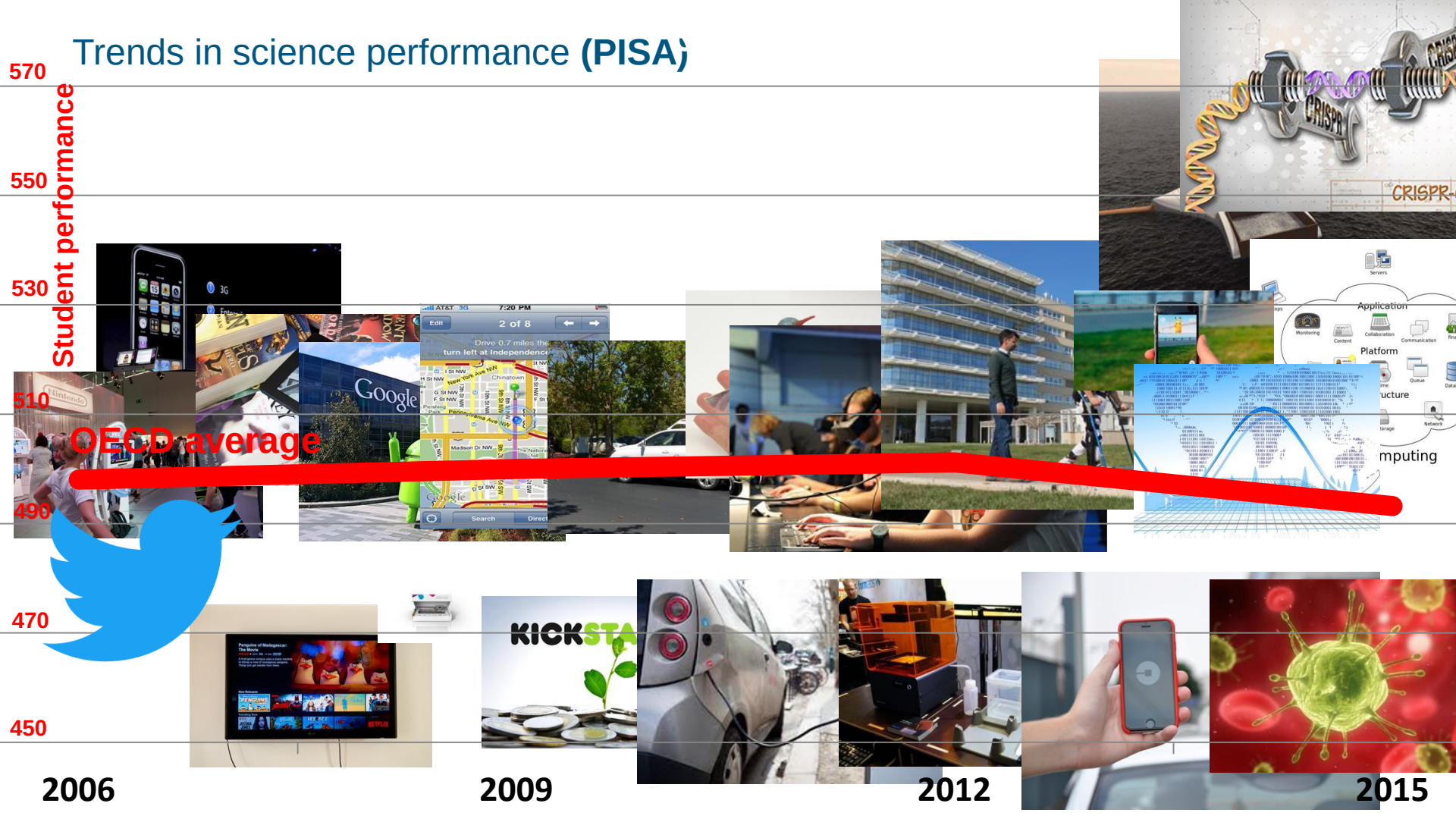
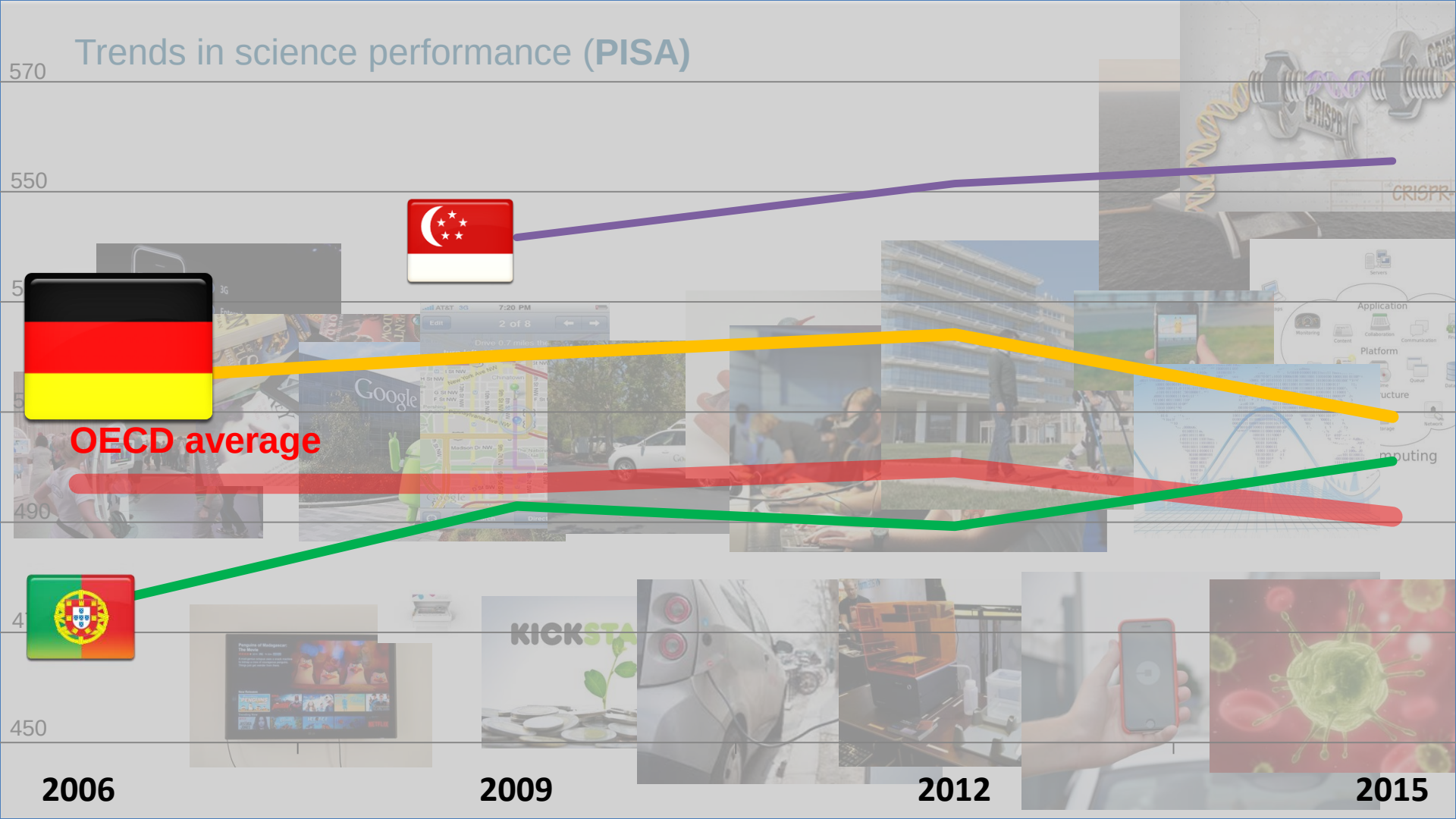
Future trends in education – 21st century skills

Andreas Schleicher, STEM Dialogue, Berlin

Trends in science performance (PISA)



Trends in science performance (**PISA**)



Poverty is not destiny - Science performance

Figure I.6.7

by international deciles of the PISA index of economic, social and cultural status (ESCS)

