirds of systems provide teacher and course identifiers
- Student- and school-level data matched, but teacher and student data linked only by a third of the systems, mainly US
- Some cases where link does not exist despite availability of both identifiers



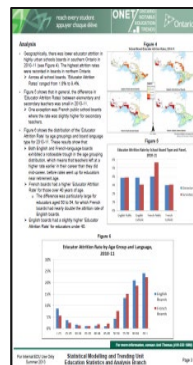
Reporting and research data systems

- Statistical reporting and evaluation – 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

Canada: Ontario School Information System (OnSIS)



Mexico: Sistema Integral de Resultados de las Evaluaciones (SIRE)



Consultas dinámicas

Selecciona el tema que te interesa explorar utilizando las herramientas de consulta dinámica.

Éstas 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.

Infografías



Consulta y explora los resultados de PLANEA - ELSER

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

Consulta y explora datos sobre la matrícula y avances 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:

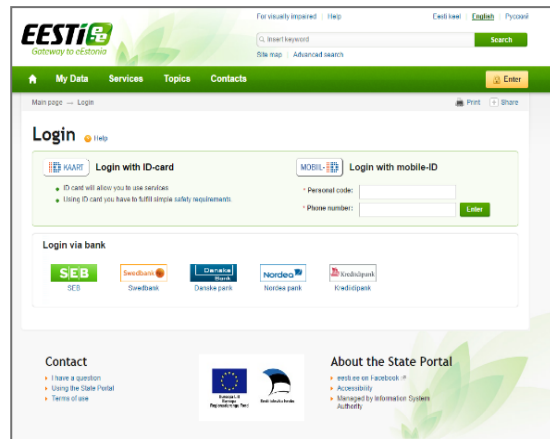
[Iniciar sesión](#) o bien [Crear una cuenta](#)



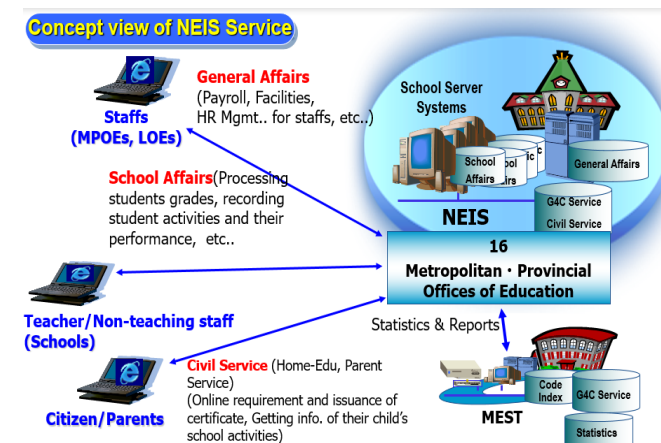
e-Government data systems

- Inspired by e-government approach promoting automated data integration across government agencies
- 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 linkages with data from other sectors

Estonia: Estonian Education Information System (EHIS)



Korea: National Education Information System (NEIS)





School improvement data systems

- 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: Analyse School Performance (ASP) system (formerly RAISEonline)



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



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



New developments in New Zealand and Denmark



4 types of longitudinal data (EMIS) systems

- Reporting and research data systems
 - Ex: Ontario School Information System (OnSIS) (Canada)
- E-government data systems
 - Ex: Estonian Education Information System (EHIS); National Education Information System (NEIS) (Korea).
- School improvement data systems
 - Ex: Analyse School Performance (ASP) (England); Escola 360° (Portugal)
- Expert (data) systems
 - Ex: Colorado and some in US; Australia, New Zealand (?)



Colorado state-wide longitudinal system and *SchoolView* website

The Colorado Department of Education

[Offices](#) | [Staff Contacts](#) | [Colorado.gov](#)

cde Improving Academic Achievement

SCHOOLview™

[CDE Home](#)

SchoolVIEW

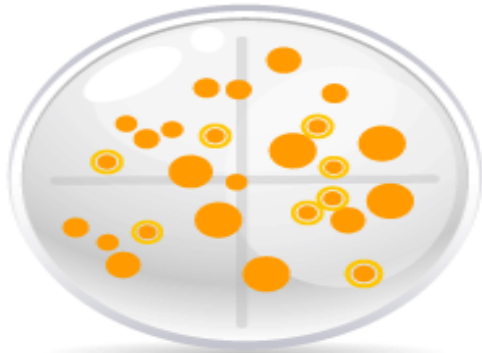
[For Educators](#)

[For Administrators](#)

[For Parents & Students](#)

Changing Conversations™ about school performance and educational resources across Colorado

colorado growth model



Compare the performance of Colorado schools and districts and gauge their progress.

school performance



Access performance data for all schools and districts across the state.

learning center



Discover SchoolView features and find resources related to Colorado's Statewide System of Accountability and Support.

community connections



Connect with others about school improvement.





