PISA

# Some lessons from PISA

## 2017 OECD Japan Seminar

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Director for Education and Skills

OECD
BETTER POLICIES FOR BETTER LIVES

# PISA in brief - 2015

**In 2015, over half a million students…**

- representing 28 million 15-year-olds in 72 countries/economies

**… took an internationally agreed 2-hour test…**

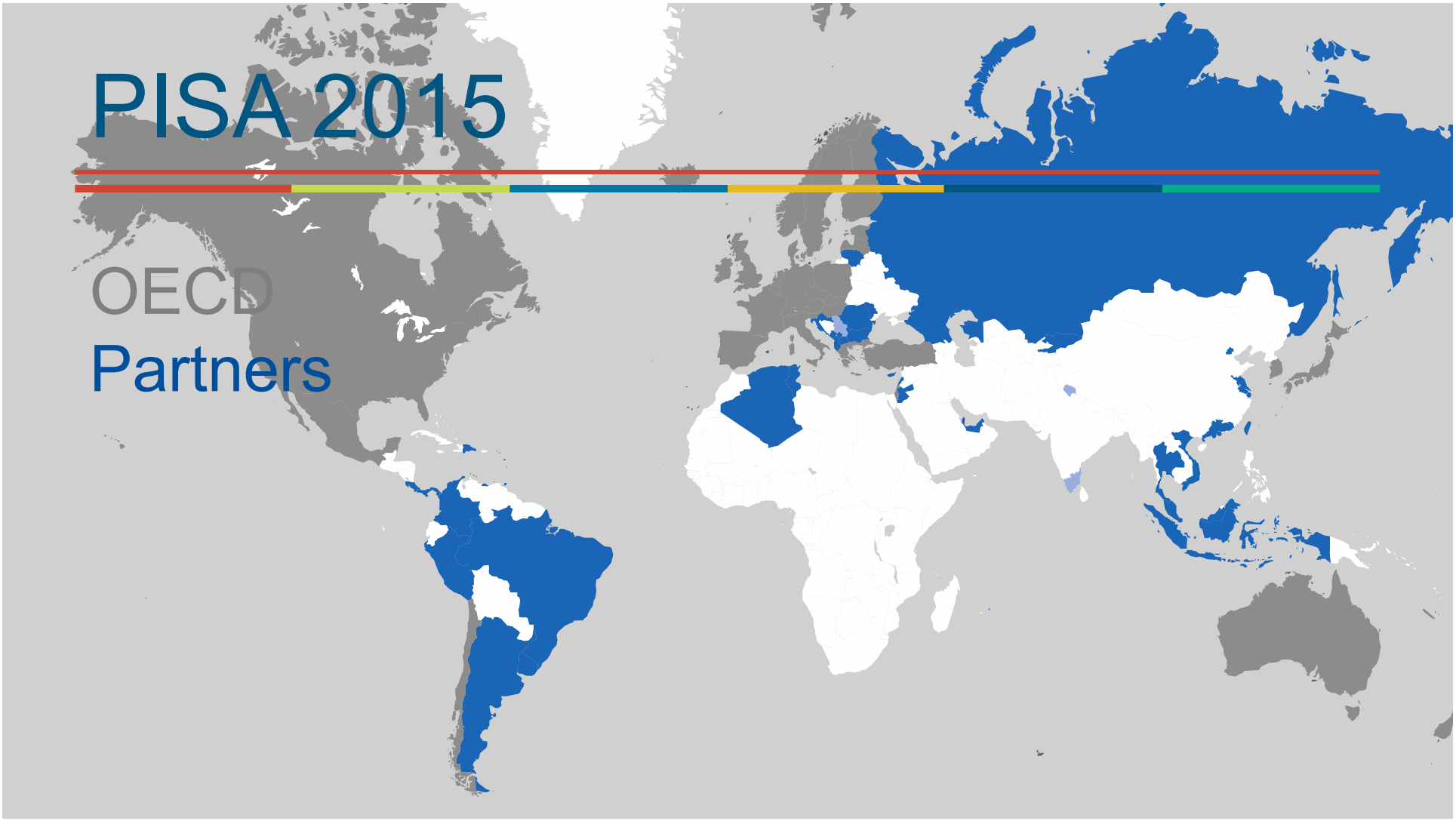
- Goes beyond testing whether students can reproduce what they were taught to assess students' capacity to extrapolate from what they know and creatively apply their knowledge in novel situations
- Total of 390 minutes of assessment material

**… and responded to questions on…**

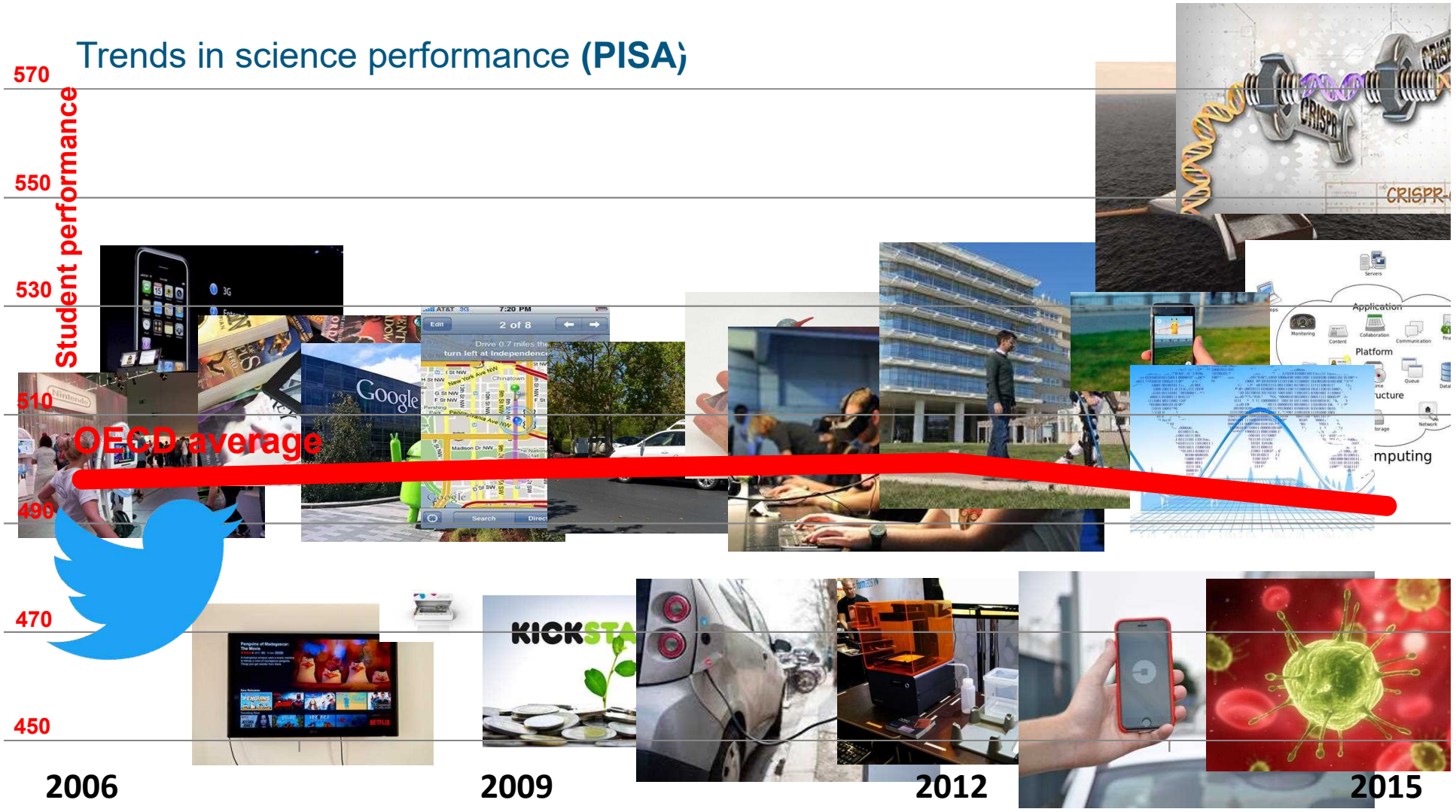
- their personal background, their schools, their well-being and their motivation

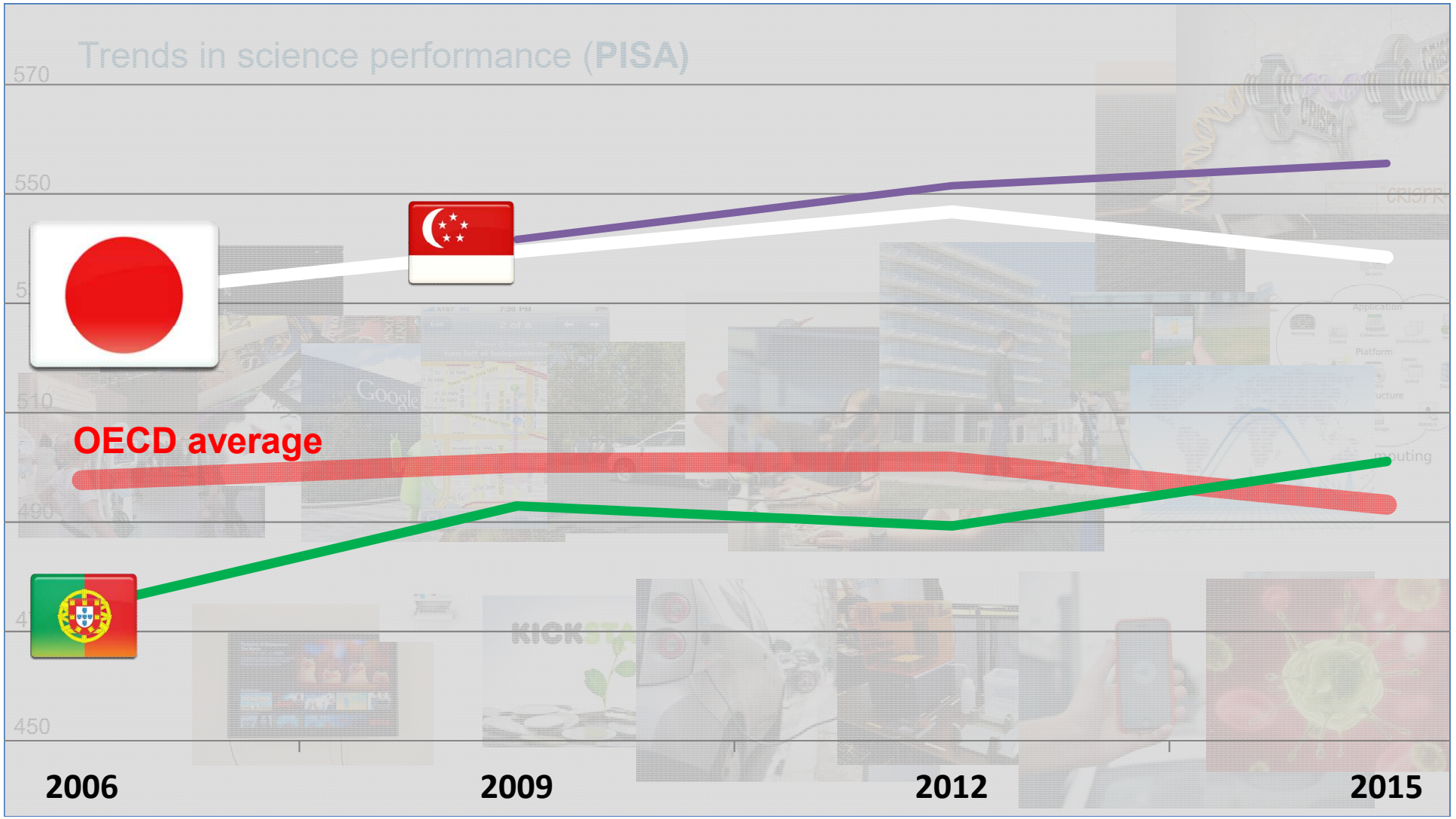
**Parents, principals, teachers and system leaders provided data on:**