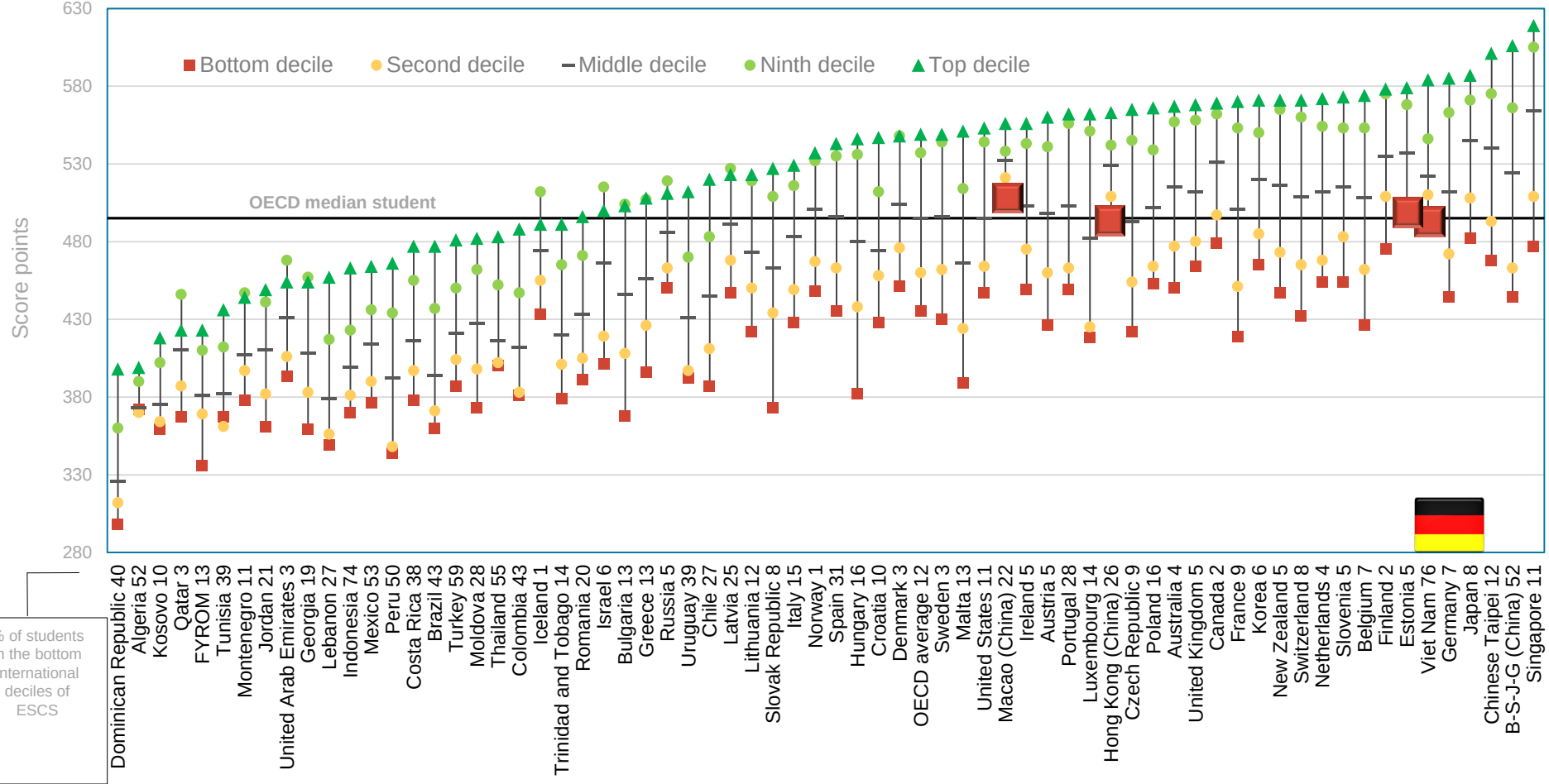


Figure I.3.2

Students expecting a career in science

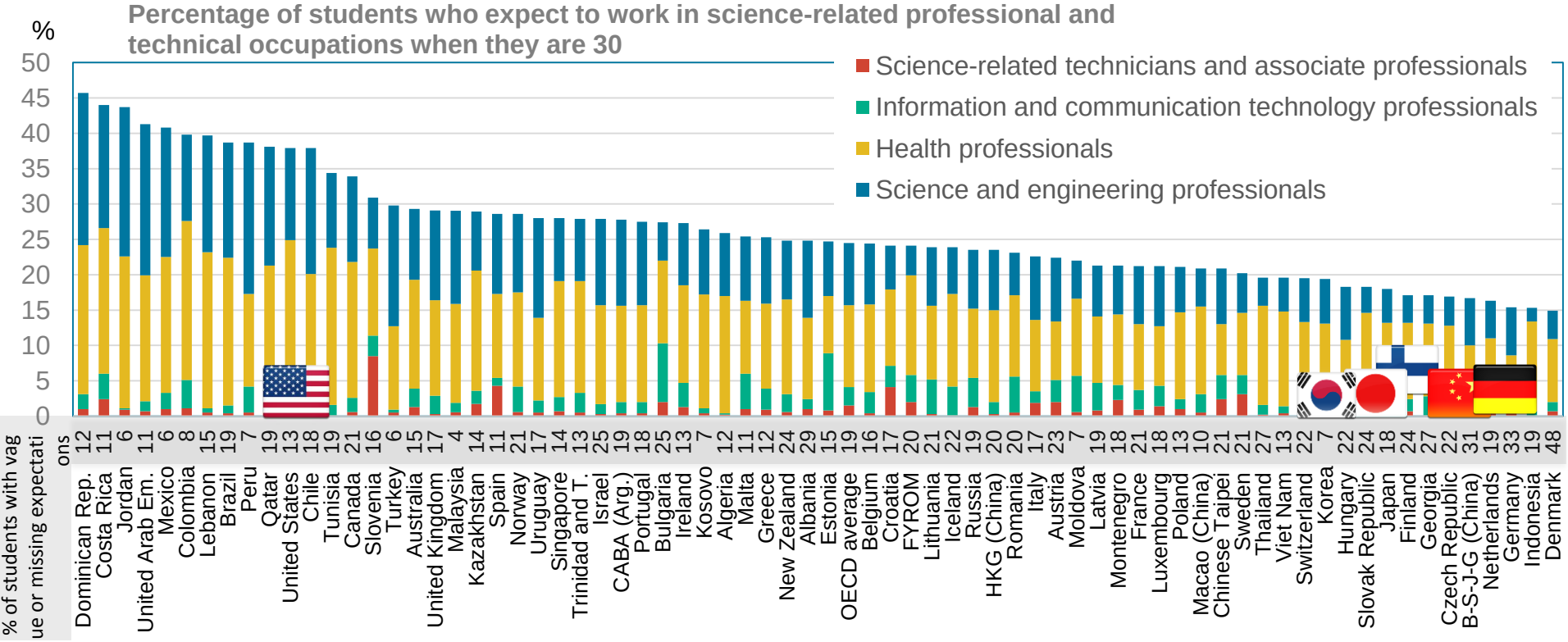
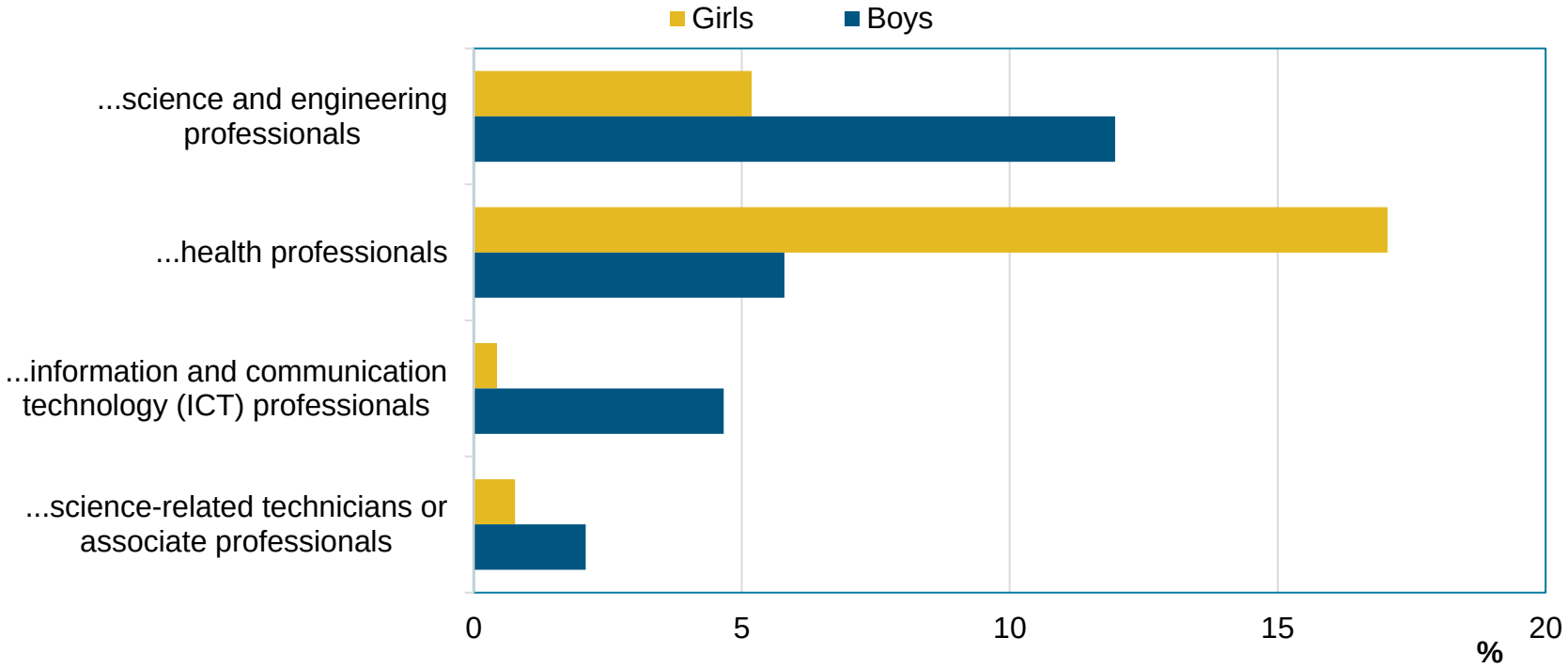


Figure I.3.5

Boys and girls' expectations of a science career

Students who expect to work as...



Multiple outcomes

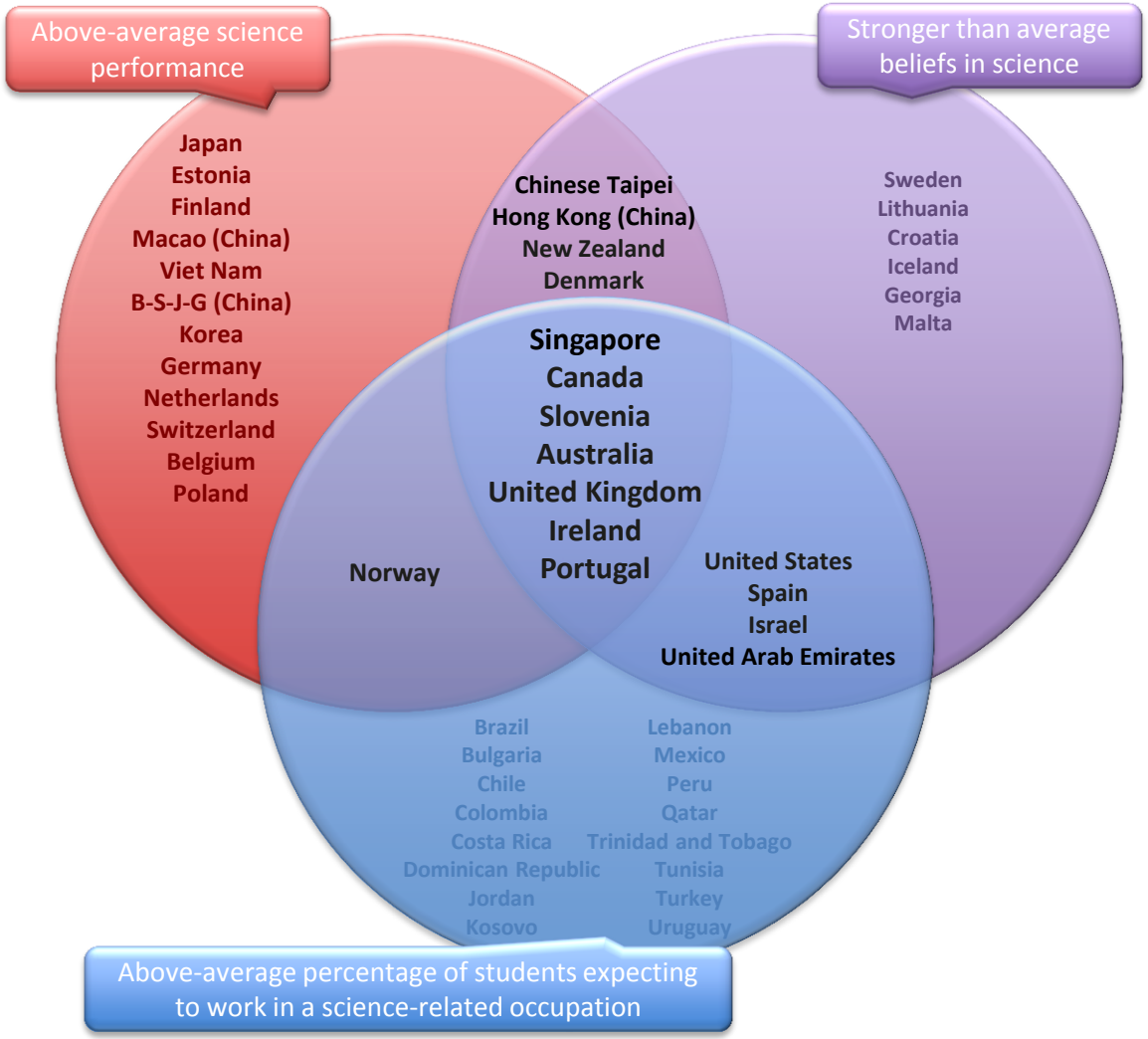
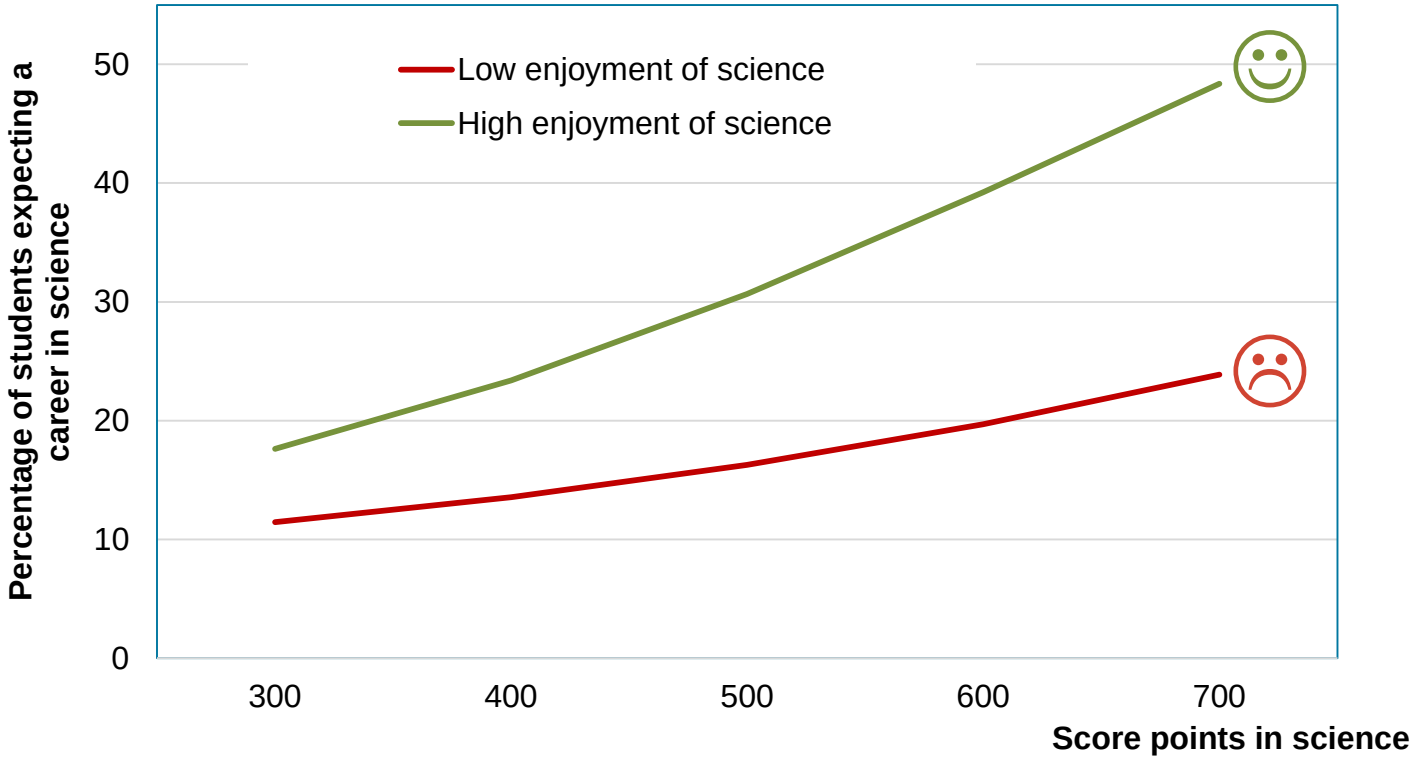