Colorado state-wide longitudinal system and *SchoolView* website



Districts

School 34 (High)

Grade 10

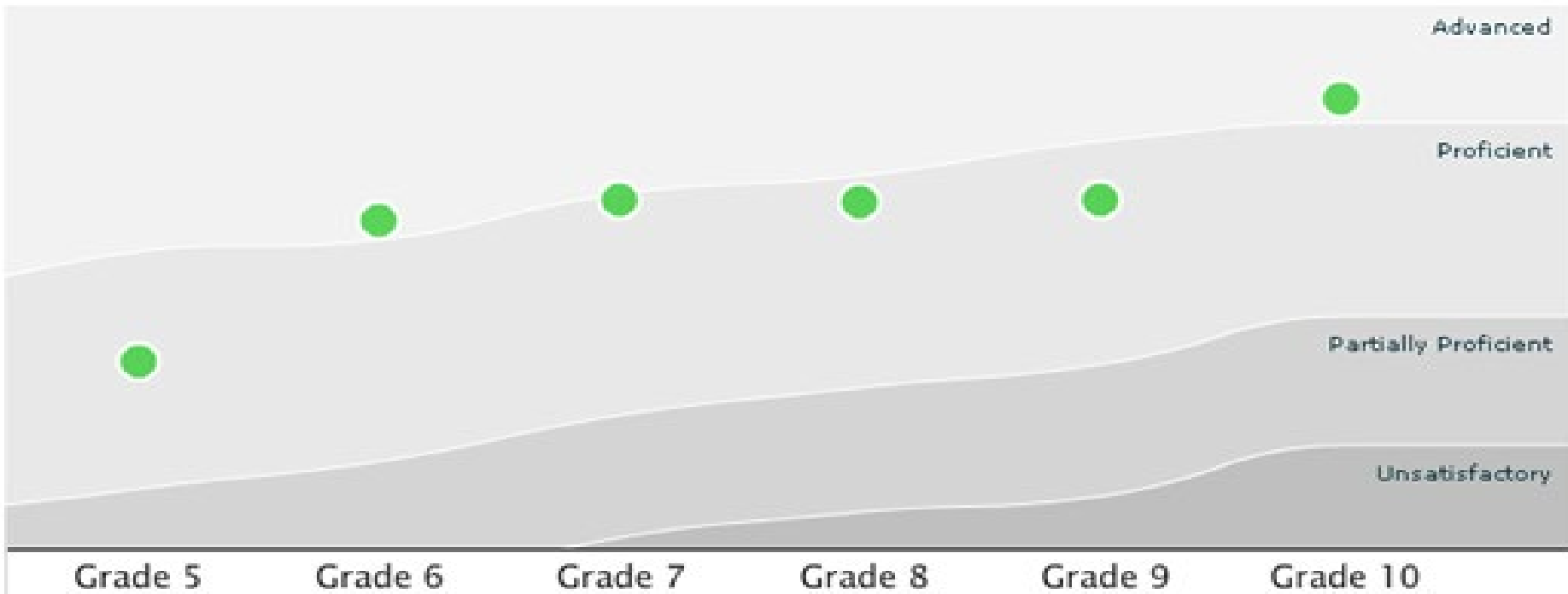
Wheeler, Matthew

Growth and Achievement

Matthew Wheeler

Math Reading Writing Growth Levels

[View Student Report PDF](#)



[Reset All](#)