- school policies, practices, resources and institutional factors that help explain performance differences
- 89,000 parents, 93,000 teachers and 17,500 principals responded


PISA 2015
OECD
Partners

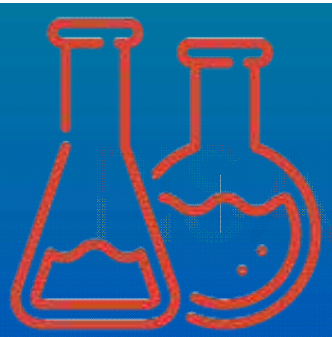
# Trends in science performance (PISA)




Trends in science performance (PISA)
570
550
510
490
450
OECD average
2006
2009
2012
2015

# Science in PISA

"the ability to engage with science-related issues, and with the ideas of science, as a reflective citizen"



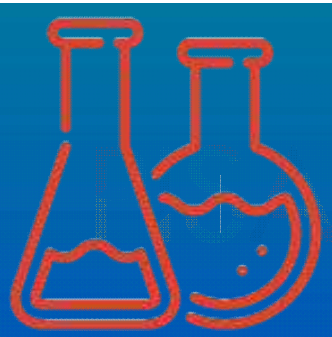
## Competencies

- 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

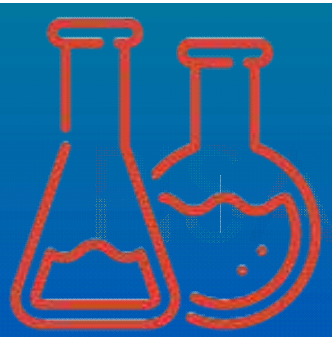
- Explain phenomena scientifically
- Evaluate and design scientific enquiry
- Interpret data and evidence scientifically

## 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
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## Attitudes

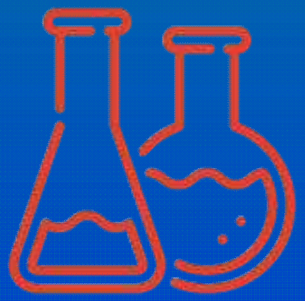
- Attitudes to science
- Scientific attitudes

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)

## Context

- Personal, local, global
- Current and historical



## Competencies

- Explain phenomena scientifically
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## Knowledge

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- Knowledge of methodological procedures used in science
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## Attitudes

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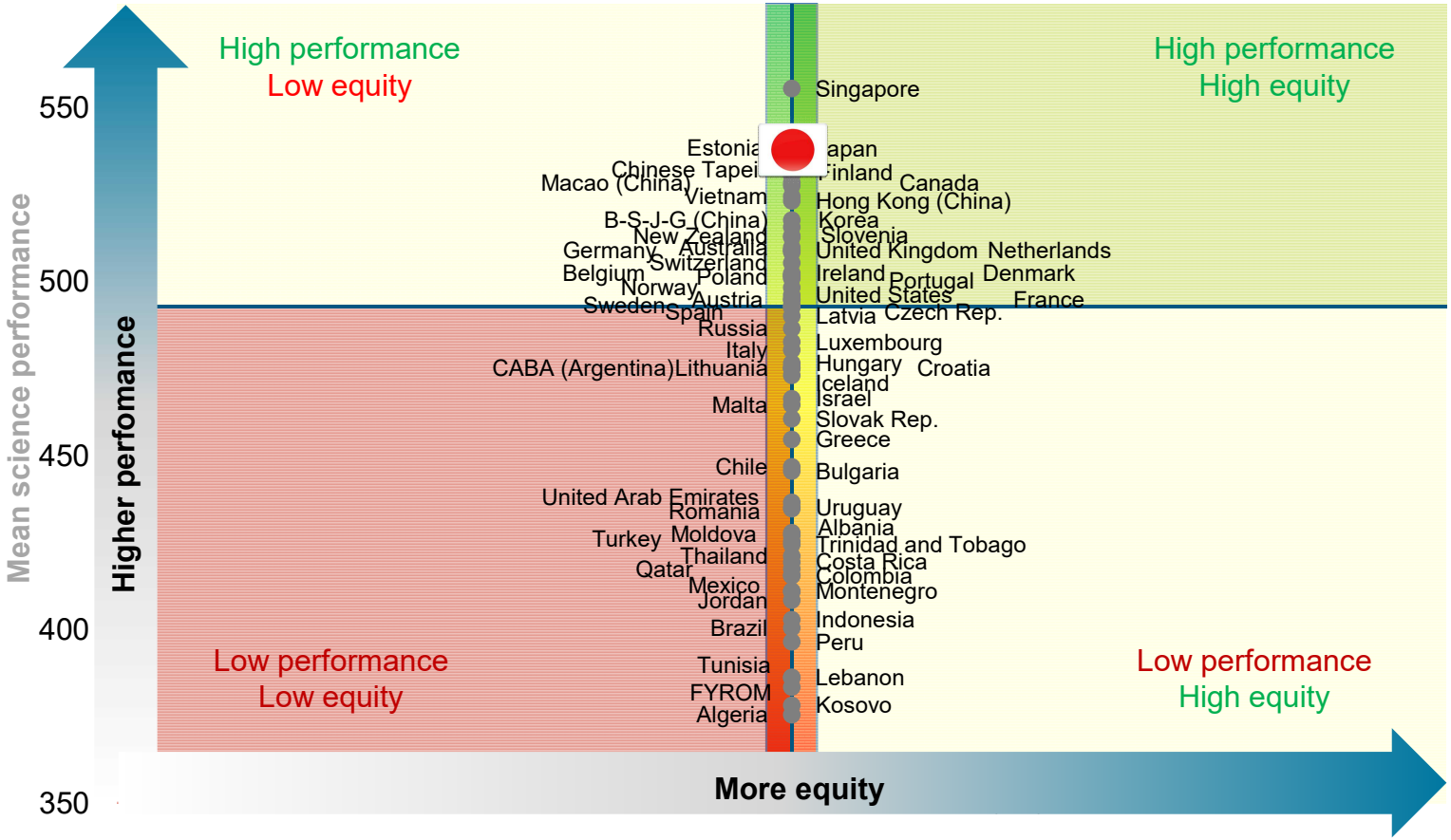
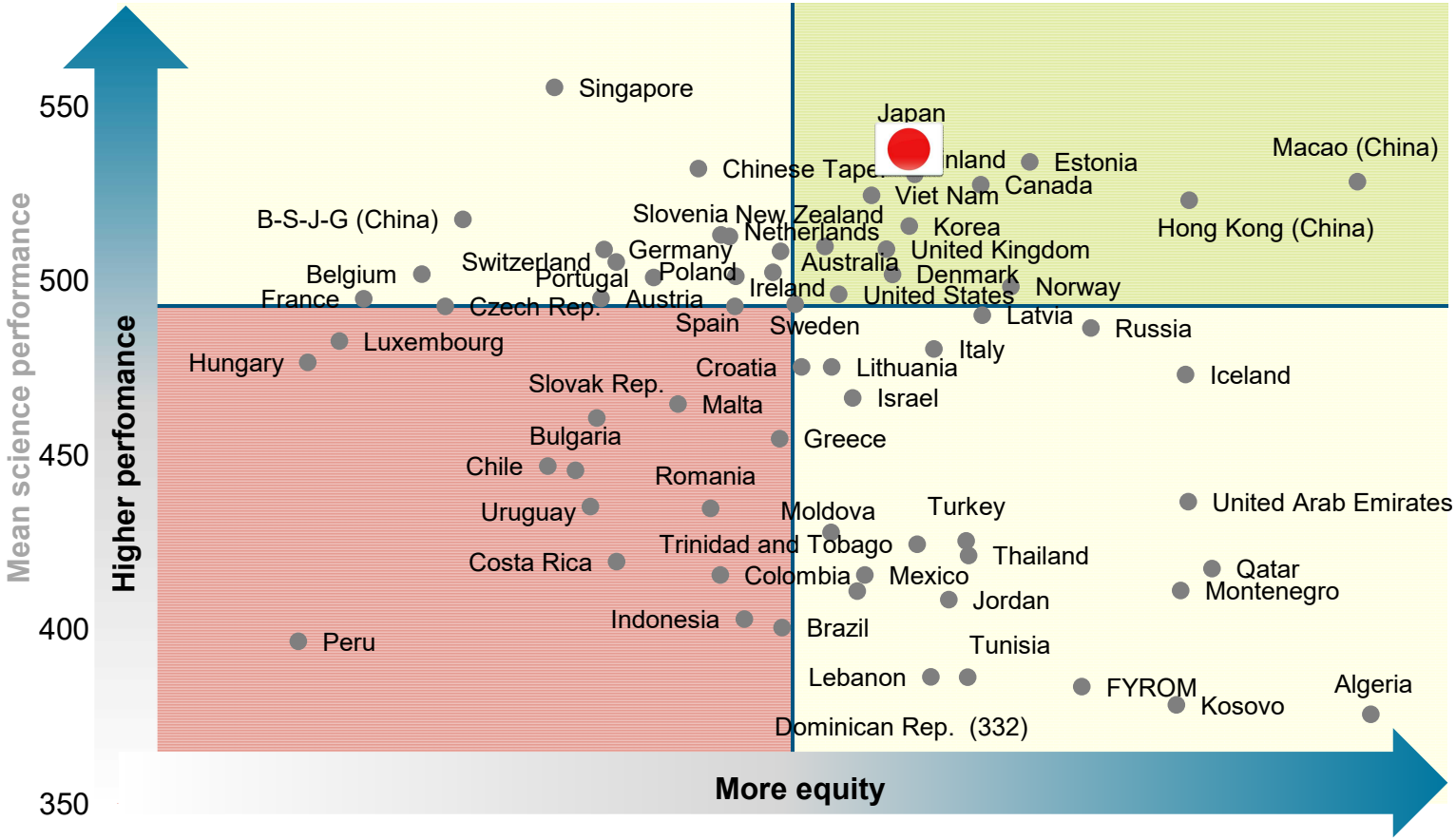
Personal, local/national and global issues, both current and historical, which demand some understanding of science and technology