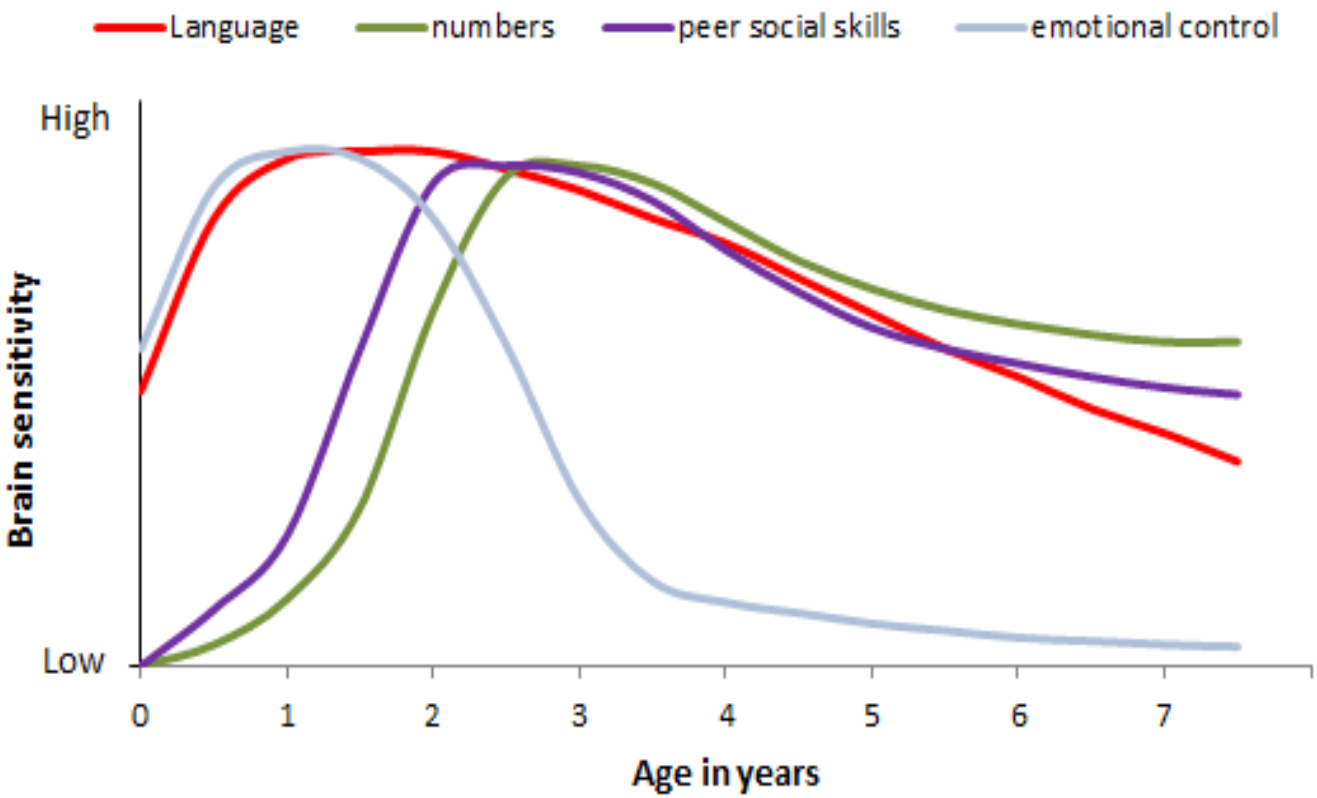
Figure I.3.17

Students expecting a career in science

by performance and enjoyment of learning



Early opportunities



Knowledge and skills for tomorrow

Dig on

Systems thinking

Global competence

Design thinking

Digital literacy

Information literacy

Digitalisation

Democratizing

Particularizing

Empowering

Concentrating

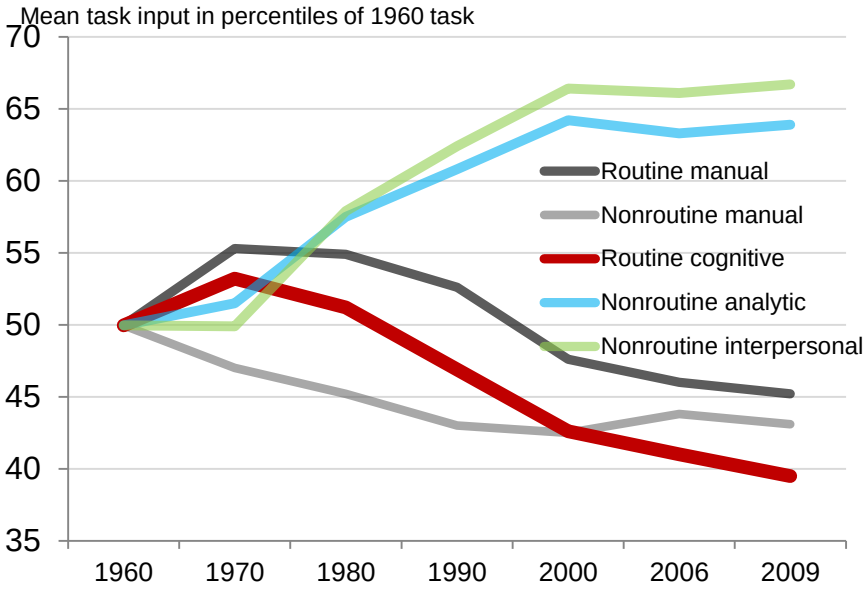
Scale without mass

Google 1m $ / employee

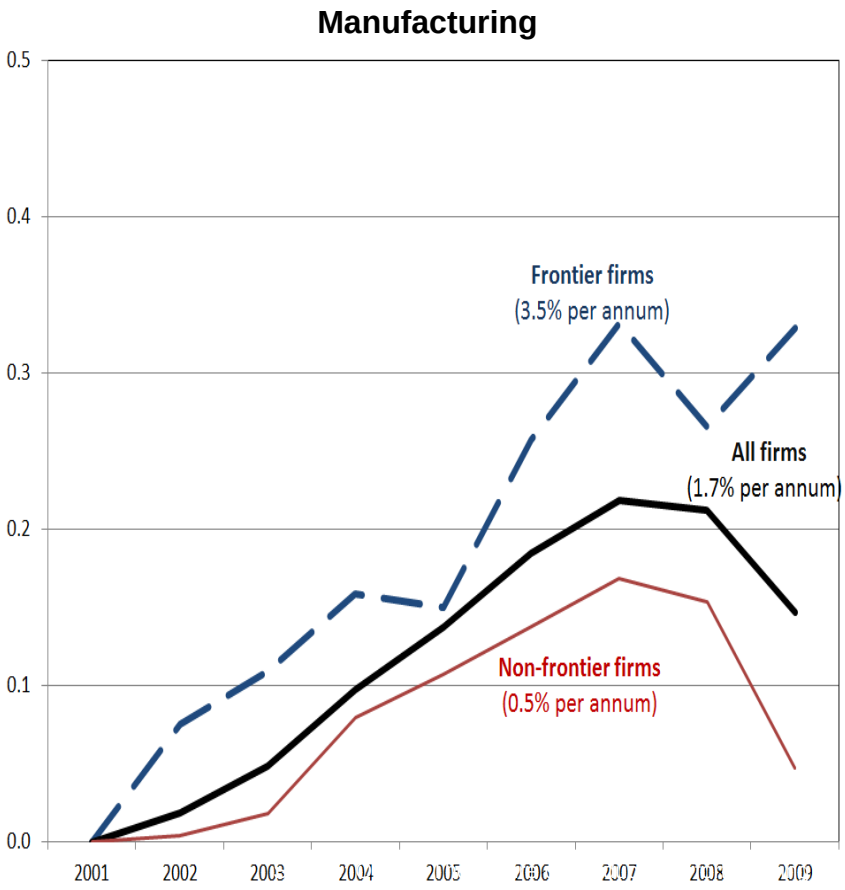
120 k$ / employee

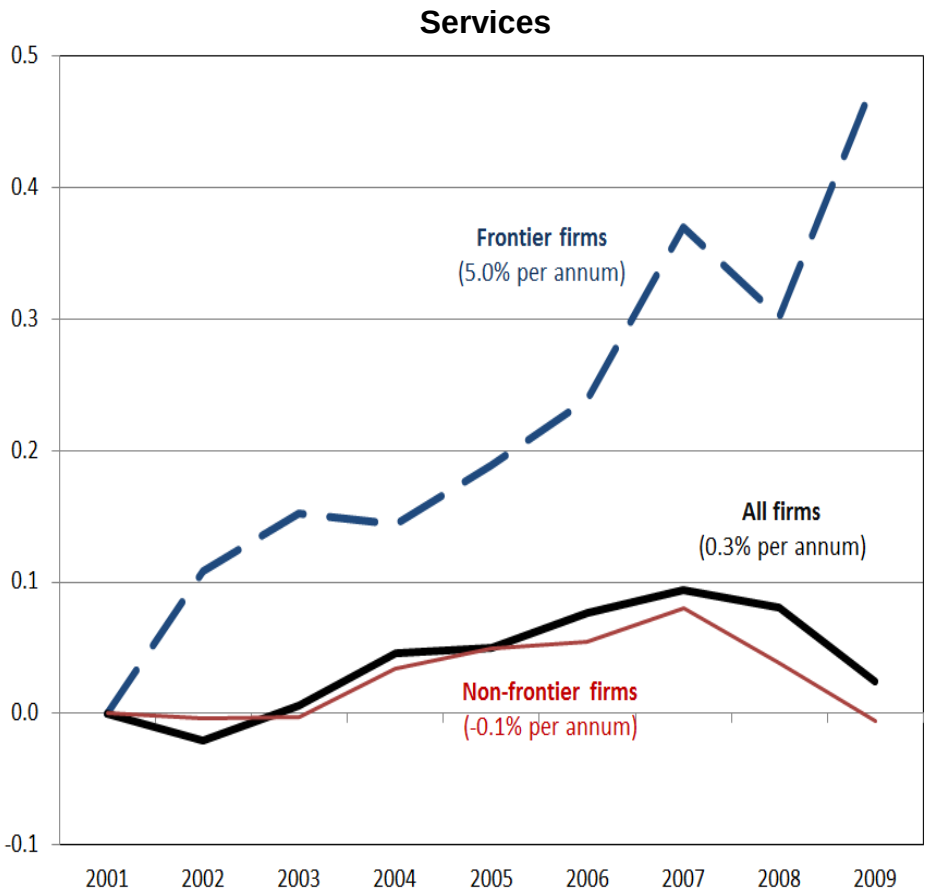
Disempowering

The kind of things that are easy to teach are now easy to automate, digitize or outsource



Labour productivity growth (2001 = 100)





Robotics

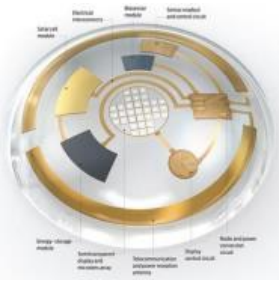
The Auto-auto

>1m km,

one minor accident,

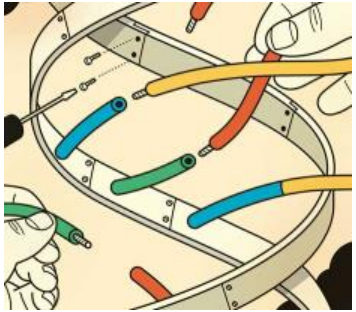
occasional human intervention

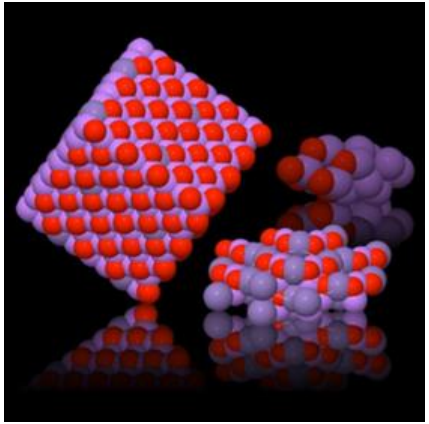
Augmented Reality

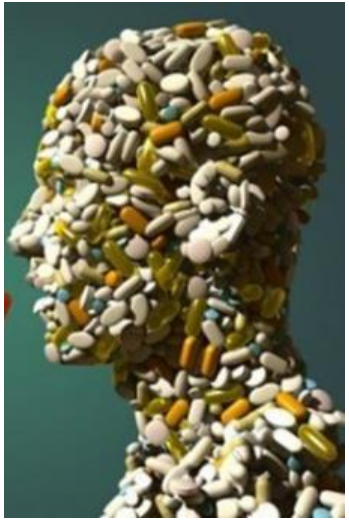


A lot more to come

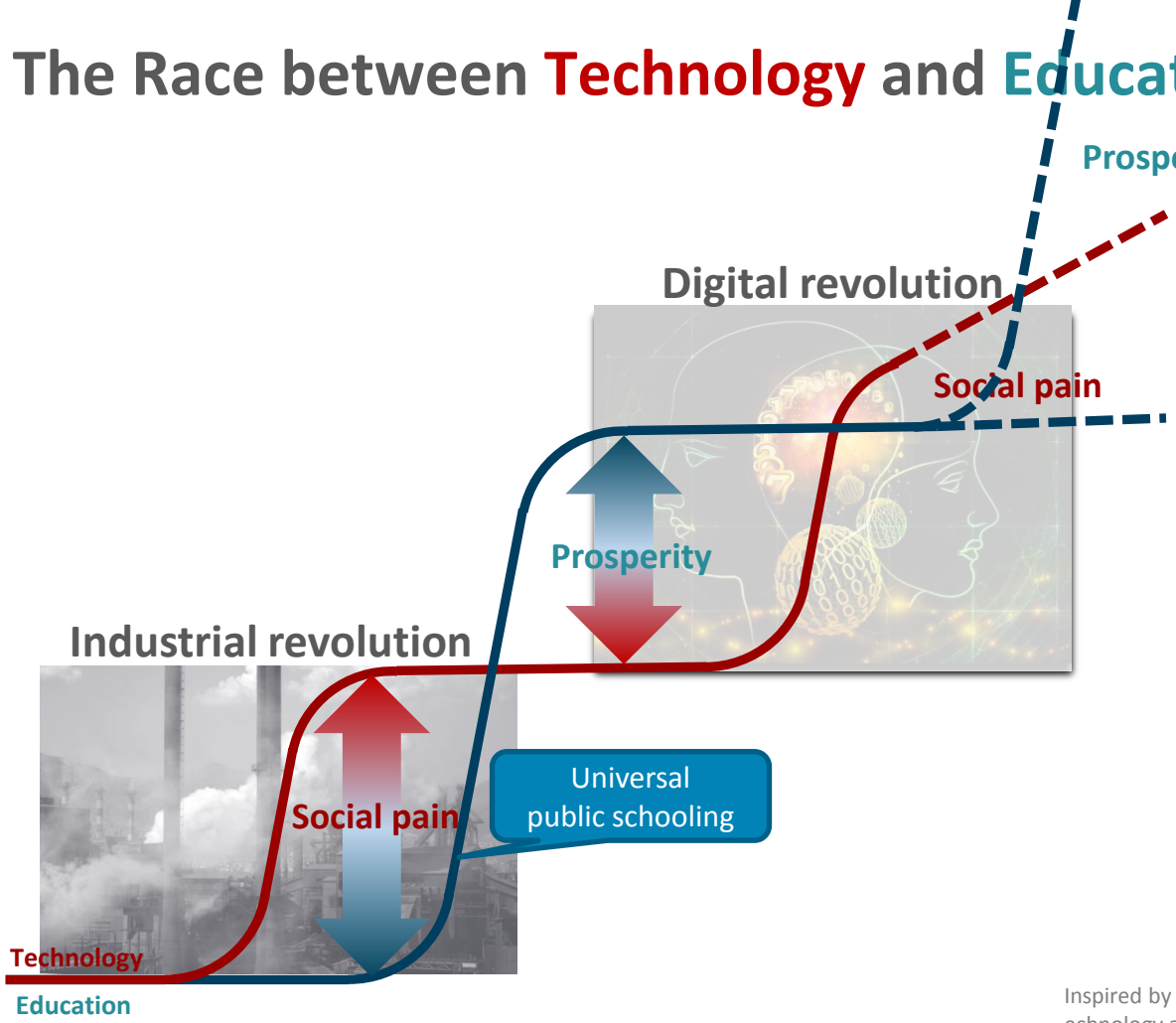
- 3D printing
- Synthetic biology
- Brain enhancements
- Nanomaterials
- Etc.