SELECTIONS

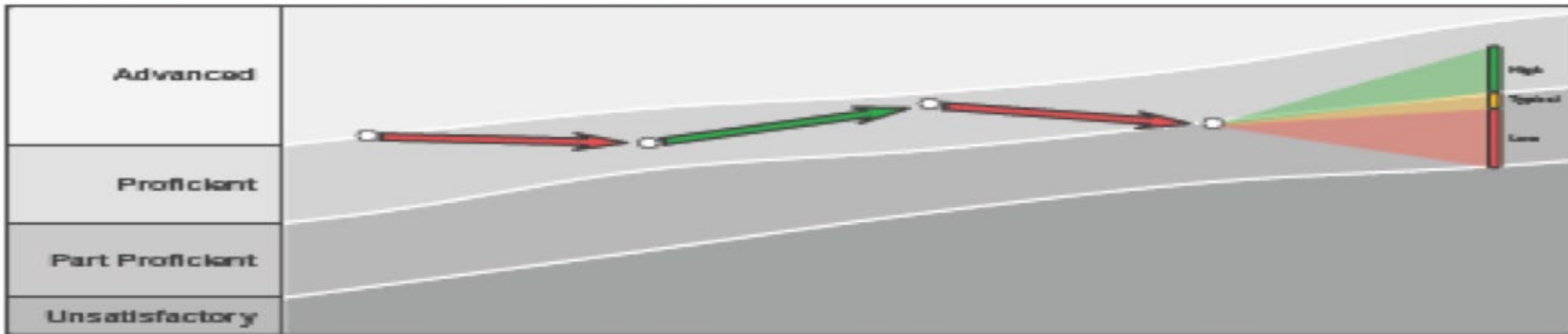
- Mountain Vi...
- School 01 (Element...
- School 02 (Element...
- School 03 (Element...
- School 03 (Middle)
- School 04 (Element...
- School 05 (Element...
- School 05 (Middle)
- School 06 (Element...
- School 07 (Element...
- School 08 (High)
- School 09 (Element...
- School 10 (Element...



Colorado state-wide longitudinal system and *SchoolView* website

Example Student 24 (1234567824)

Example High School



	Grade 6 2006	Grade 7 2007	Grade 8 2008	Grade 9 2009	Next Year
Scale Score	588	582	616	598	
Achievement Level	Proficient	Proficient	Proficient	Part Proficient	
Growth Percentile		26	76	9	
Growth Level		Low	High	Low	

Math

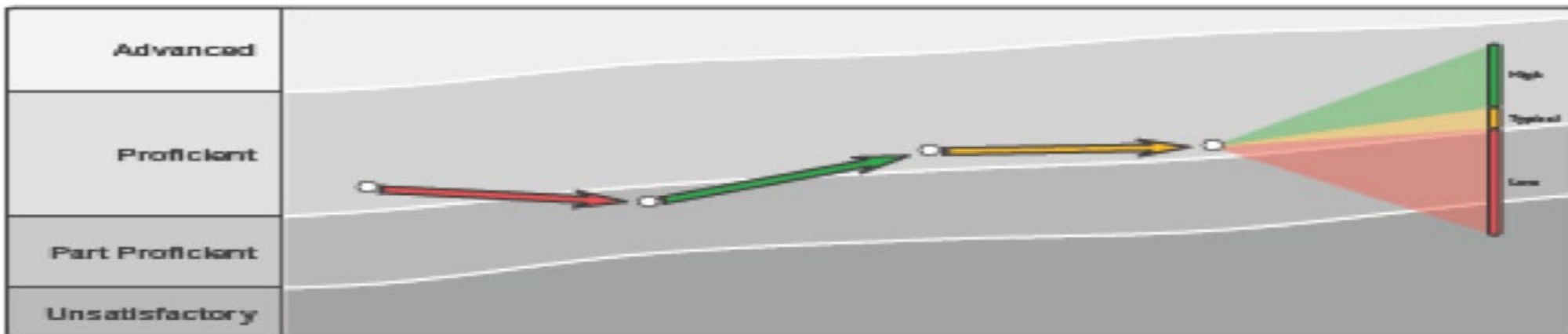
Achievement

○ CSAP Math Scale Score

Growth

Level	Percentile
High	60th - 90th
Typical	30th - 60th
Low	1st - 30th

Achievement
Growth



	Grade 6 2006	Grade 7 2007	Grade 8 2008	Grade 9 2009	Next Year
Scale Score	617	606	645	650	
Achievement Level	Part Proficient	Proficient	Proficient	Proficient	
Growth Percentile		26	76	9	
Growth Level		Low	High	Typical	