# Science performance in PISA (2015)



# Science performance and equity in PISA (2015)



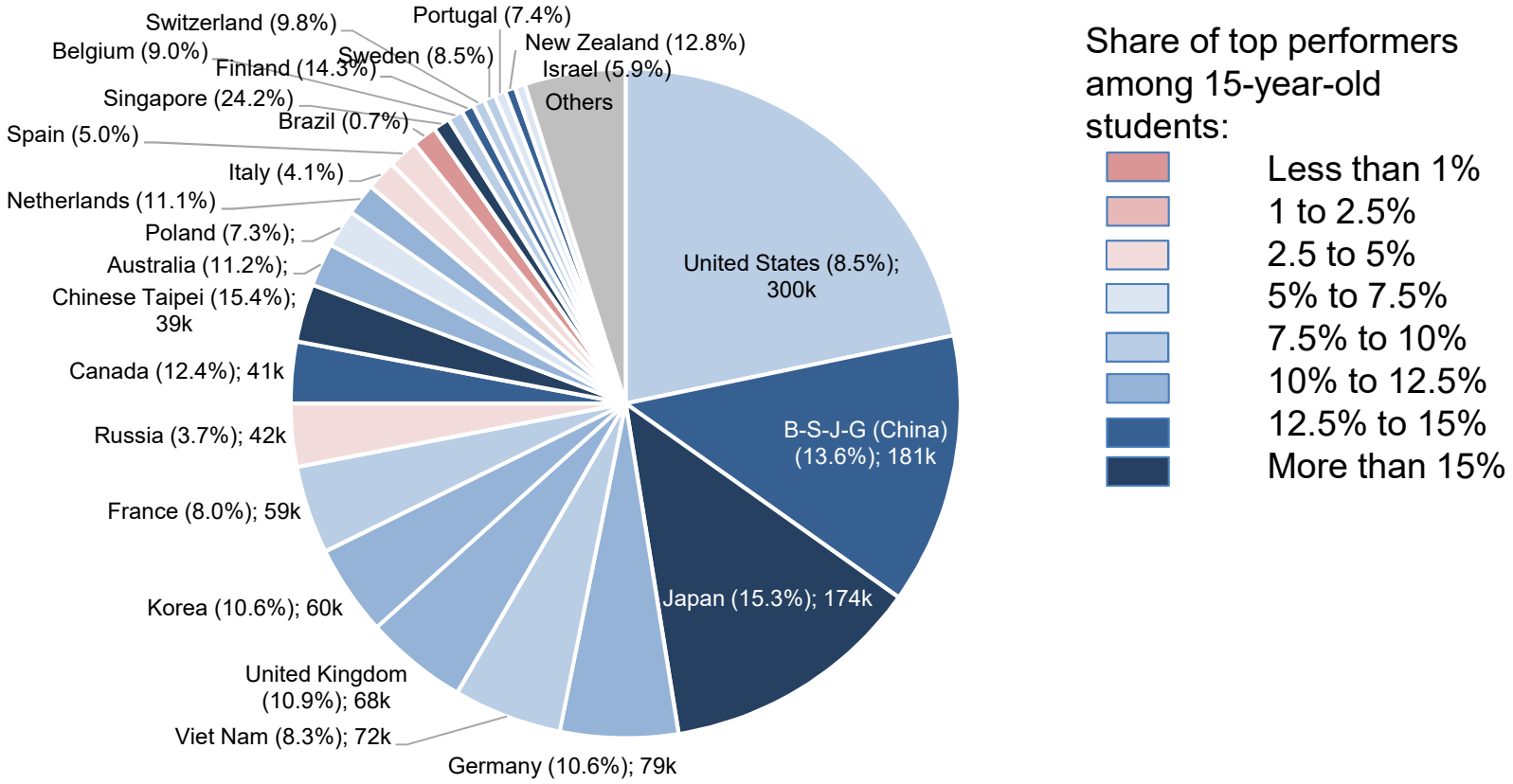

Some countries combine excellence with equity

# Top performers

Students who can develop and work with models for complex science situations, identifying constraints and specifying assumptions. They can select, compare and evaluate appropriate problem-solving strategies for dealing with complex problems related to these models.

Figure I.2.18

# The global pool of top performers: A PISA perspective



# Science and careers

Figure I.3.5

# Expectations of a science career

## by gender

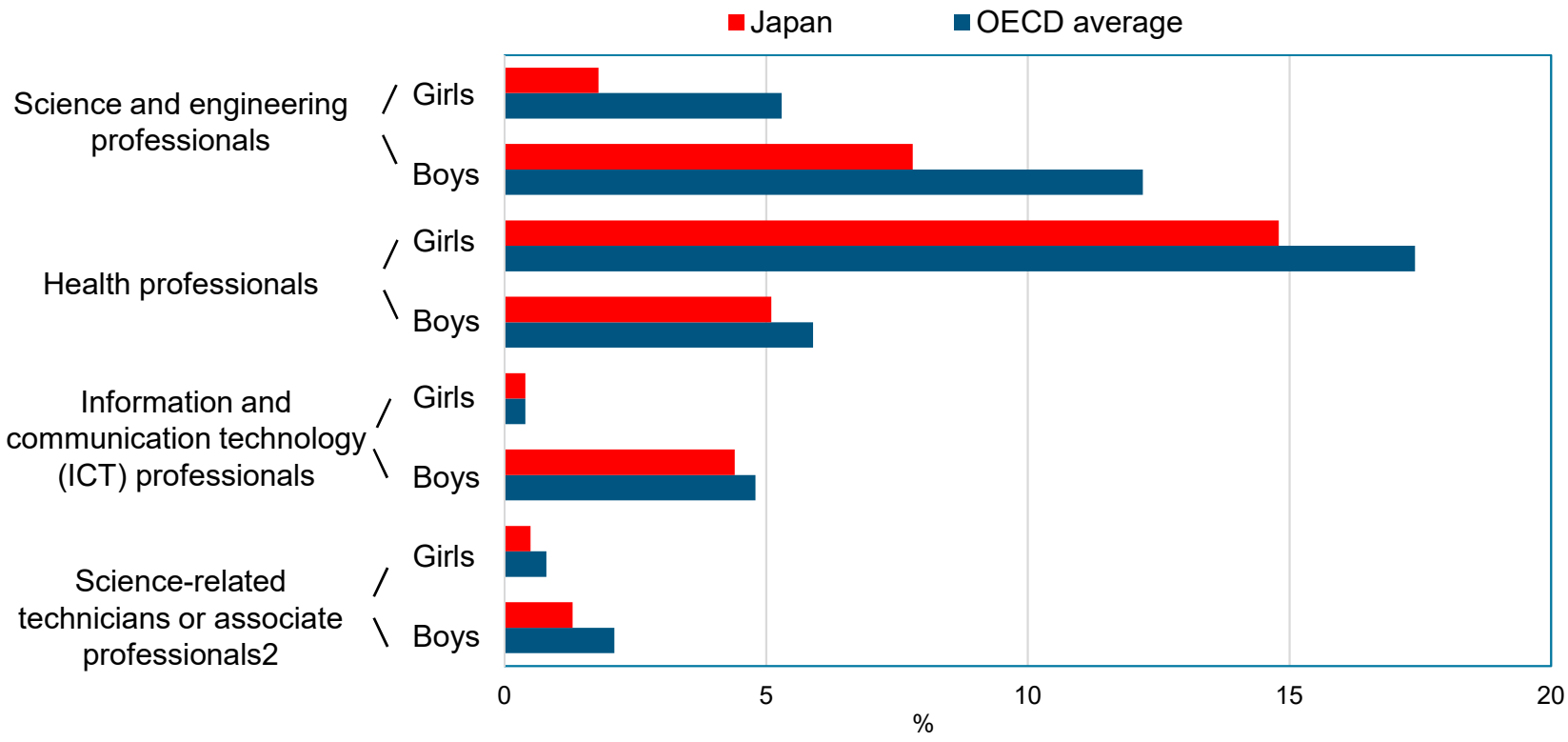
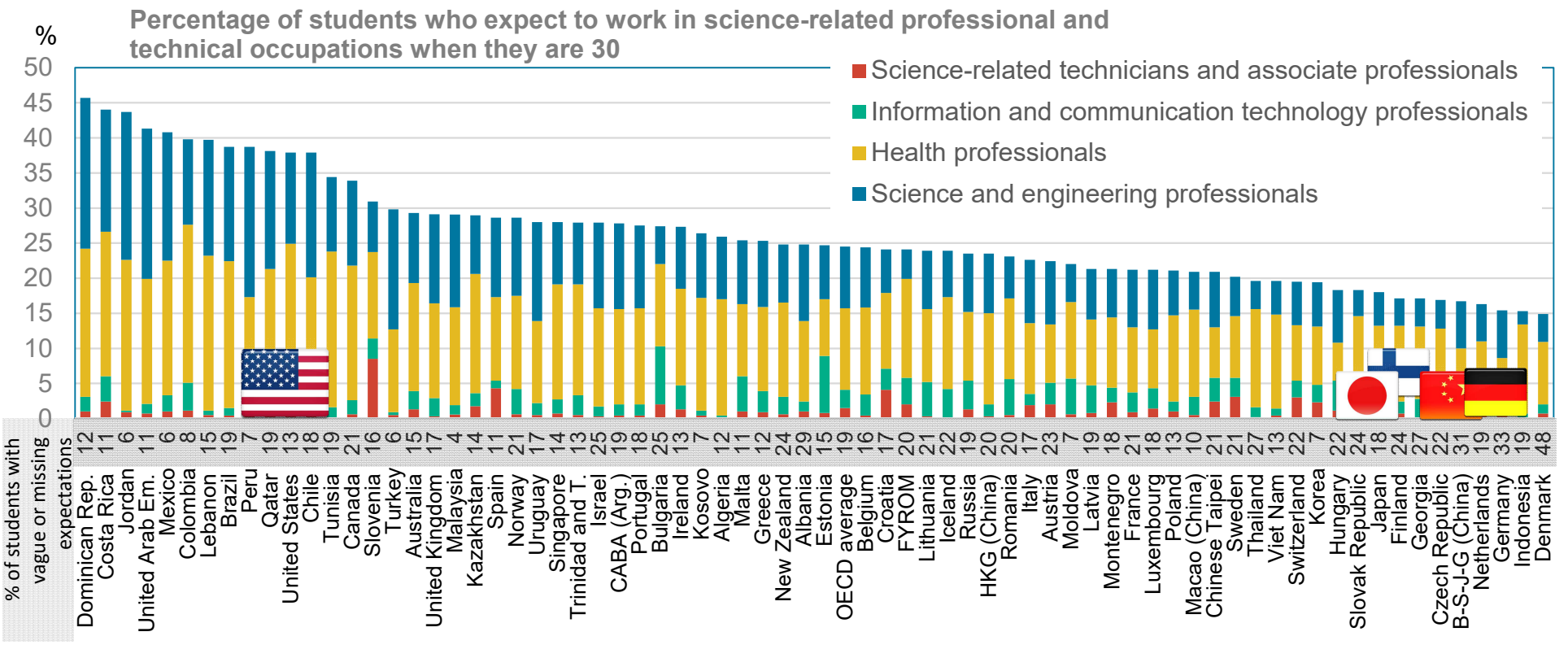