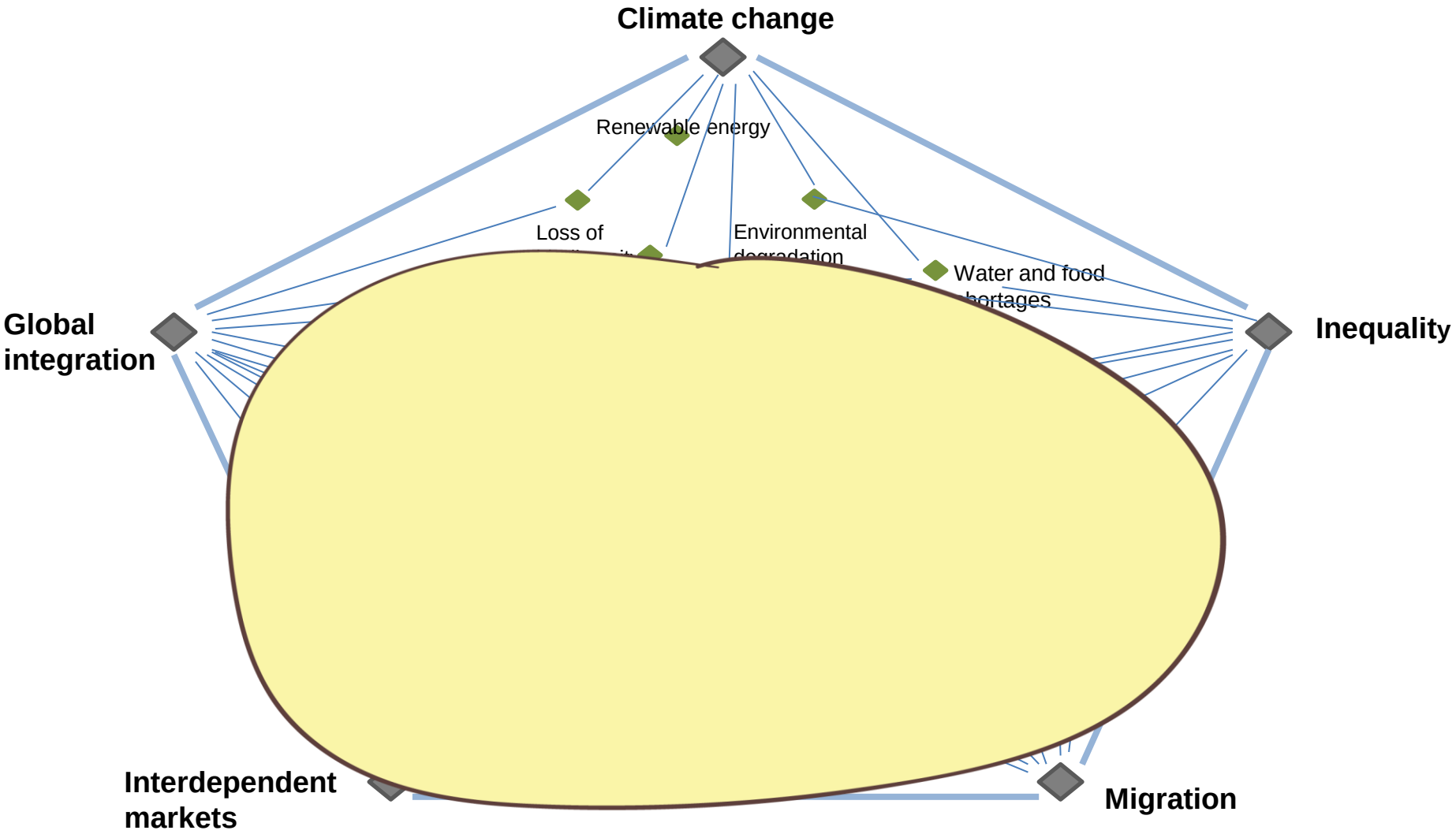




The Race between Technology and Education

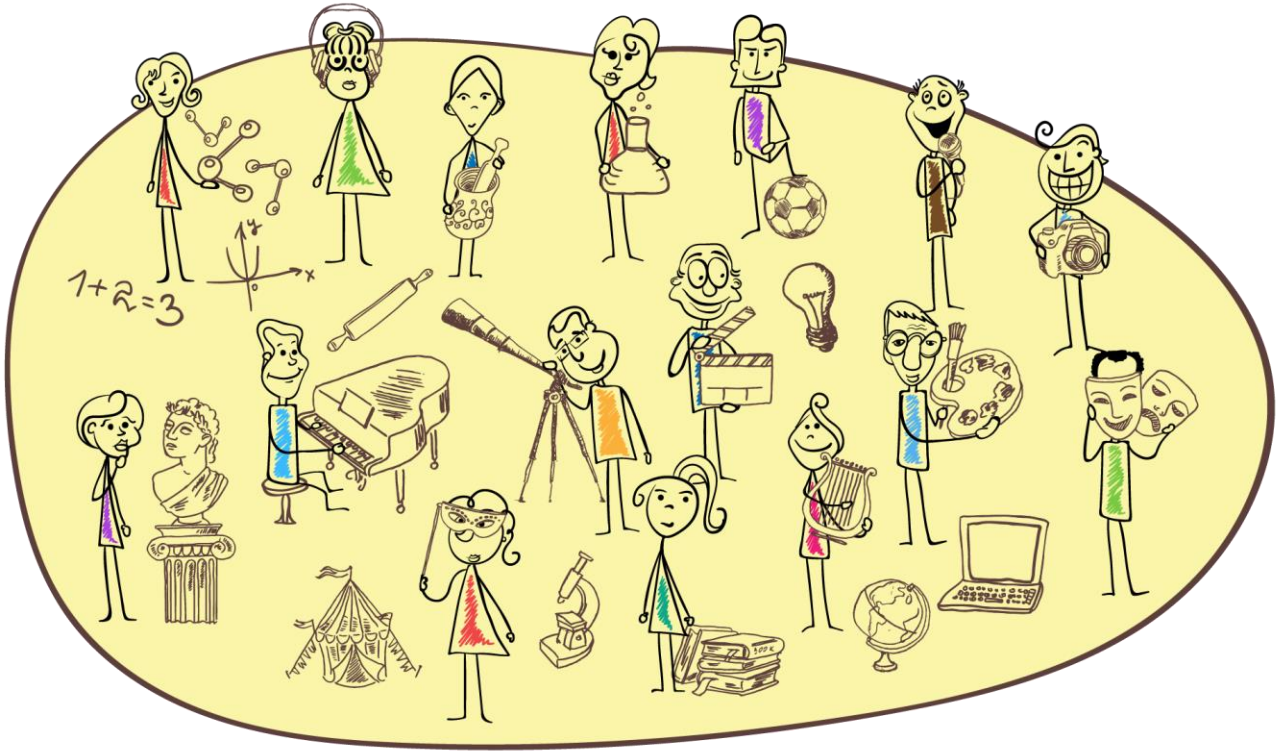


Inspired by "The race between t
echnology and education"
Pr. Goldin & Katz (Harvard)

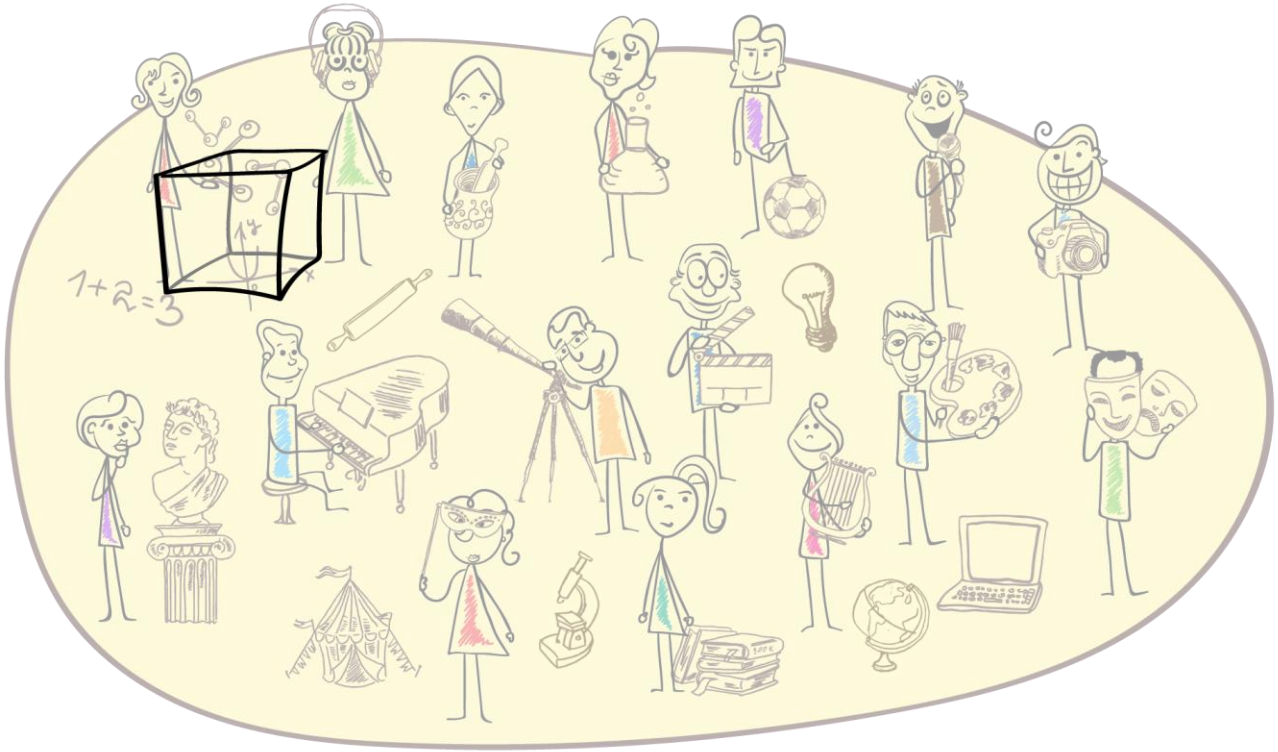

Climate change
Renewable energy
Loss of
Environmental
Water and food
Global integration
Inequality
Interdependent markets
Migration

The multi-faceted world of knowledge

The human world of knowledge



The small world of the curriculum



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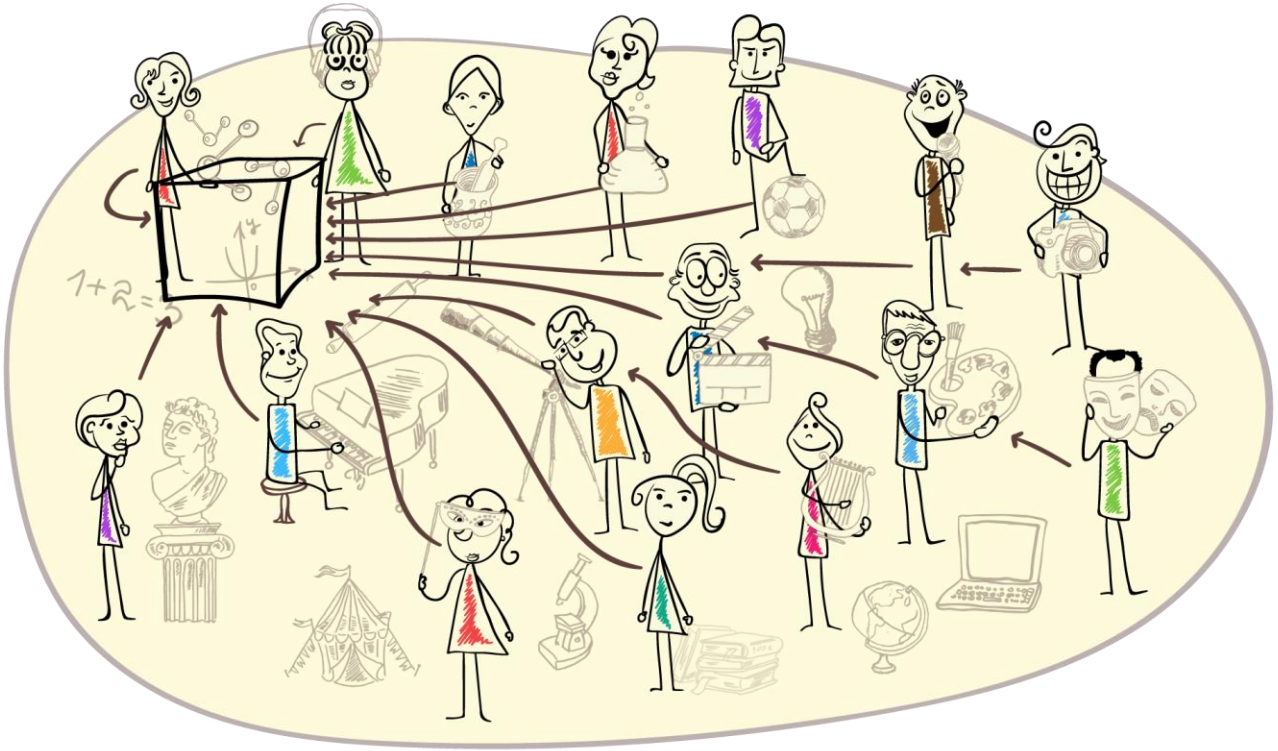