Reading

Achievement

○ CSAP Reading Scale Score

Growth

Level	Percentile
High	60th - 90th
Typical	30th - 60th
Low	1st - 30th

Achievement
Growth

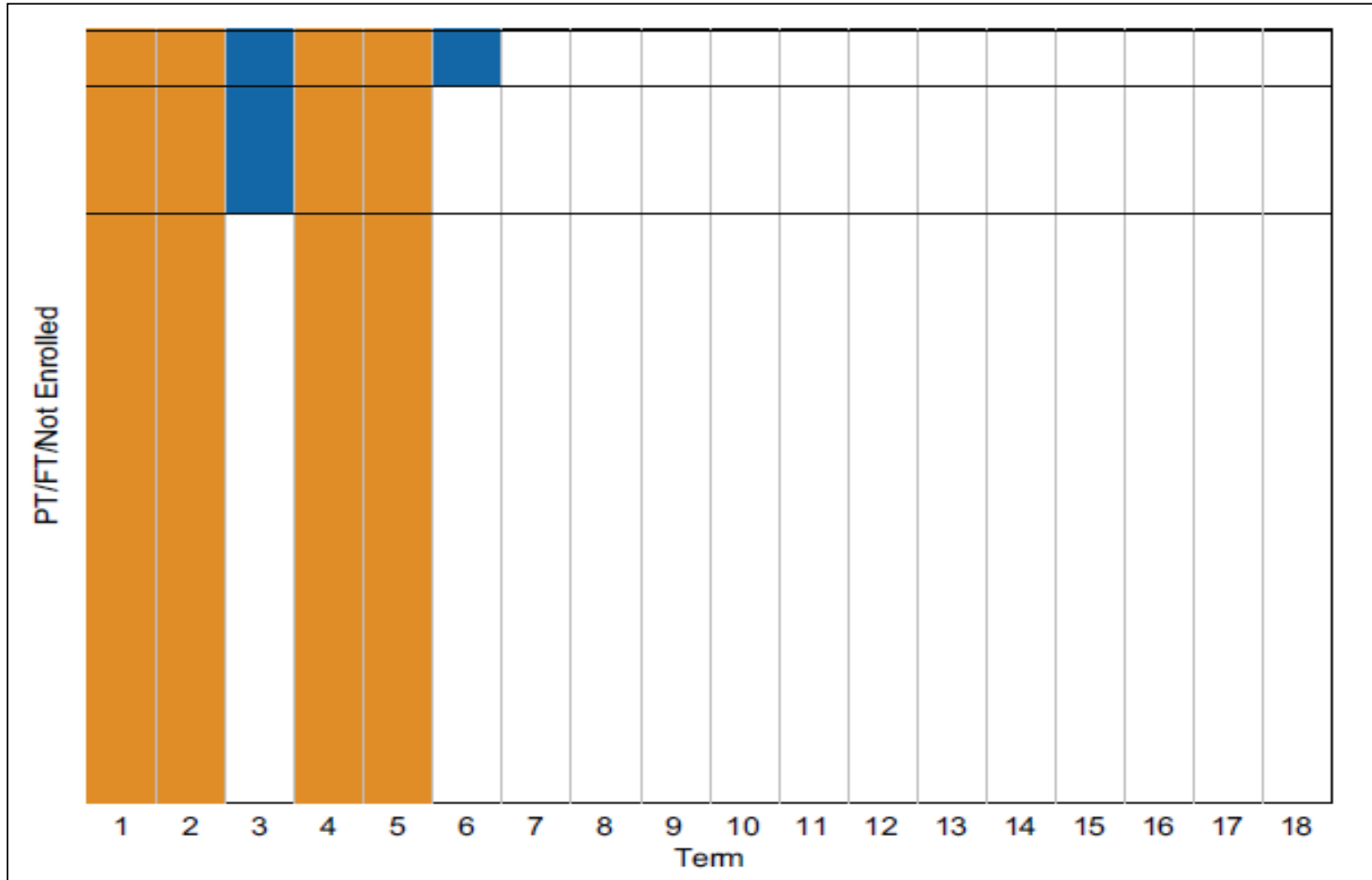


why smart data improve education systems



Presumed enrolment patterns in US community colleges

Blue: Part Time (PT)
Orange: Full Time (FT)