Figure I.3.2

# Students expecting a career in science



Multiple outcomes

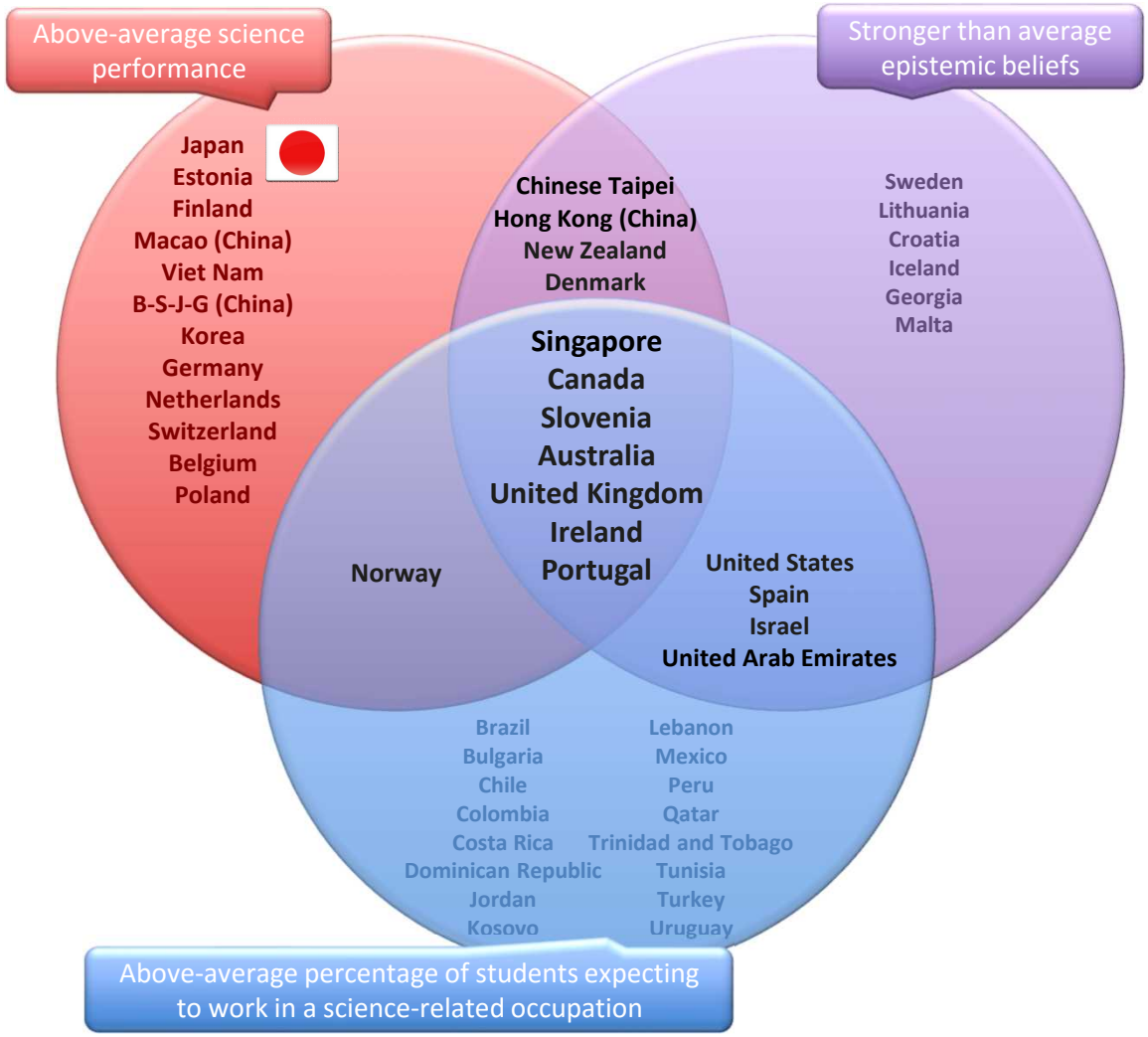


Figure I.3.17

# Students expecting a career in science

## by performance and enjoyment of learning

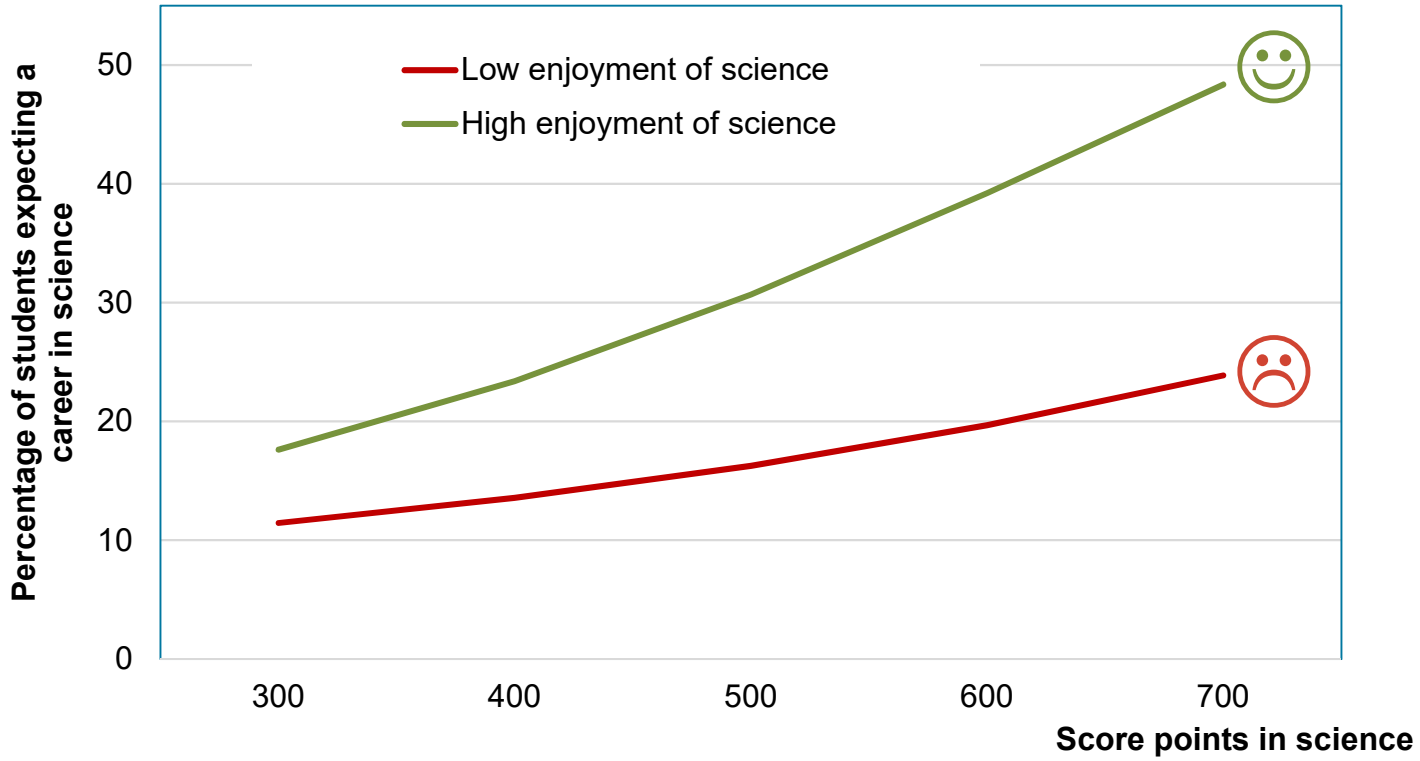
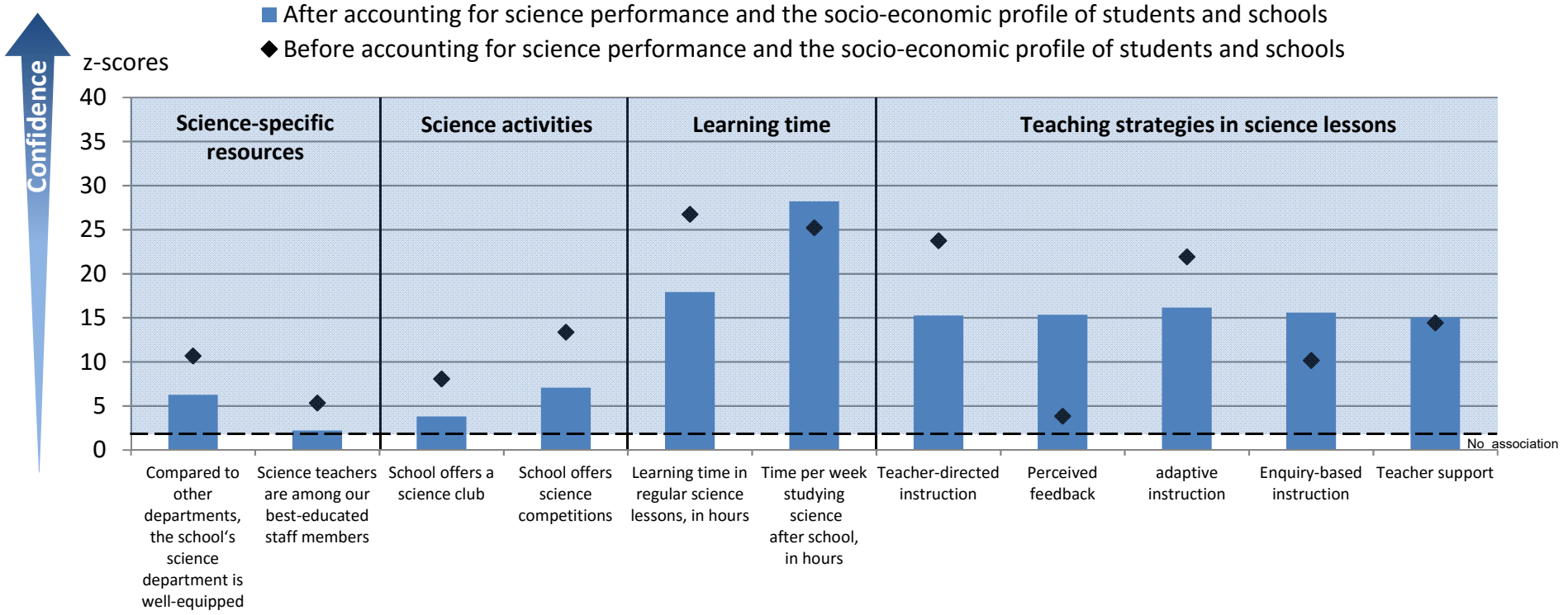