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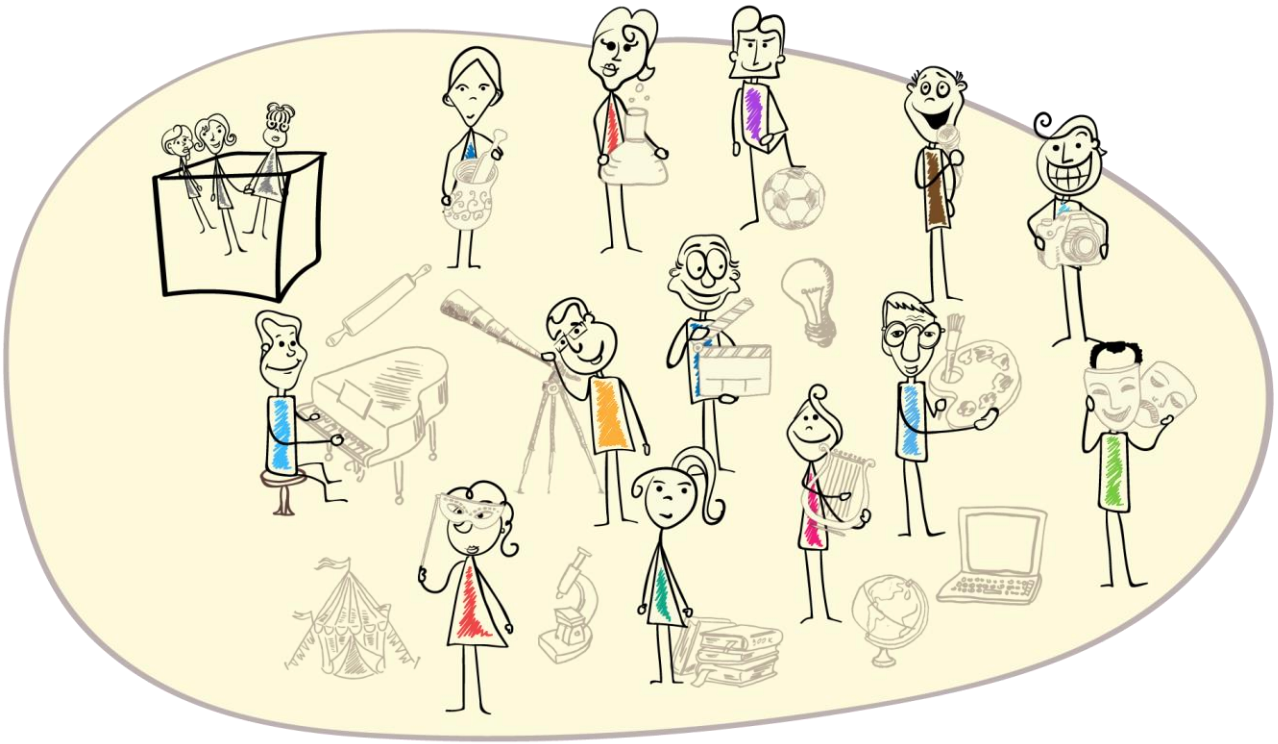

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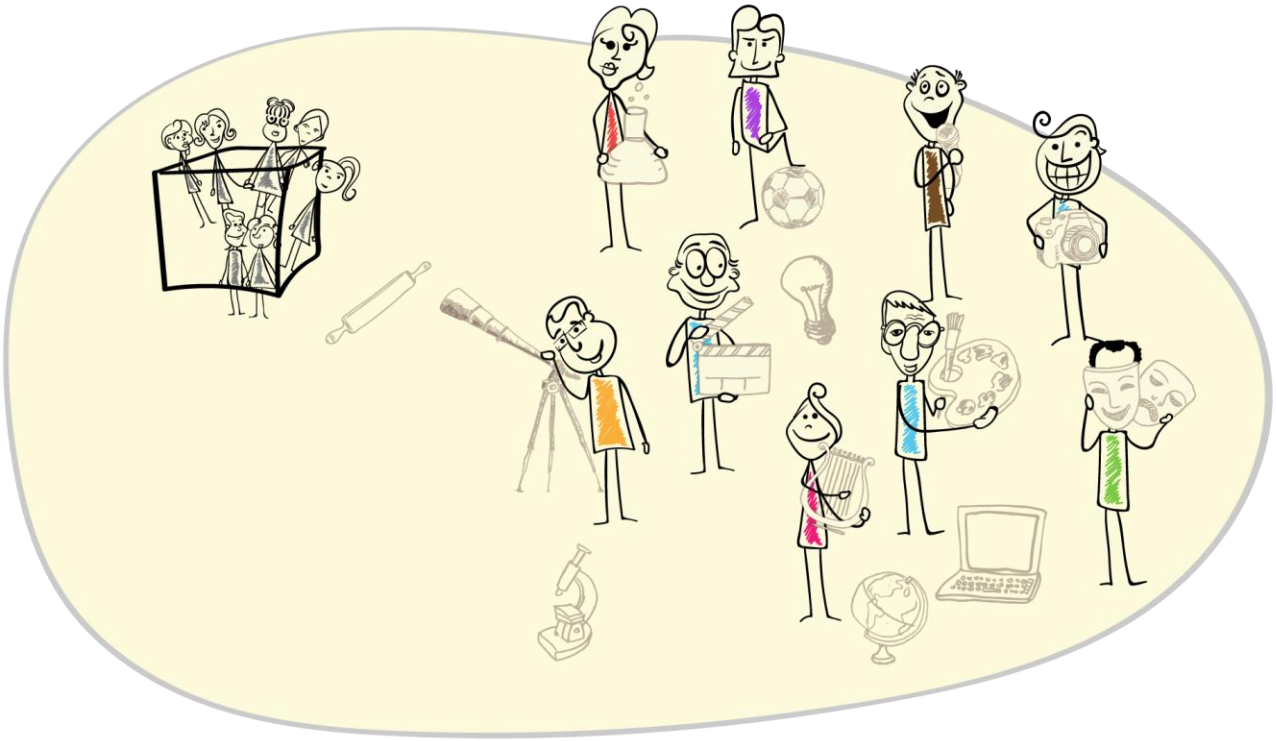

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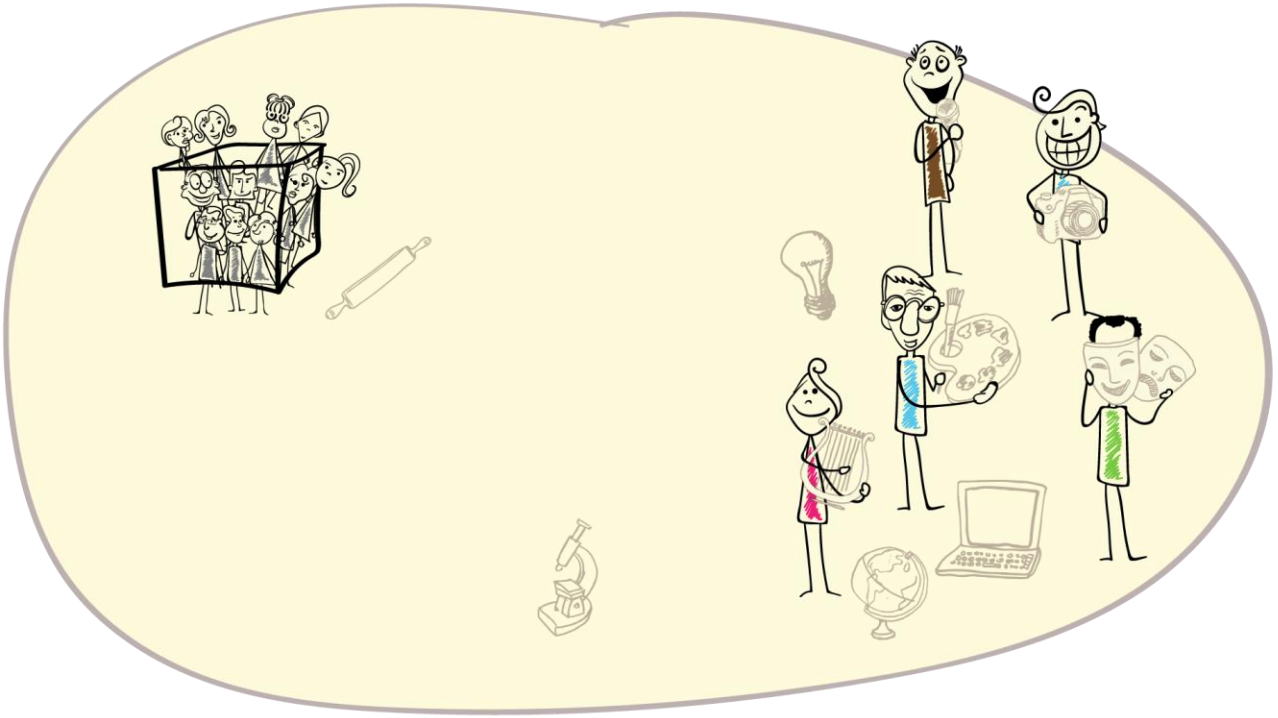


The small world of the curriculum

The big world of learning

The True
The realm of human knowledge

The Good
The realm of ethics and judgement

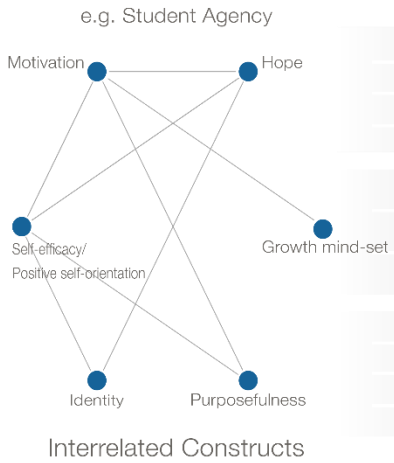
The Just and Well-Ordered
The realm of political and civic life, binding social capital

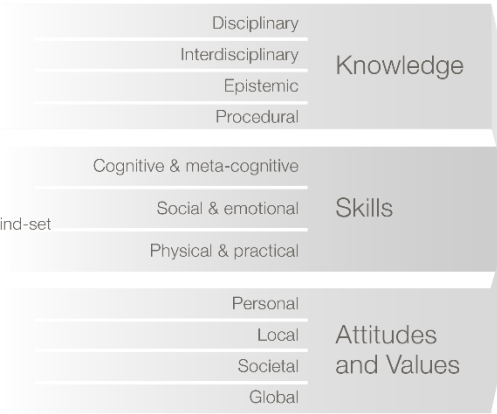
The Beautiful
The realm of creativity, esthetics and design

The Sustainable
The realm of natural and physical health

The Prosperous
The realm of economic life

The **OECD** Learning Framework 2030





Creating new value connotes processes of creating, making, bringing into being and formulating; and outcomes that are innovative, fresh and original, contributing something of intrinsic positive worth. The constructs that underpin the competence are imagination, inquisitiveness, persistence, collaboration and self-discipline.

In a structurally imbalanced world, the imperative of reconciling diverse perspectives and interests, in local settings with sometimes global implications, will require young people to become adept in handling tensions, dilemmas and trade-offs. Underlying constructs are empathy, adaptability, trust.

Dealing with novelty, change, diversity and ambiguity assumes that individuals can 'think for themselves'. This suggests a sense of responsibility, and moral and intellectual maturity, with which a person can reflect upon and evaluate their actions in the light of their experiences and personal and societal goals; what they have been taught and told; and what is right or wrong

Competencies

- Explain phenomena scientifically
- Evaluate and design scientific enquiry
- Interpret data and evidence scientifically

Recognise, offer and evaluate explanations for a range of natural and technological phenomena.

Describe and appraise scientific investigations and propose ways of addressing questions scientifically.

Analyse and evaluate data, claims and arguments in a variety of representations and draw appropriate scientific conclusions.