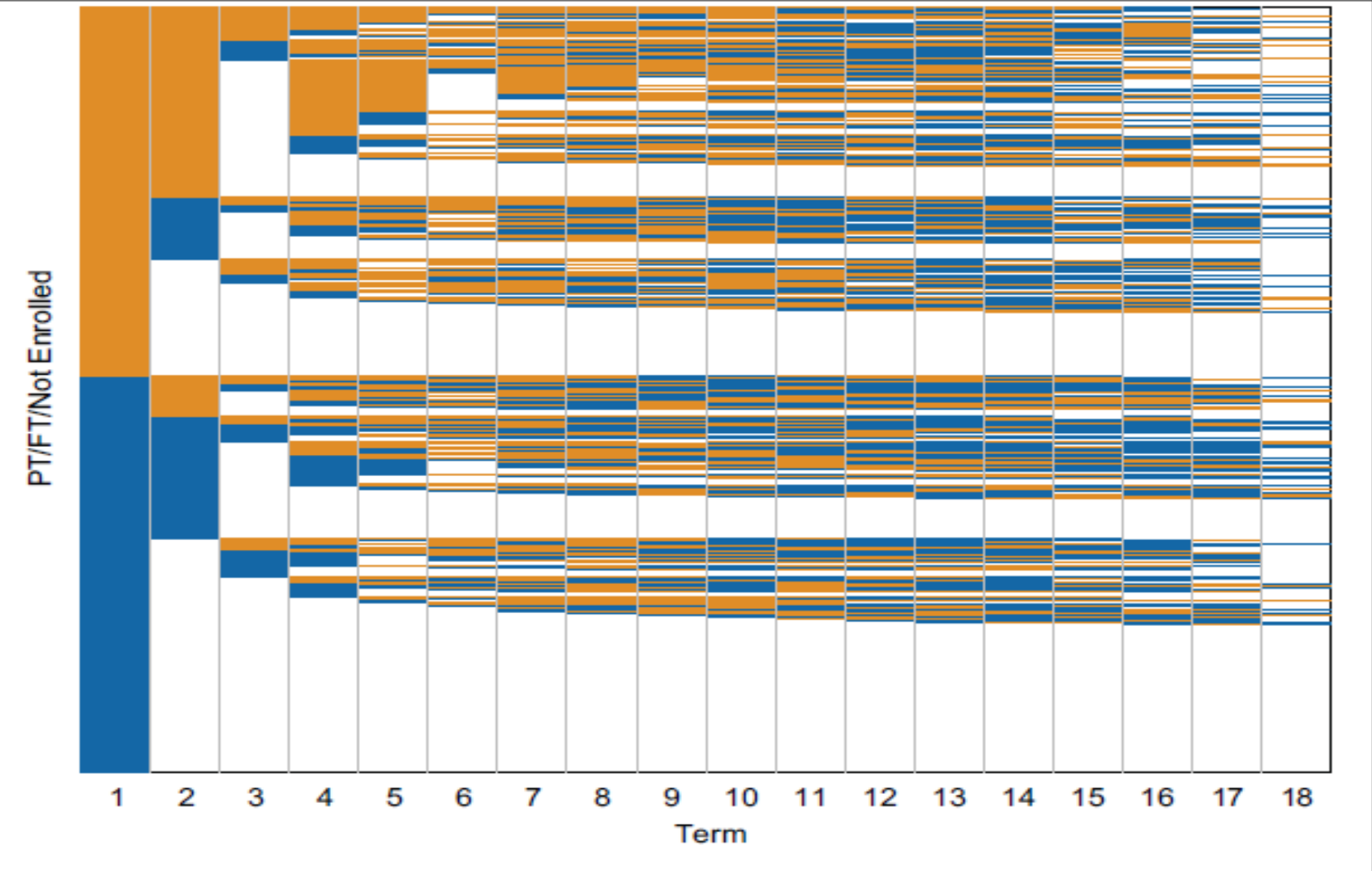


Source: Crosta (2013)



Actual enrolment patterns in US community colleges

Blue: Part Time (PT)
Orange: Full Time (FT)



Source: Crosta (2013)