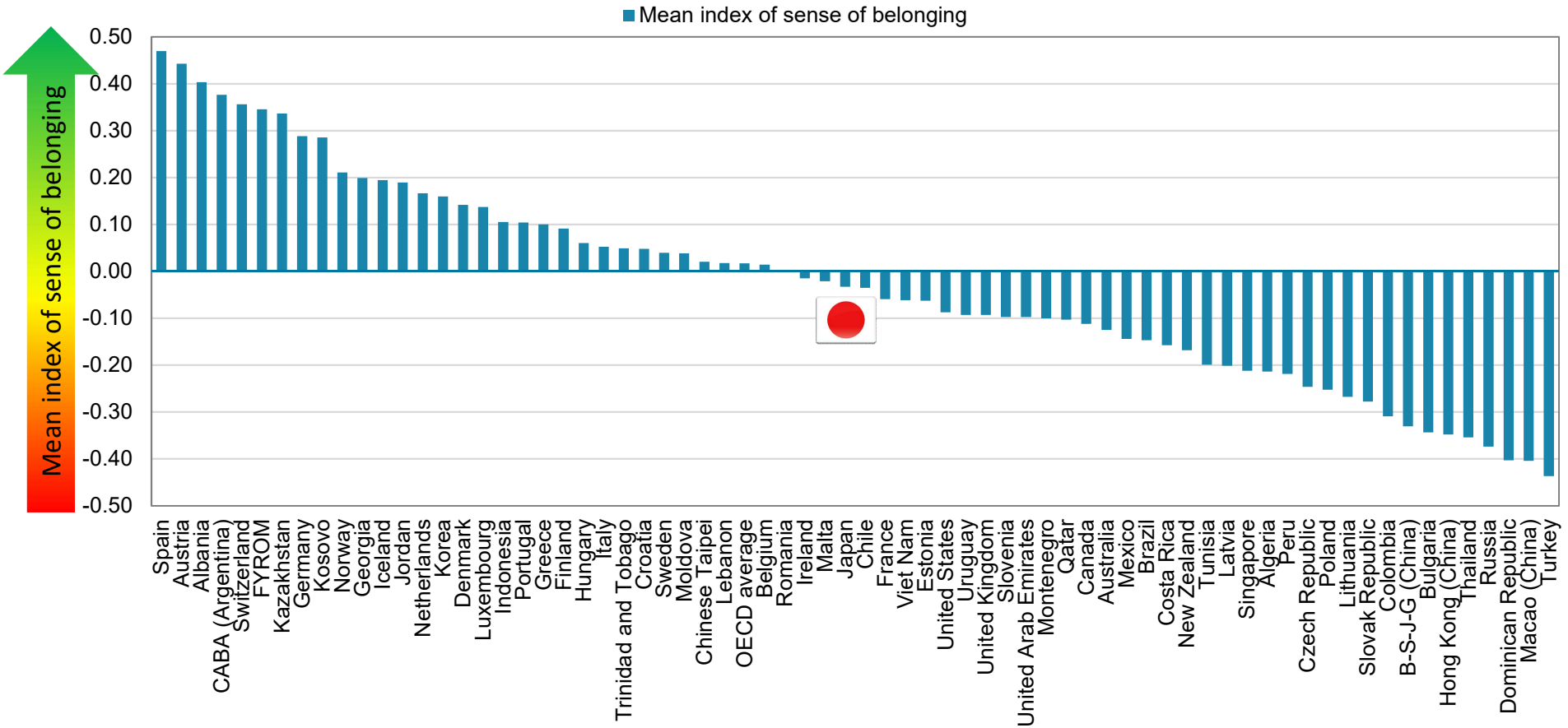
Figure II.2.22

# Explaining students' expectations of a career in science



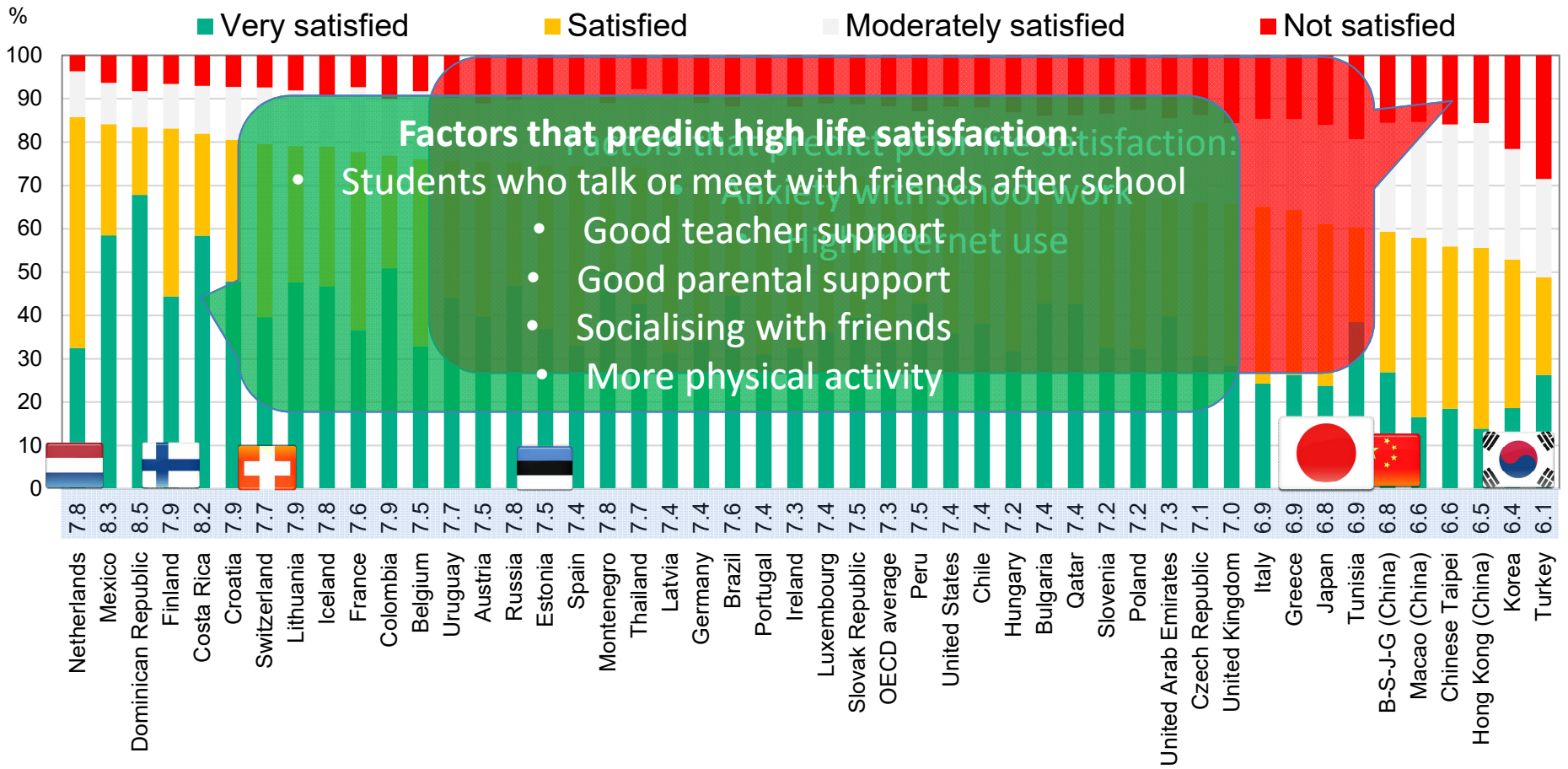
# Student sense of belonging at school

Figure III.7.2



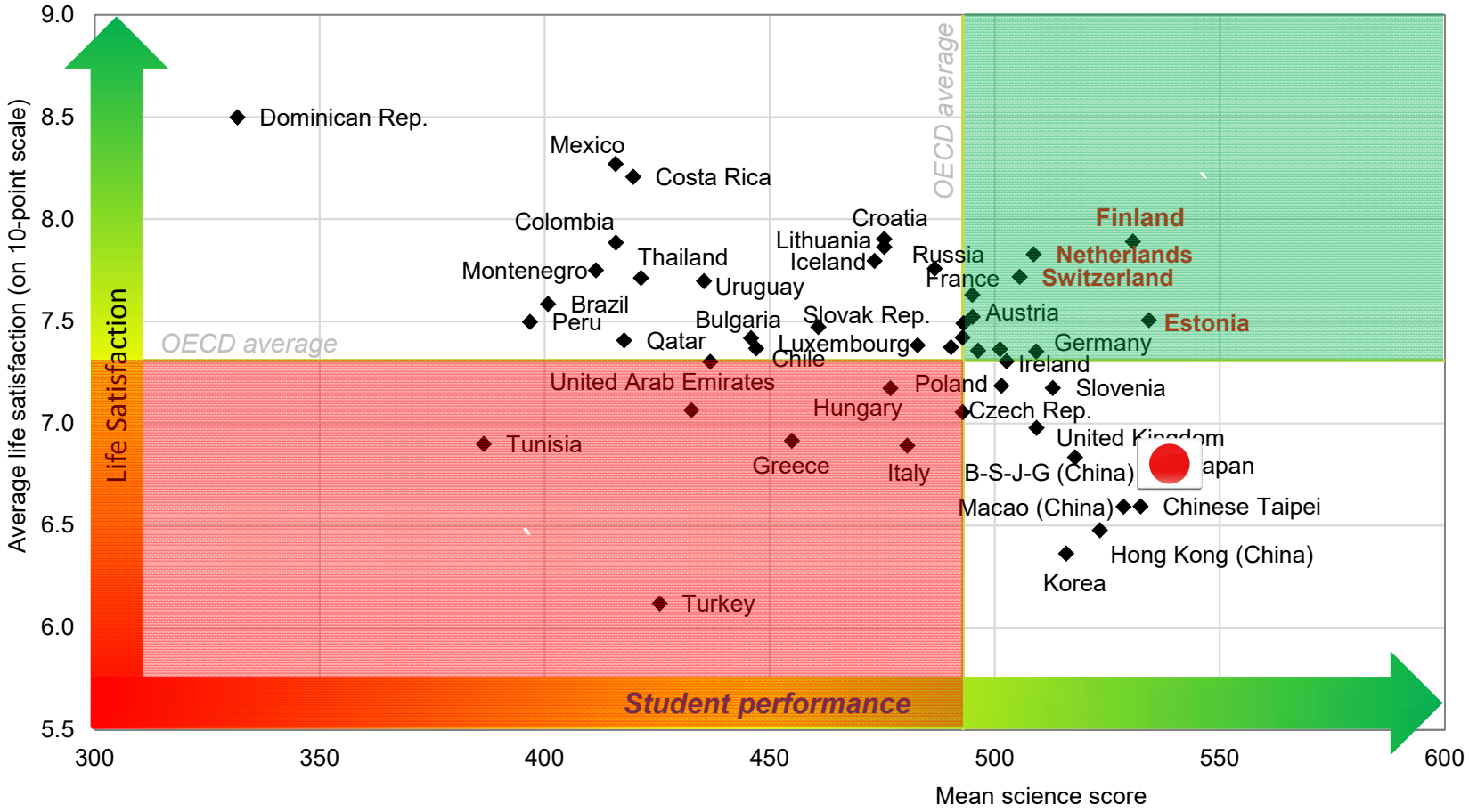
# Life satisfaction among 15-year-old students