Competencies

- Explain phenomena scientifically
- Evaluate and design scientific enquiry
- Interpret data and evidence scientifically

Knowledge

- Content knowledge
- Knowledge of methodological procedures used in science
- Knowledge of the epistemic reasons and ideas used by scientists to justify their claims

Each of the scientific competencies requires content knowledge (knowledge of theories, explanatory ideas, information and facts), but also an understanding of how such knowledge has been derived (procedural knowledge) and of the nature of that knowledge (epistemic knowledge)

"Epistemic knowledge" reflects students' capacity to think like a scientist and distinguish between observations, facts, hypotheses, models and theories

Competencies

- Explain phenomena scientifically
- Evaluate and design scientific enquiry
- Interpret data and evidence scientifically

Knowledge

- Content knowledge
- Knowledge of methodological procedures used in science
- Knowledge of the epistemic reasons and ideas used by scientists to justify their claims

Attitudes

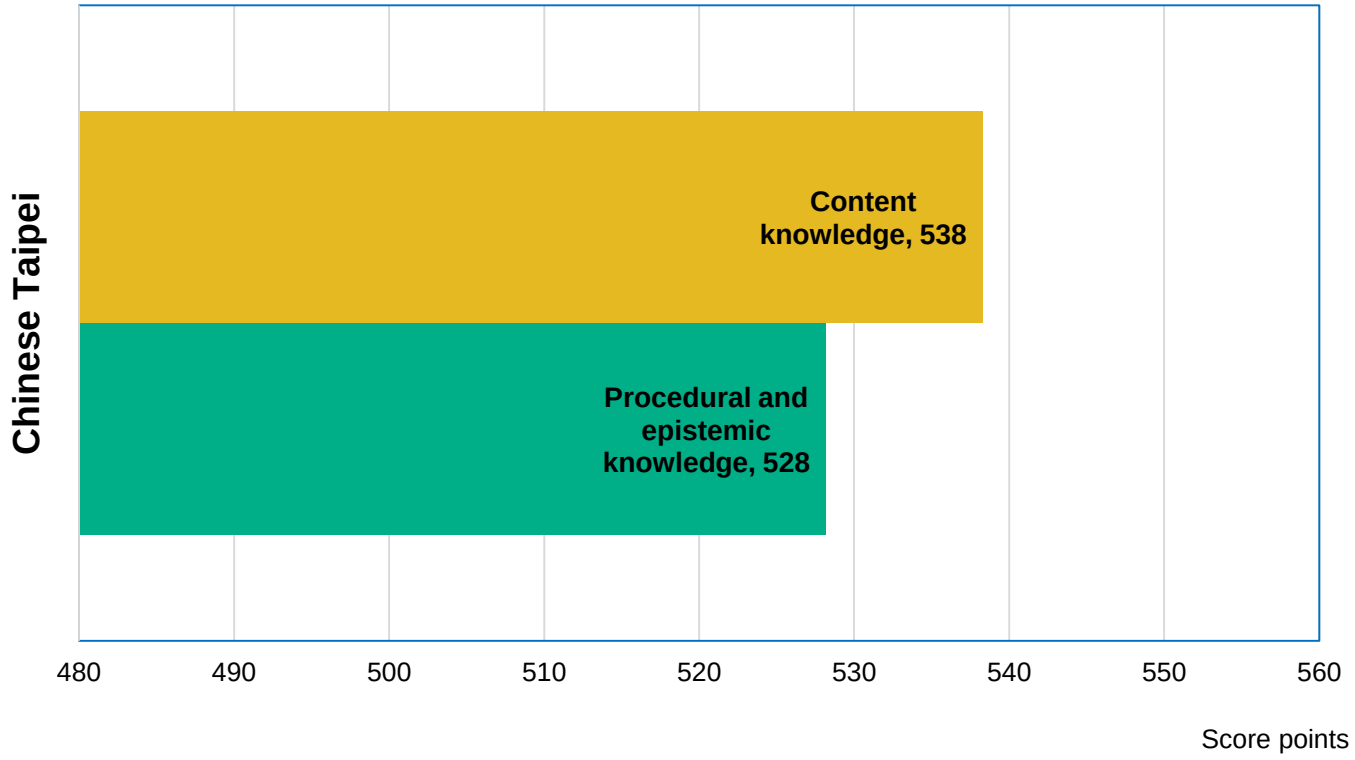
- Attitudes to science
- Scientific attitudes

Peoples' attitudes and beliefs play a significant role in their interest, attention and response to science and technology.

PISA distinguishes between attitudes towards science (e.g. interest in different content areas of science) and scientific attitudes (e.g. whether students value scientific approaches to enquiry)

Comparing countries and economies on the different science knowledge subscales

Figure I.2.30



Comparing countries and economies on the different science knowledge subscales

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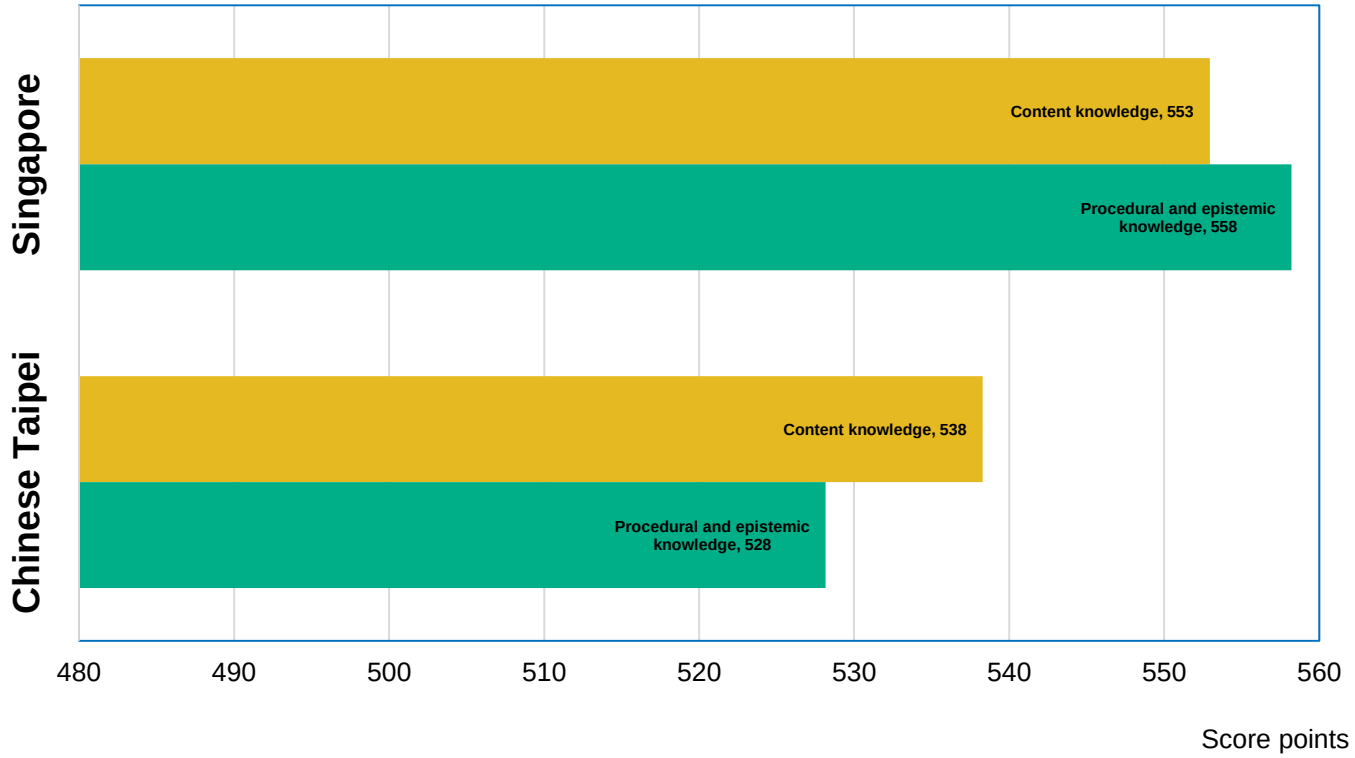

Comparing countries and economies on the different science knowledge subscales

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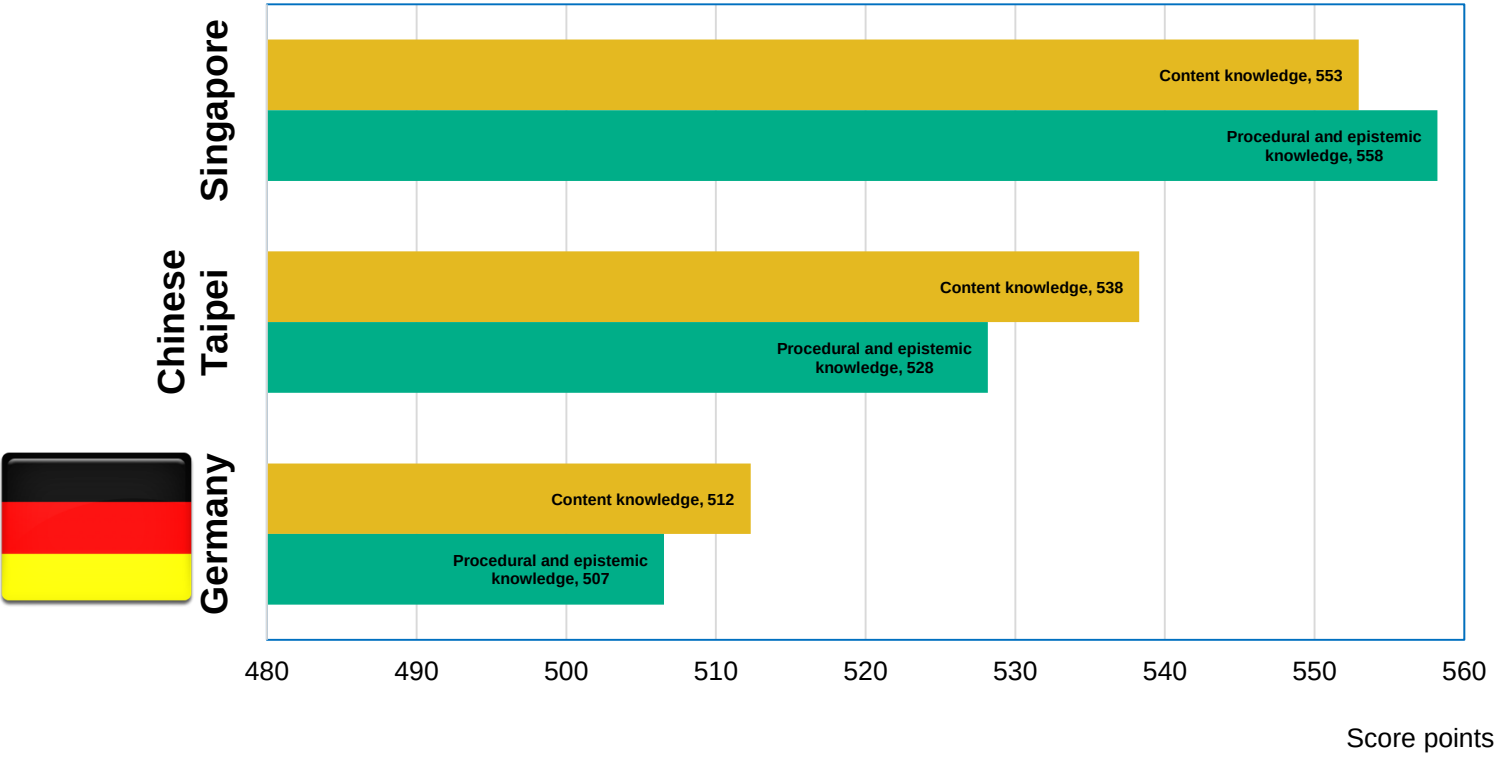
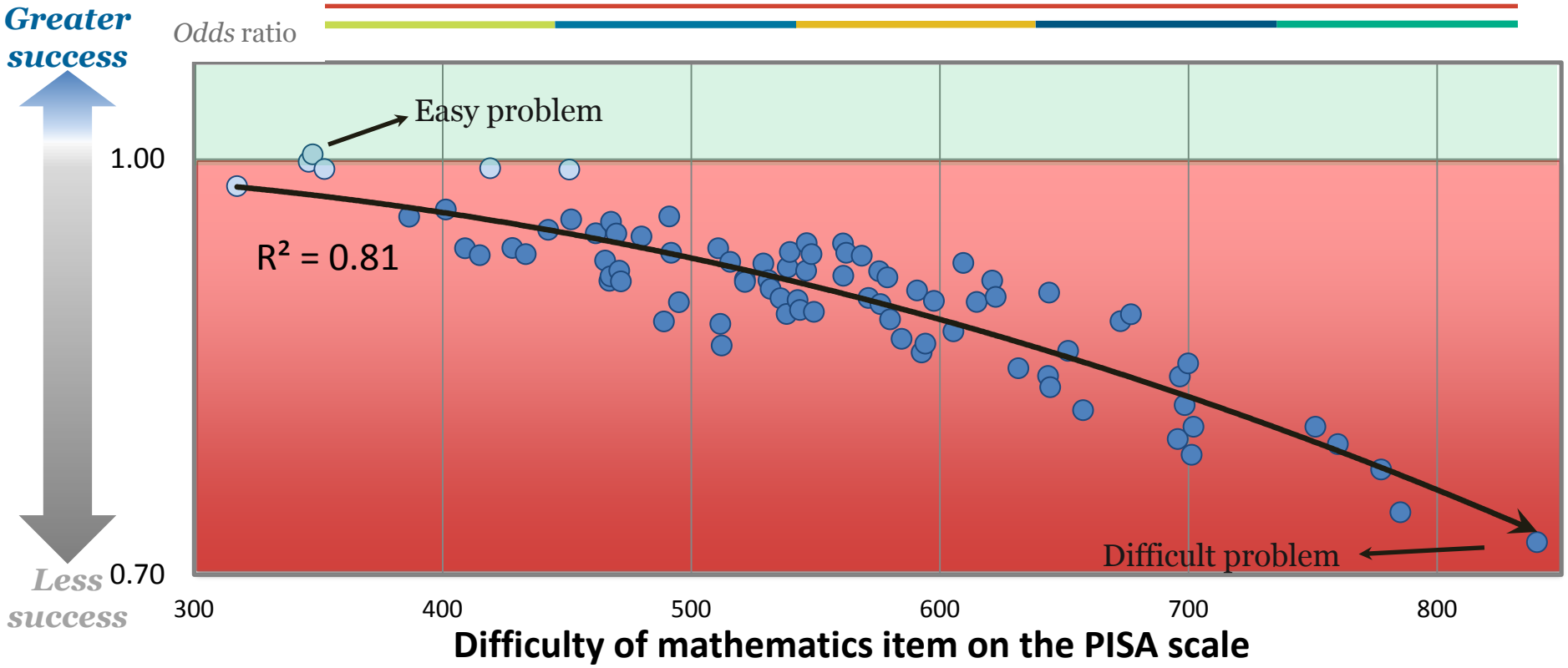
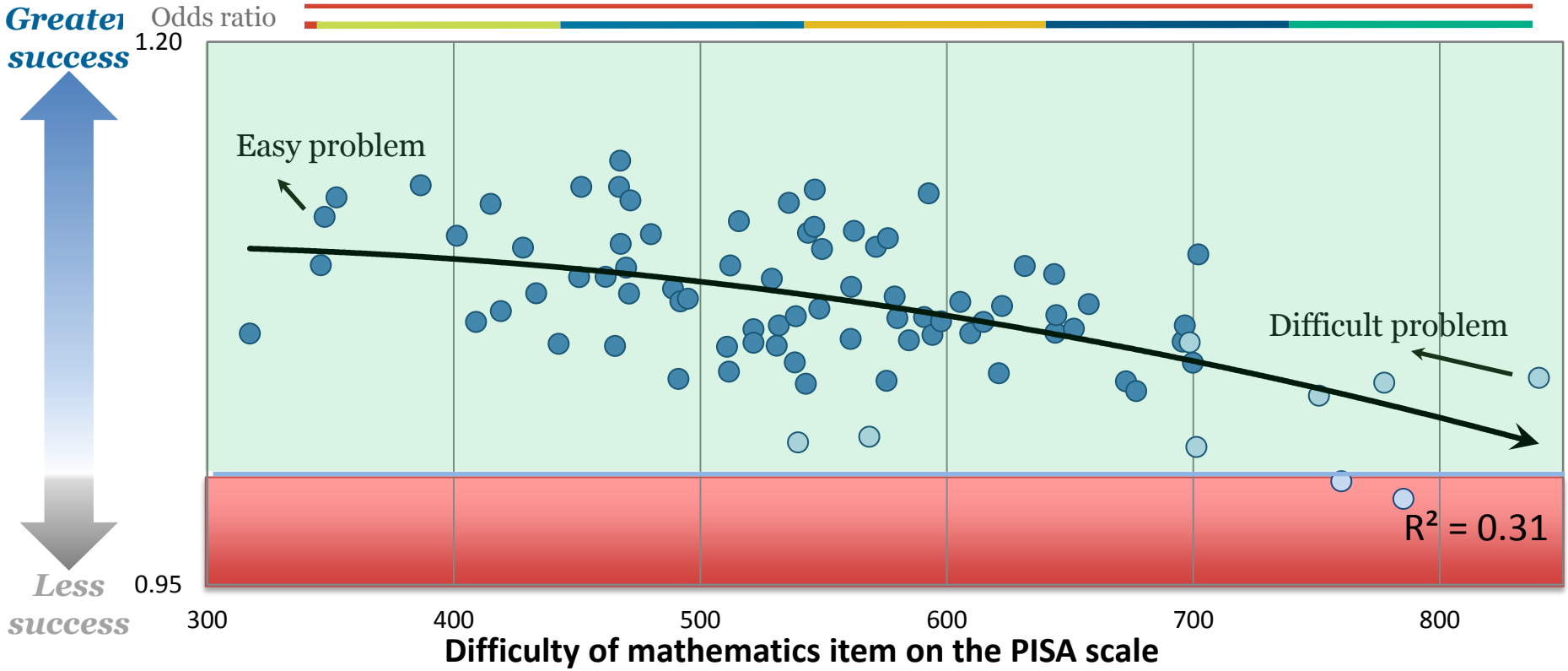