Early Warning Systems



Students Per Performance Band

- No Risk
- Minimal Risk
- Moderate Risk
- Extreme Risk

Students At Risk

- At Risk
- Not At Risk

Displaying 1 to 10 of 10

Student ID	Last Name	First Name	Overall Score	Overall Label	Attendance	Failures	Incidents
1	One	Student	55	Moderate Risk	Moderate Risk	Moderate Risk	Moderate Risk
10	Ten	Student	90	No Risk	Moderate Risk	No Risk	No Risk
2	Two	Student	70	Minimal Risk	Extreme Risk	No Risk	No Risk
3	Three	Student	95	No Risk	No Risk	No Risk	Moderate Risk
4	Four	Student	90	No Risk	No Risk	Moderate Risk	No Risk
5	Five	Student	100	No Risk	No Risk	No Risk	No Risk
6	Six	Student	15	Extreme Risk	Extreme Risk	Extreme Risk	Moderate Risk
7	Seven	Student	75	Minimal Risk	Moderate Risk	No Risk	Moderate Risk
8	Eight	Student	40	Moderate Risk	Moderate Risk	Moderate Risk	Extreme Risk
9	Nine	Student	15	Extreme Risk	Extreme Risk	Extreme Risk	Moderate Risk

Show 50

[Add to Intervention Group](#)

Advisory Dashboard

Advisory Dashboard - Teacher's View

Student Name	# of F's	Discipline	Attendance	Enrichment	Community Service Hours	GPA Simple Current	GPA Simple Cumulative	Suspension
Akins, Tanesha	2	40	91.92%	0	3	1.84	1.06	4
Albert, Montrell	7	24	97.98%	0	0	0.41	0.76	0
Anderson, Asia	0	18	92.93%	0	44	1.70	2.28	3
Andrews, Kianna	0	3	91.92%	0	5	2.86	3.26	0
Angeles, Meyahueltzin E	0	1	94.95%	0	48	3.56	3.96	0
Armistead, Adrienne	1	29	73.74%	0	2	1.60	2.59	9
Armistead, Sean A	9	65	72.73%	0	0	0.00	0.13	6
Baines, Mario	0	53	74.75%	0	3	2.02	1.55	1
Banks, Devonte	0	4	97.98%	0	10	3.25	2.26	0
Banks, Malachi	1	28	86.87%	0	0	0.78	2.39	6
Barr, Dejah	3	9	66.67%	0	7	0.20	2.34	8
Beck, Tekeyah	0	3	78.79%	0	20	2.94	1.56	0
Bell, Maurice	2	9	91.92%	0	0	1.68	1.64	0
Binion, Tasheina	0	0	95.96%	0	9	3.62	3.41	0
Booker, Isaac	0	16	92.93%	0	3	3.62	2.91	0
Booker, Kendalyn H	0	18	92.93%	0	40	2.62	3.29	0
Bouldin, Glen A	2	9	91.92%	0	3	1.05	0.86	1
Boyd, Freddy	0	13	91.92%	0	2	3.83	3.29	0

School
Legal Prep Charter Academy

Reporting Term
S2

Show/Hide Dropped Classes
(only applies to # of F's Column)

Current Classes

Grade
(All)

Home Room
(All)

Special Program
(All)

Sort By
Student Name

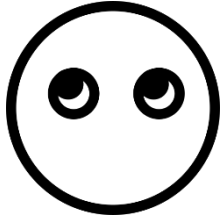
Sort Order
Ascending



Better understanding patterns of dropout



38%: **Jaded dropouts** (don't like school, low and declining grades)



53%: **Quiet dropouts** (like school, low and slowly rising grades)



9%: **Involved dropouts** (like school, high grades, but unexpected need to take an additional course or significant life event)



policy challenges



A few policy pointers



- **Usefulness**
 - Develop solutions with stakeholders (teachers, etc.) – not just EdTech
 - Work with schools on the benefits of the technological solution so it gets used
- **Effectiveness**
 - Verify that AI solutions do what they say (e.g. gives accurate diagnosis/predictions)
 - Ensure it improves outcomes (e.g. supports interventions to solve the problems)
- **Equity**
 - Privilege cheap solutions running on existing platforms (digital divide is bigger than we thought)
 - Establish standards and facilitate inter-operability