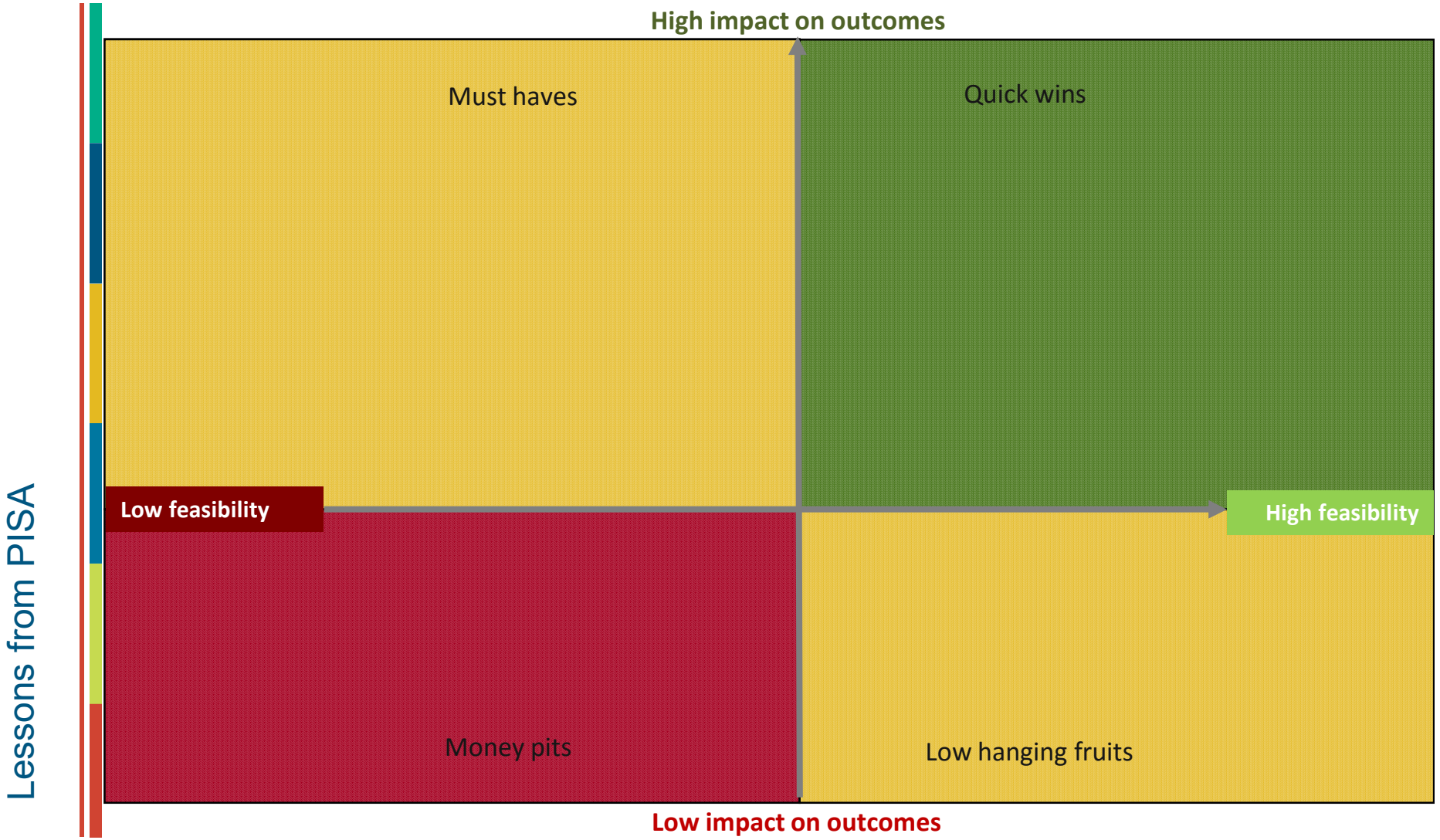
Figure III.3.1

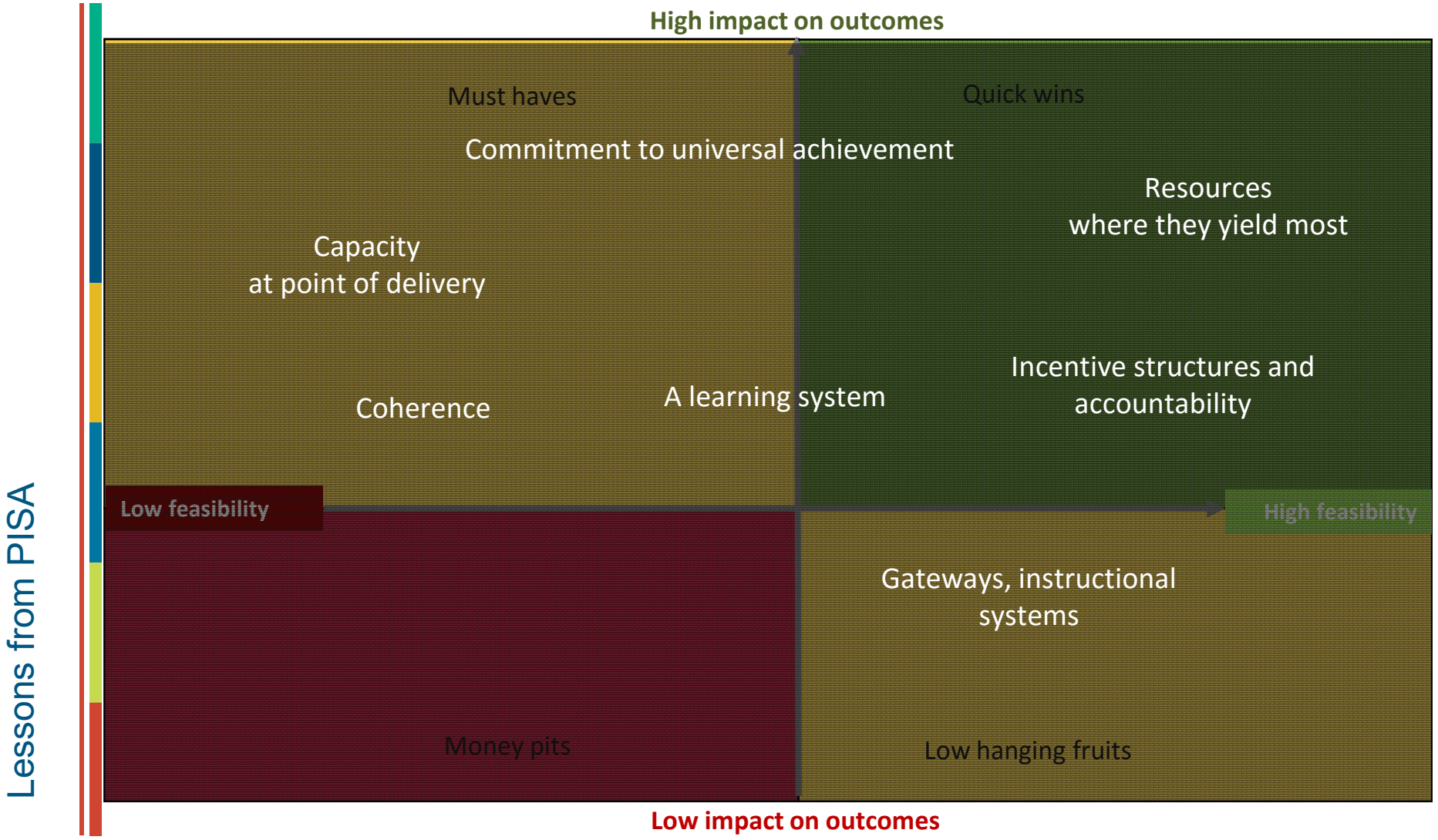


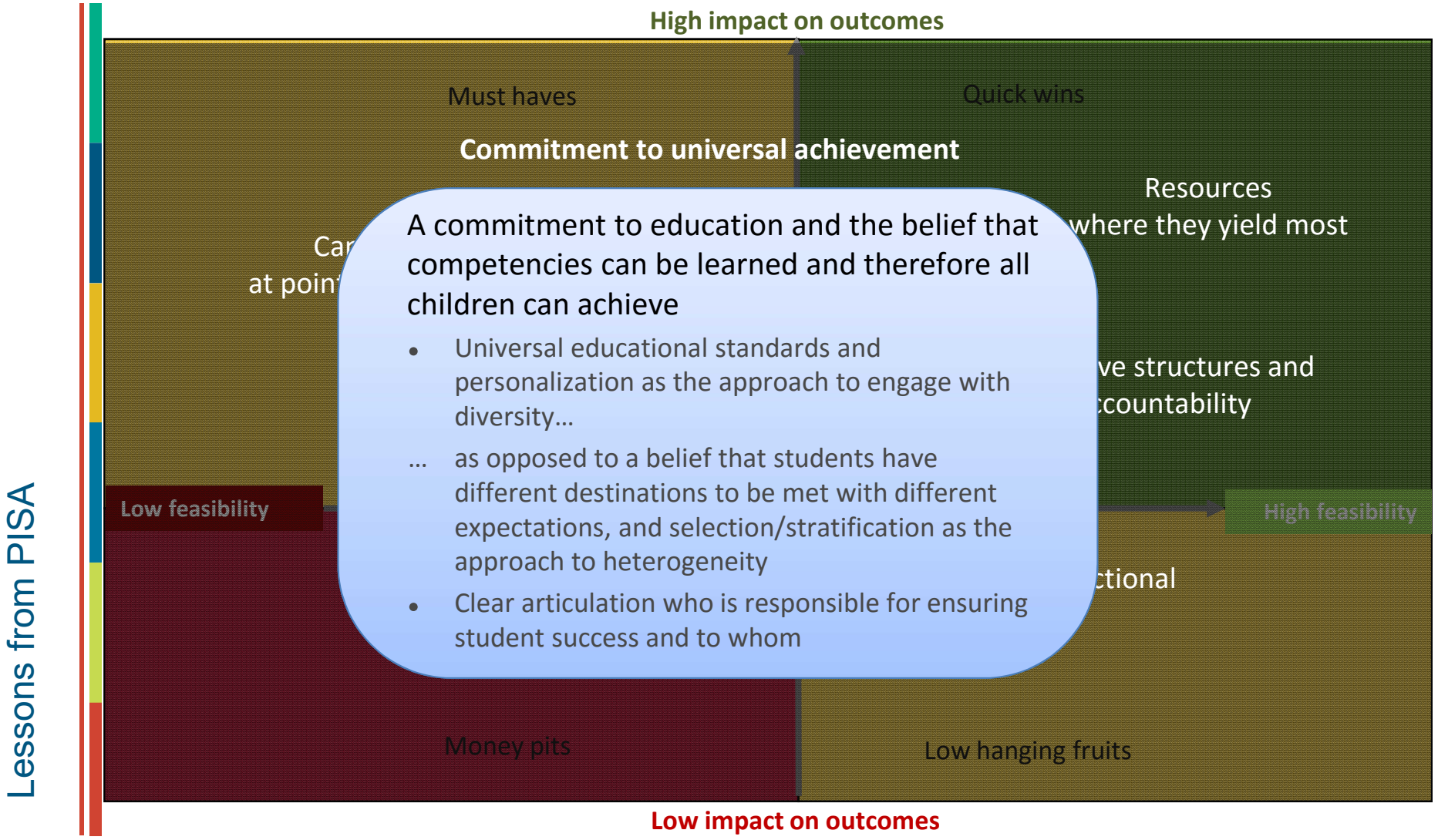
# Life satisfaction and student performance can go together