Memorisation is **less useful** as problems become **more difficult** *(OECD average)*



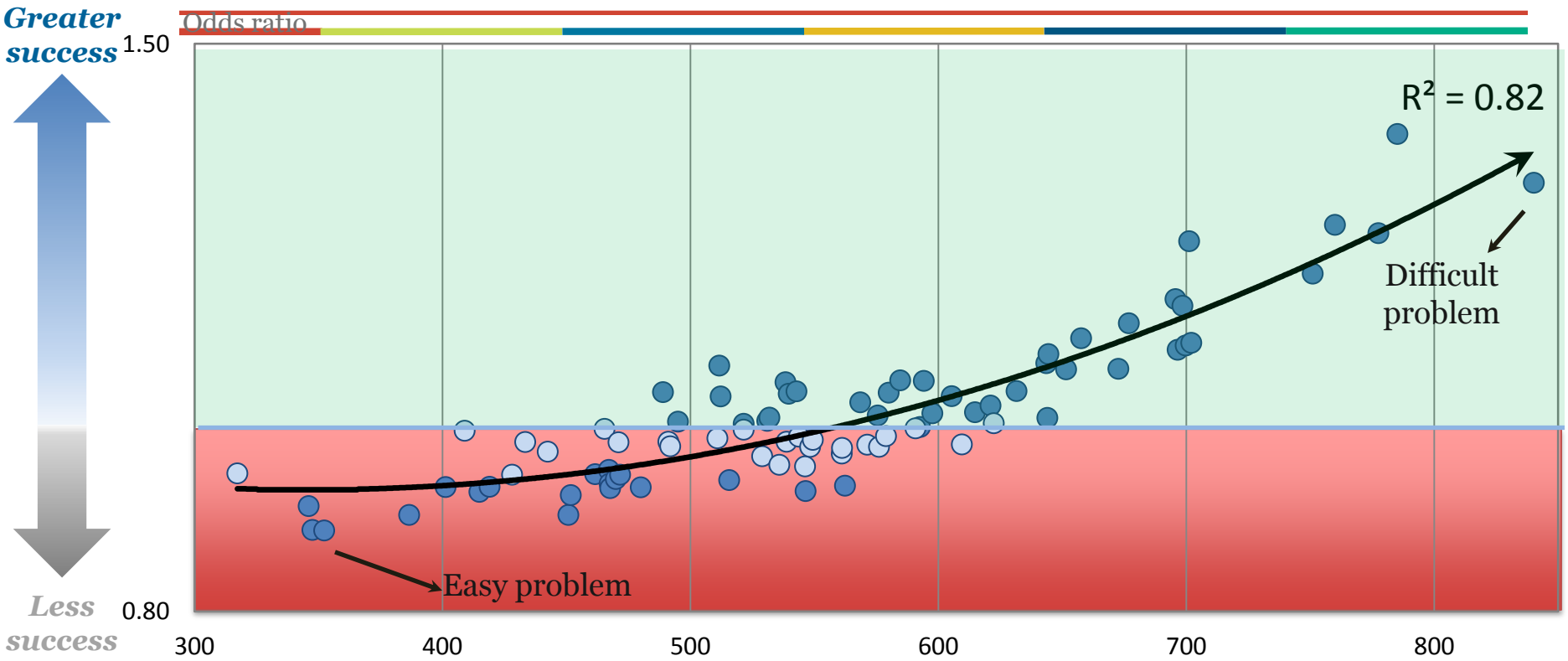
Source: Figure 4.3

Control strategies are **always helpful** but **less so** as problems become **more difficult** *(OECD average)*



Source: Figure 5.2

Elaboration strategies are more useful as problems become more difficult *(OECD average)*



Source: Figure 6.2

The big world of learning

- **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


Some students learn at high levels

All students learn at high levels

Delivered wisdom

User-generated wisdom

Recognising both students and adults as resources for the co-creation of communities, for the design of learning and for the success of students

Bureaucratic Look-up

Devolved Look-outward

Figure II.6.23

Learning time and science performance

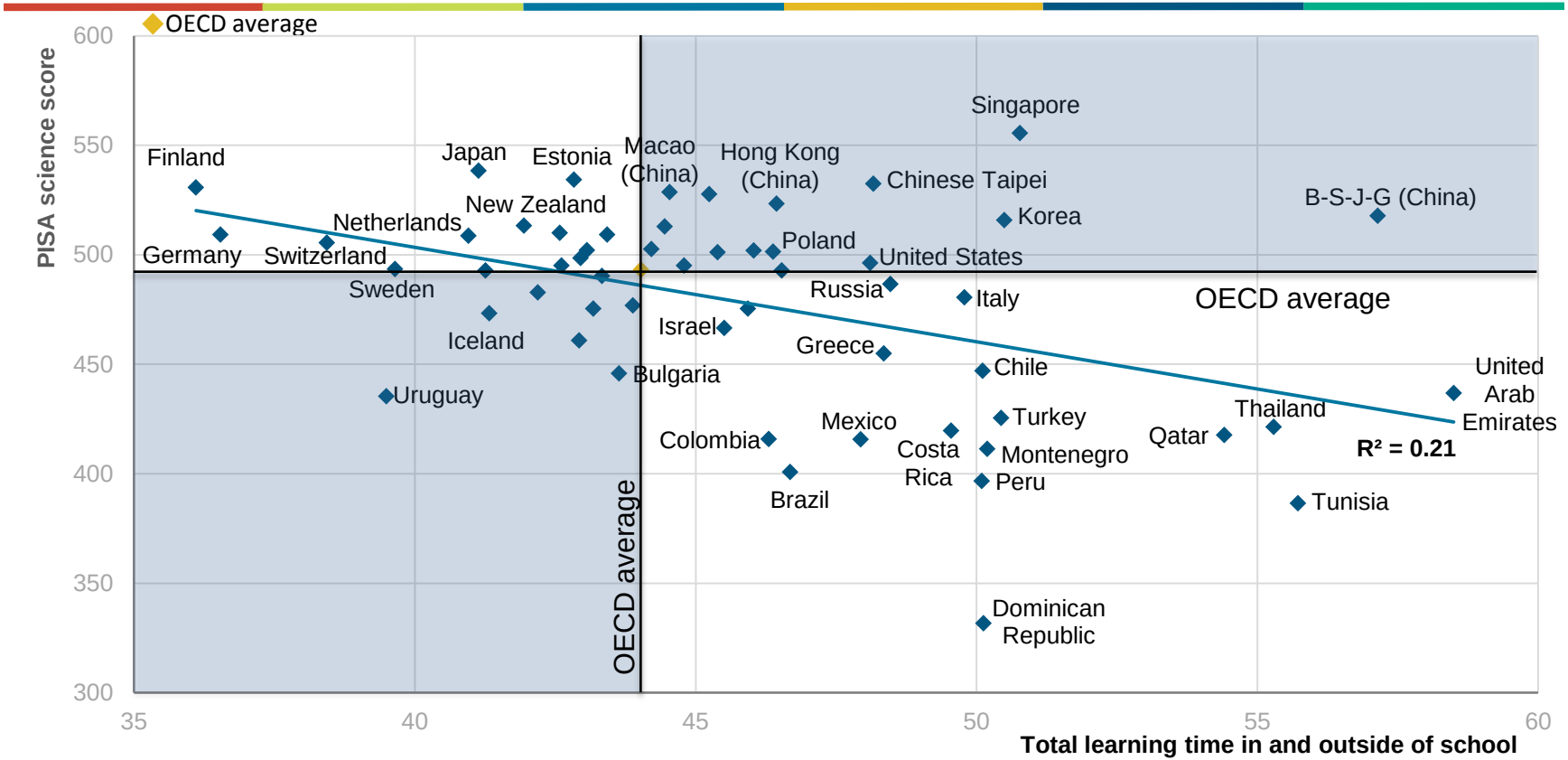
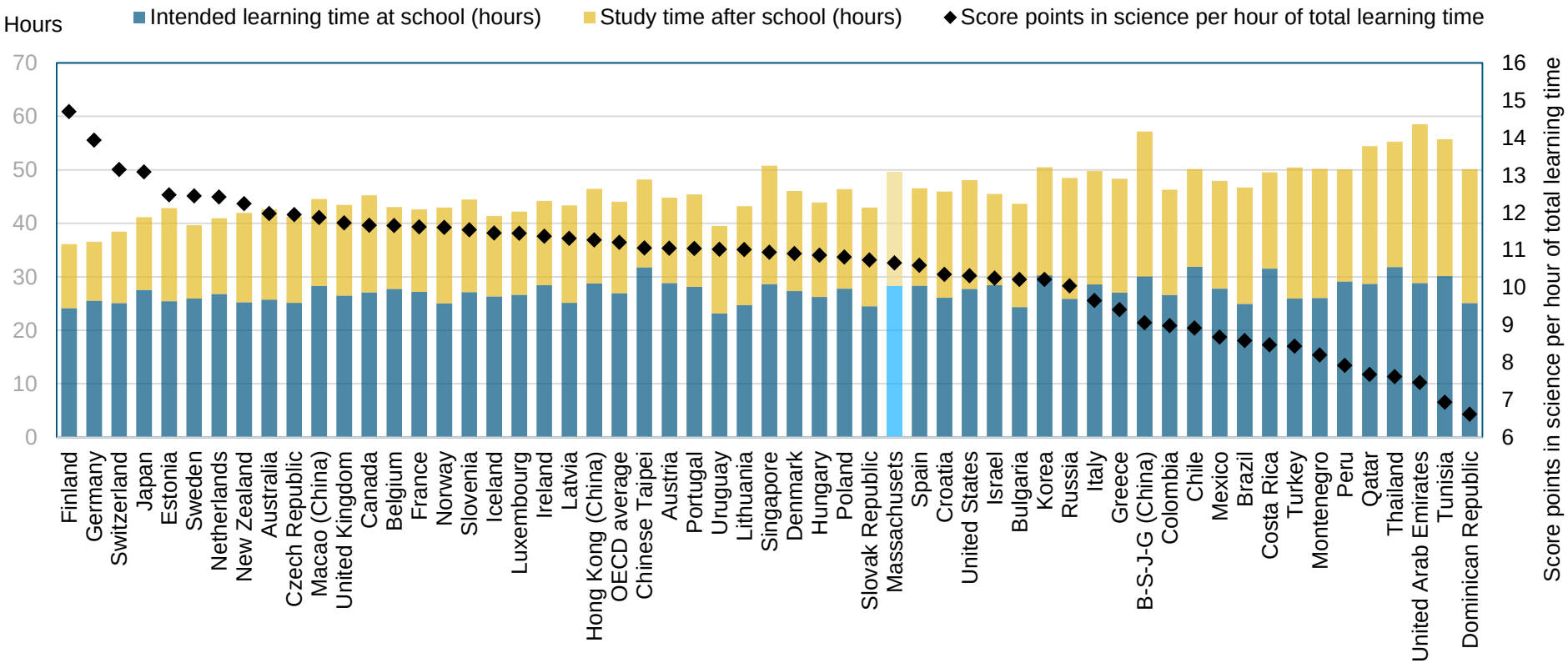