A few policy pointers



- **Fairness**
 - Ensure that you are not replicating biases due to your historical data (e.g. machine learning) or due to the human choices in designing the algorithm
 - Ensure that you are not creating new biases (e.g. look at the results)
- **Transparency**
 - Open data/open algorithm: allow anyone (i.e. other experts) to see and verify/challenge/improve the algorithm
 - Explain how the algorithm works and which choices were made (to the extent possible)
 - Involve stakeholders to discuss the choices made when there is high stake
- **Data protection**
 - Data protection regulation in most countries: GDPR in Europe, FERPA in the US, etc.
 - Risk management policy: zero risk policy is not possible

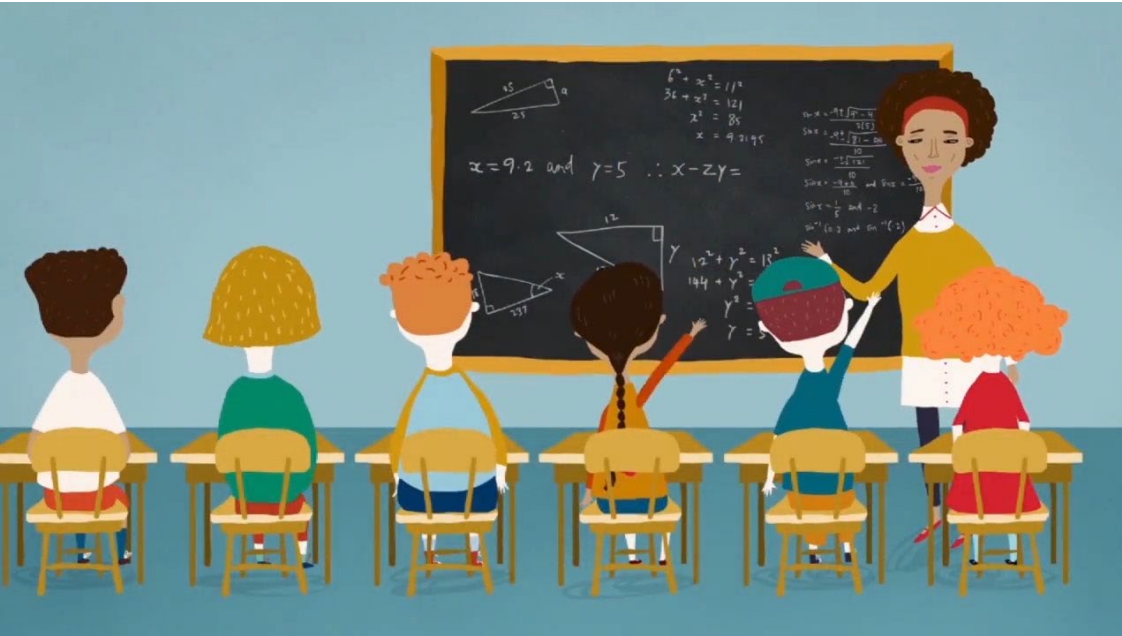


How do we reimagine education with AI and smart technologies? Scenarios





Scenario 1: Continued digitalisation



- **Adoption remains relatively limited in the classroom**
- **Teachers and learners have an increasing number of digital learning resources to use (or not) – but they remain largely disconnected**
- **Administrative functions become increasingly digitalised**
- **The EdTech market and use of digital resources mainly targets non-formal or out-of-school uses**
- **Investments and use in digital education infrastructure follow pre-COVID trends in education**



Scenario 2: Smart schools and universities



- **Technology is pervasive, but not necessarily visible at first sight (connected devices + sensors/cameras)**
 - Smart classrooms and smart campuses
- **Teachers and learners use digital resources on a regular basis and receive constant feedback/support based on learning and classroom analytics**
- **Administrators and parents receive real-time information and advise on students, schools or systems**
- **The formal sector becomes a key sector for the EdTech industry, which creates new tensions and risks for public authorities**
- **Investments in digital education infrastructure and in the use of AIED accelerate**





Scenario 3: Social transformation



- **Technology is pervasive, but not necessarily visible at first sight (connected devices + sensors/cameras) and gives information to all actors**
- **The adoption of digital tools and other social changes (teleworking, etc.) leads to a reorganisation of schooling practices**
- **Students use digital tools out of class, on school premises or at home – and class is devoted to social learning**
- **School pathways are more personalised, learners have more choices and autonomy while still being supervised by teachers**
- **Investments in digital education infrastructure, including in the use of space and time use in school**