Figure III.3.3



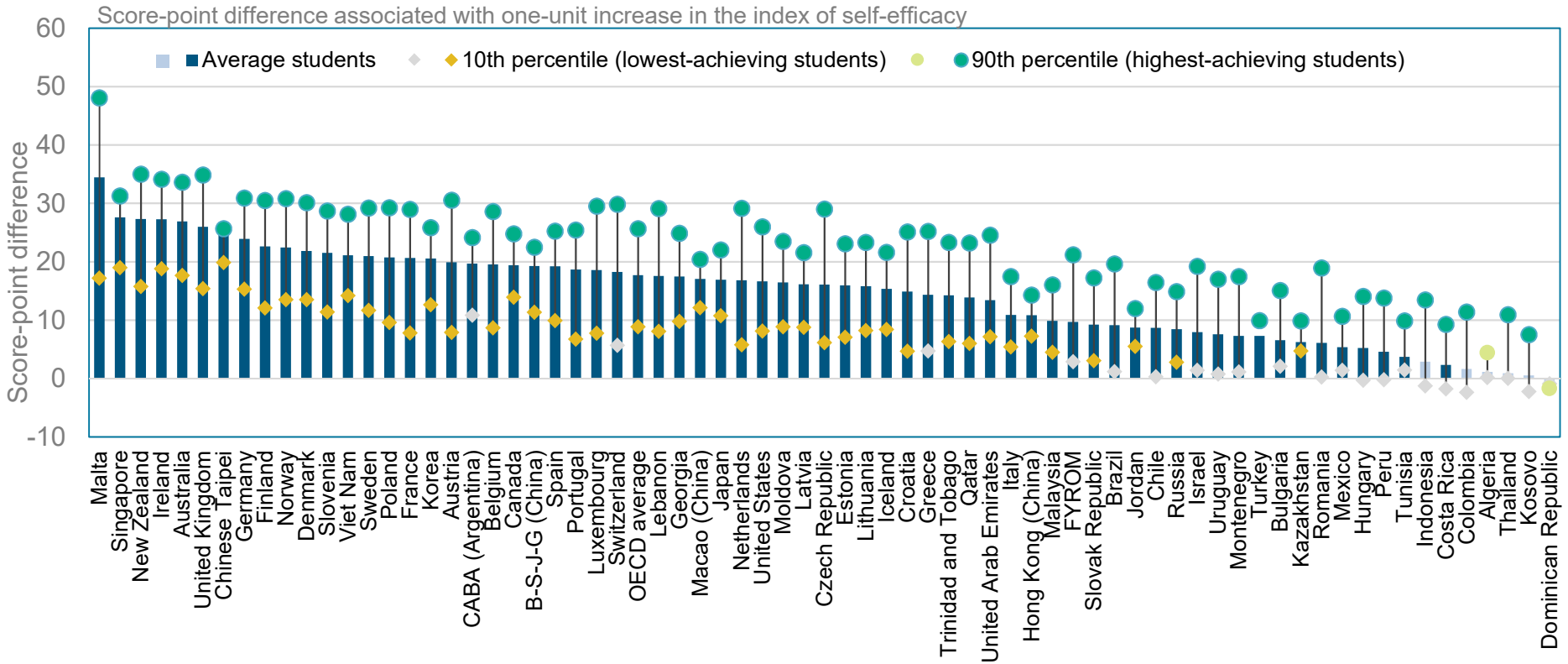

Lessons from PISA
High impact on outcomes
Must haves
Quick wins
Low feasibility
High feasibility
Money pits
Low hanging fruits
Low impact on outcomes

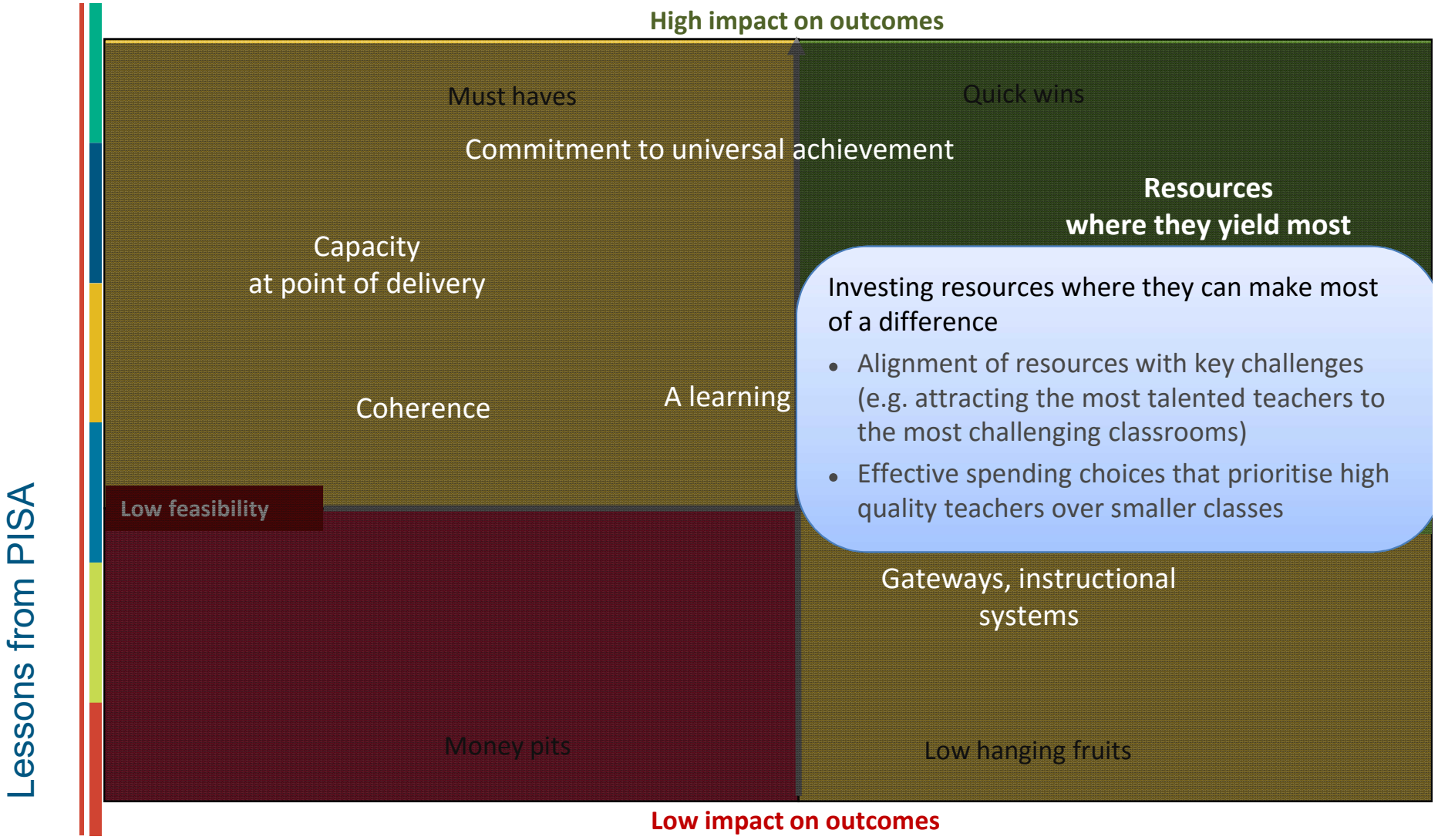

High impact on outcomes
Must haves
Quick wins
Commitment to universal achievement
Resources
where they yield most
Capacity
at point of delivery
Incentive structures and
accountability
Coherence
A learning system
Low feasibility
High feasibility
Gateways, instructional
systems
Money pits
Low hanging fruits
Low impact on outcomes
Lessons from PISA


Lessons from PISA
High impact on outcomes
Must haves
Quick wins
Commitment to universal achievement
Resources
where they yield most
A commitment to education and the belief that competencies can be learned and therefore all children can achieve
• Universal educational standards and personalization as the approach to engage with diversity…
… as opposed to a belief that students have different destinations to be met with different expectations, and selection/stratification as the approach to heterogeneity
• Clear articulation who is responsible for ensuring student success and to whom
Low feasibility
High feasibility
Money pits
Low hanging fruits
Low impact on outcomes

# Students' self-efficacy in science and science performance

Figure I.3.22




High impact on outcomes
Must haves
Quick wins
Commitment to universal achievement
Resources
where they yield most
Capacity
at point of delivery
Investing resources where they can make most of a difference
• Alignment of resources with key challenges (e.g. attracting the most talented teachers to the most challenging classrooms)
• Effective spending choices that prioritise high quality teachers over smaller classes
Coherence
A learning
Low feasibility
Gateways, instructional systems
Money pits
Low hanging fruits
Low impact on outcomes
Lessons from PISA