Figure II.6.23

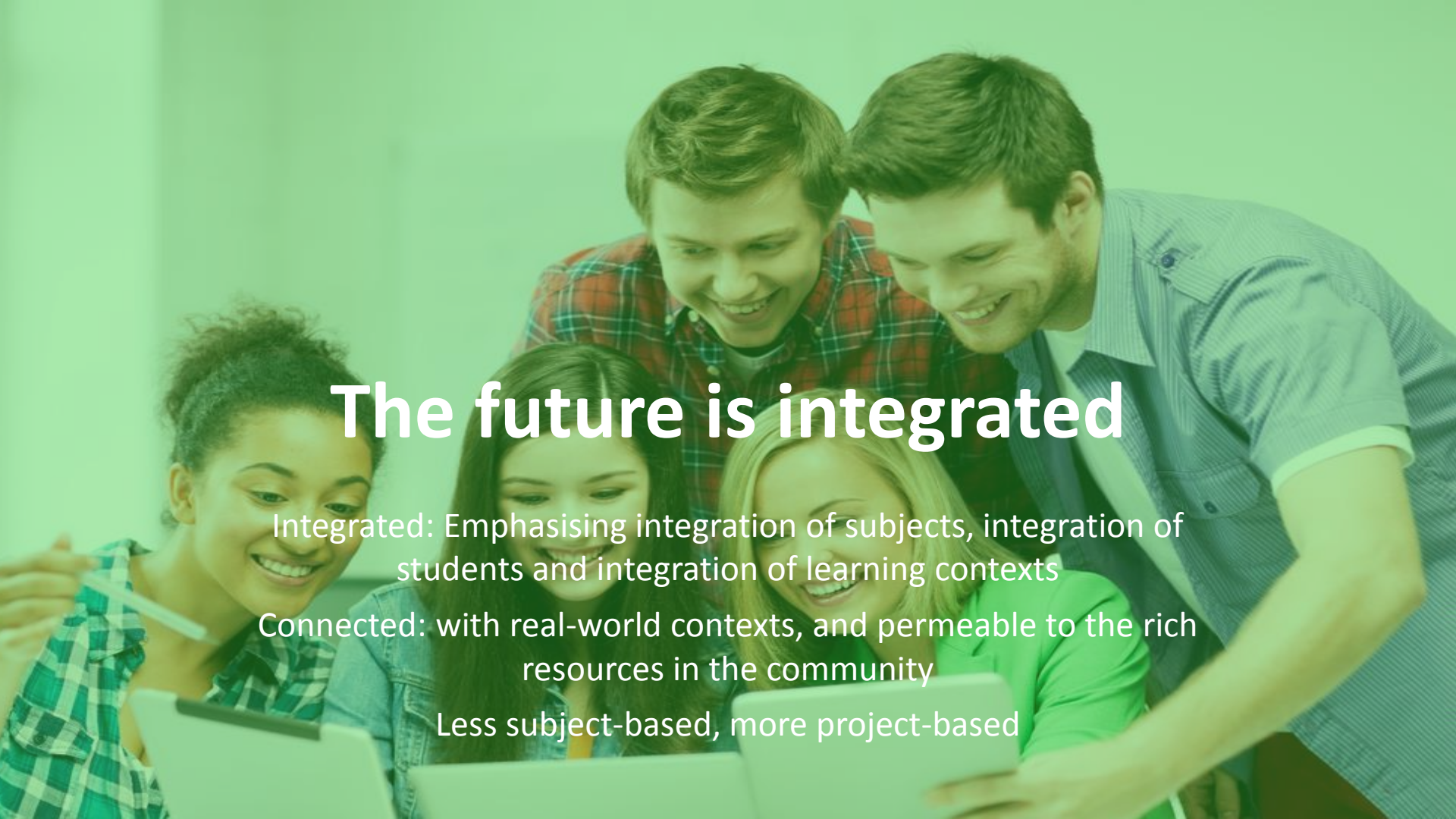
Learning time and science performance



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

Uniformity

Diversity

Embracing diversity with differentiated pedagogical practices

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.

Learning a place

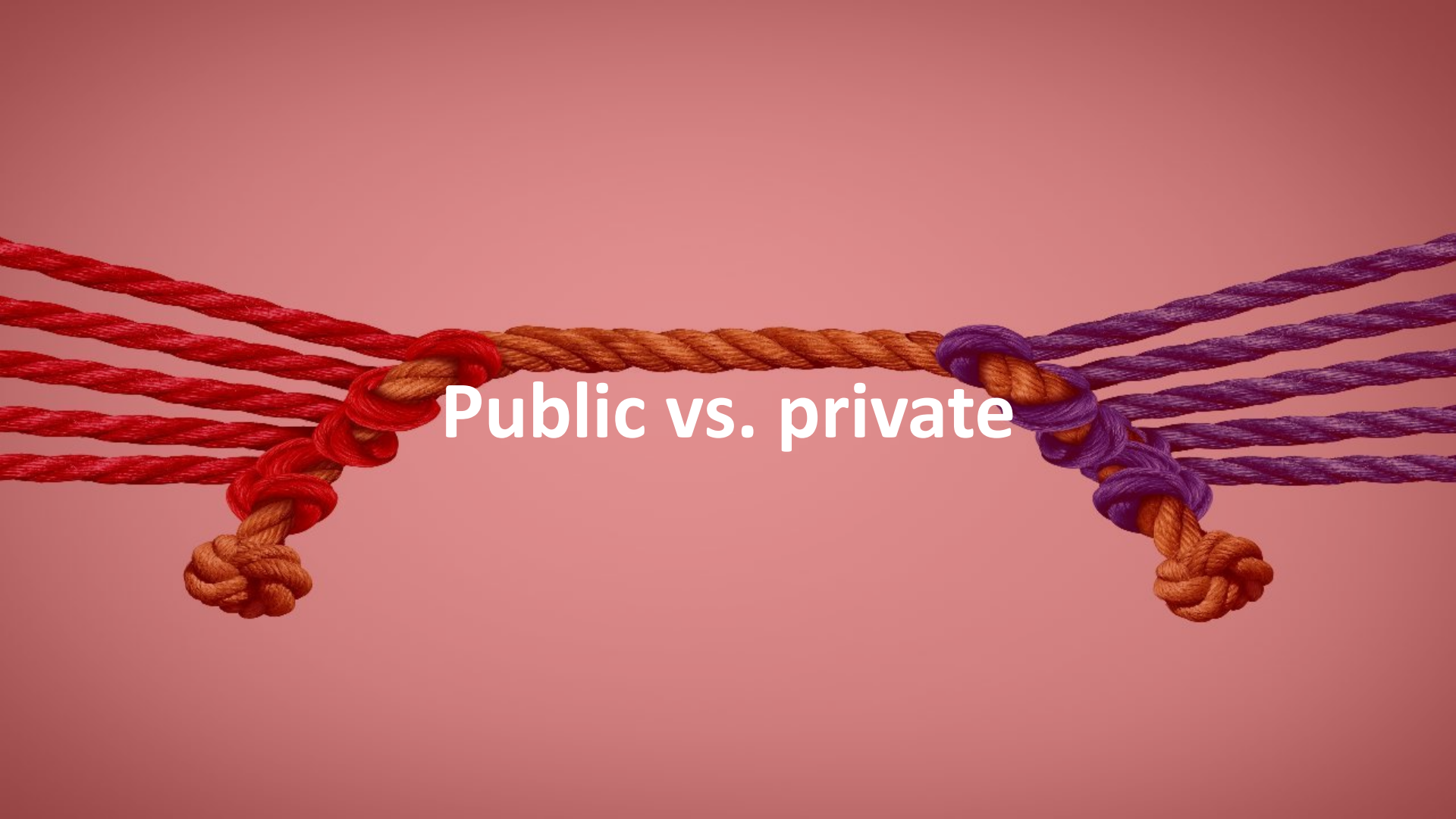
Schools as technological islands, that is technology was deployed mostly to support existing practices for efficiency gains

Learning an activity

Technologies liberating learning from past conventions and connect learners in new and powerful ways. The past was interactive, the future is participative

Administrative control and accountability

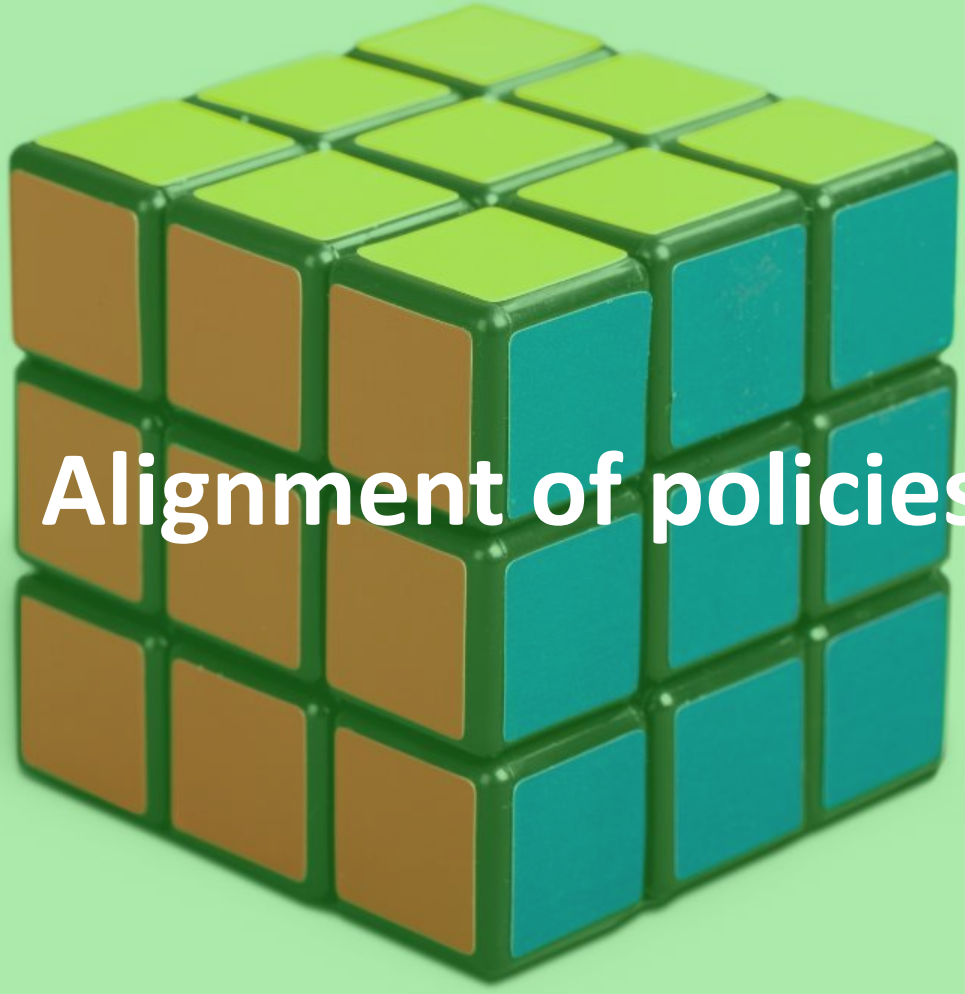
Professional forms of work organisation



Public vs. private

Public with private

Idiosyncratic policies



Alignment of policies

Thank you

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- All publications
- The complete micro-level database

Email: Andreas.Schleicher@OECD.org

Twitter: SchleicherEDU

and remember:

Without data, you are just another person with an opinion