# Inequity in opportunity

Resources

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

Figure II.6.2

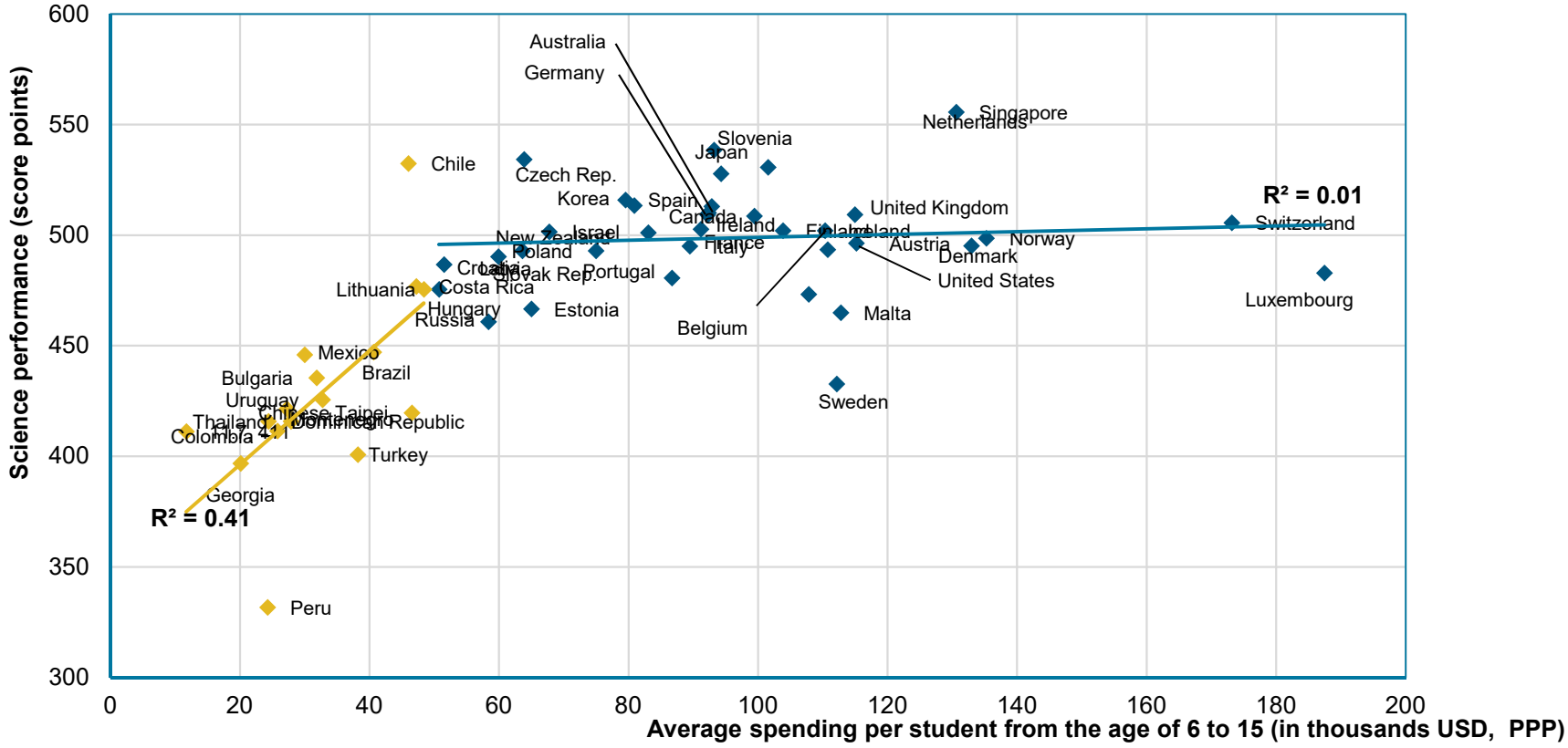
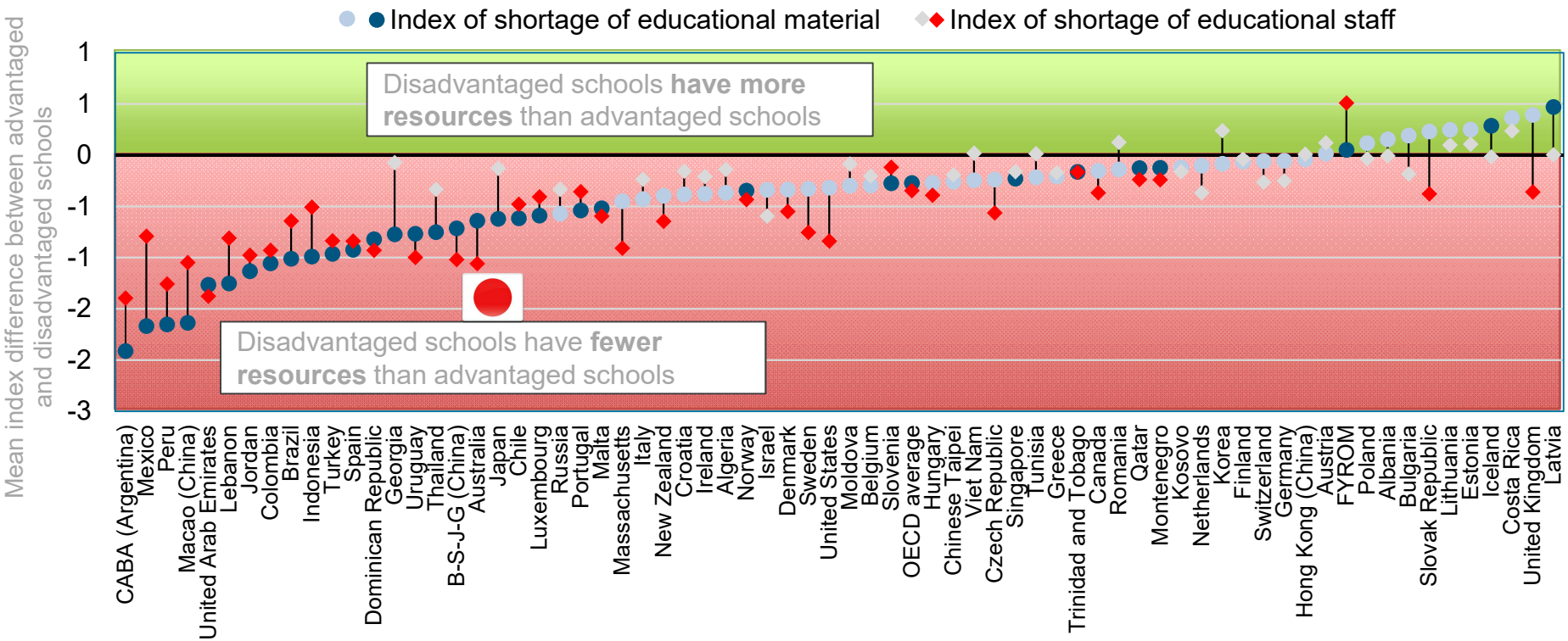


Figure I.6.14

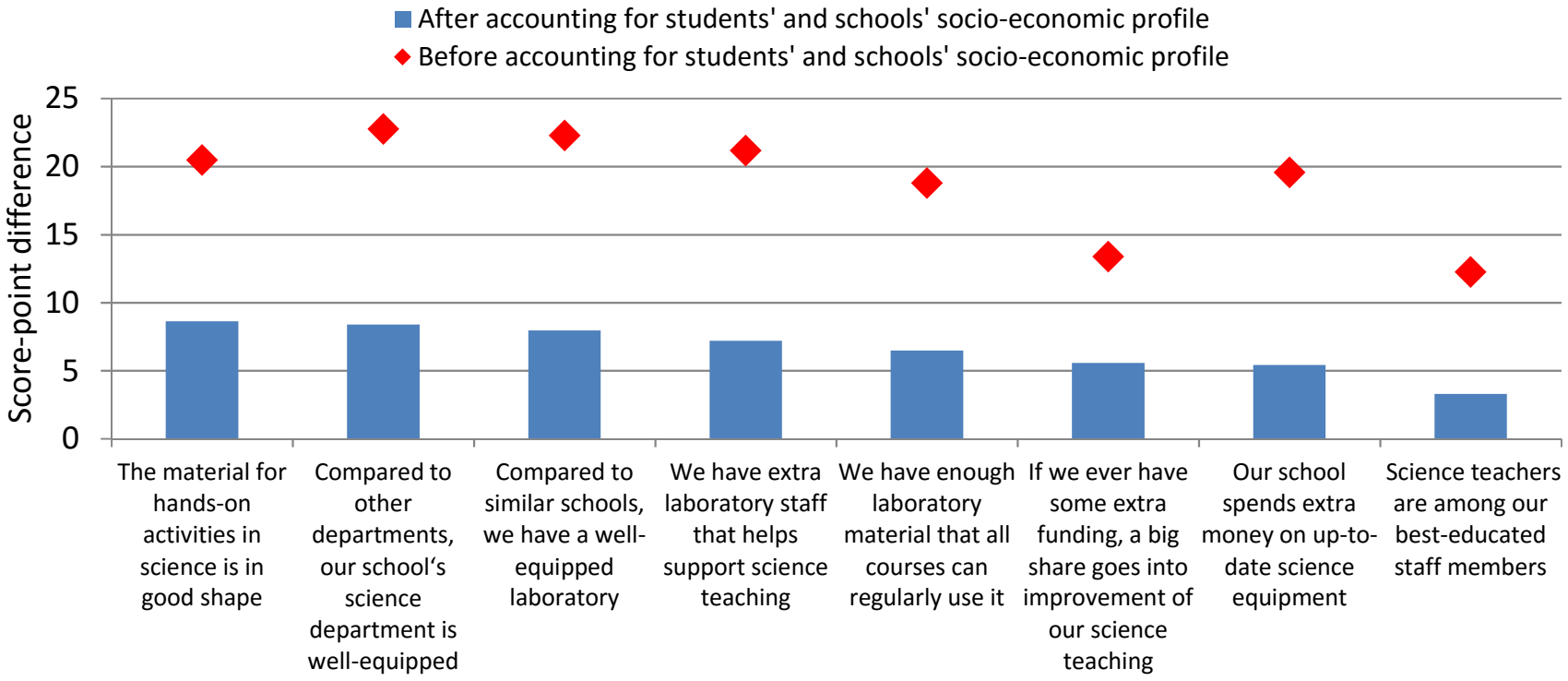
# Differences in educational resources

## between advantaged and disadvantaged schools



# Science-specific resources at school and science performance

Figure II.2.7



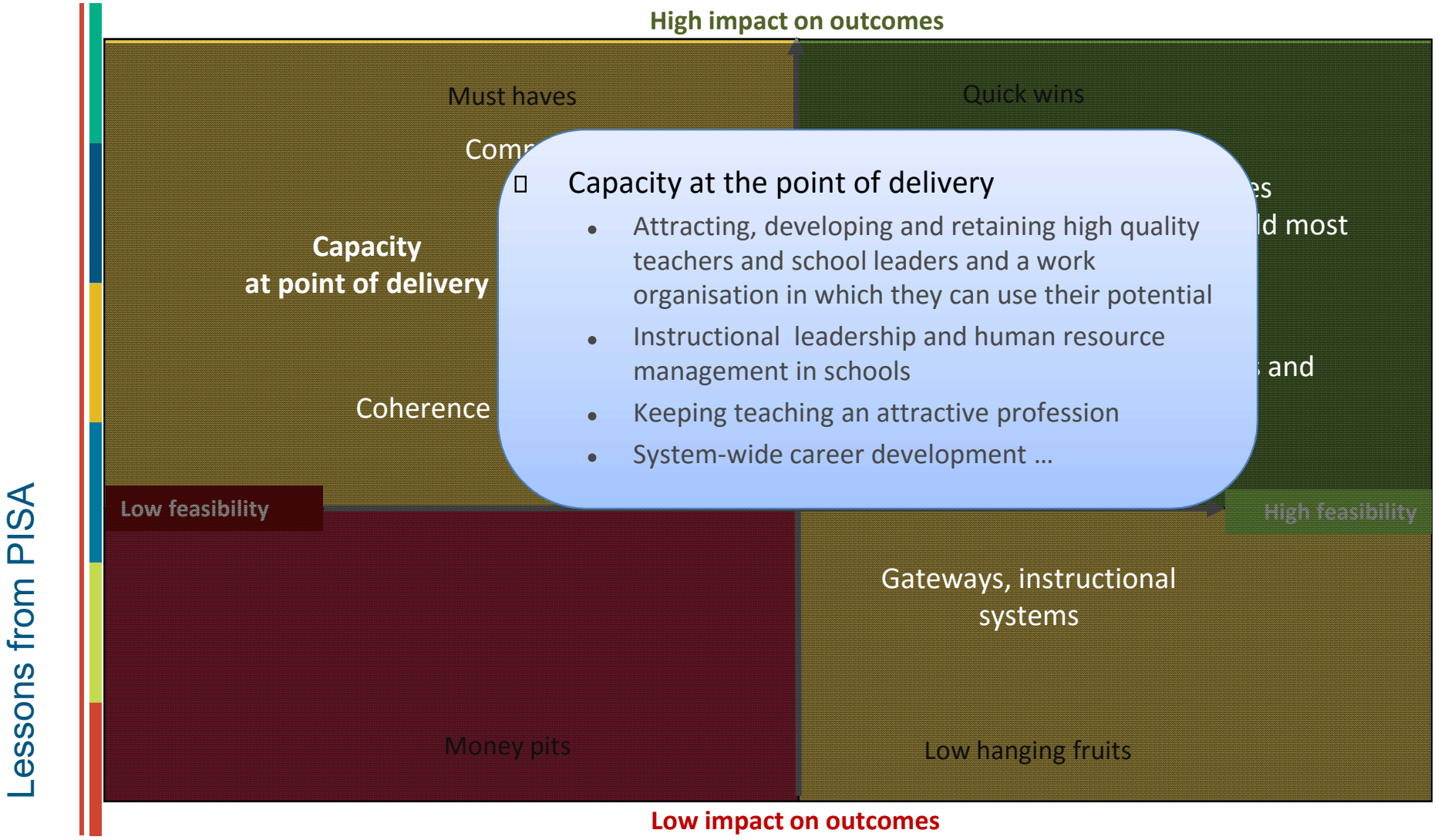
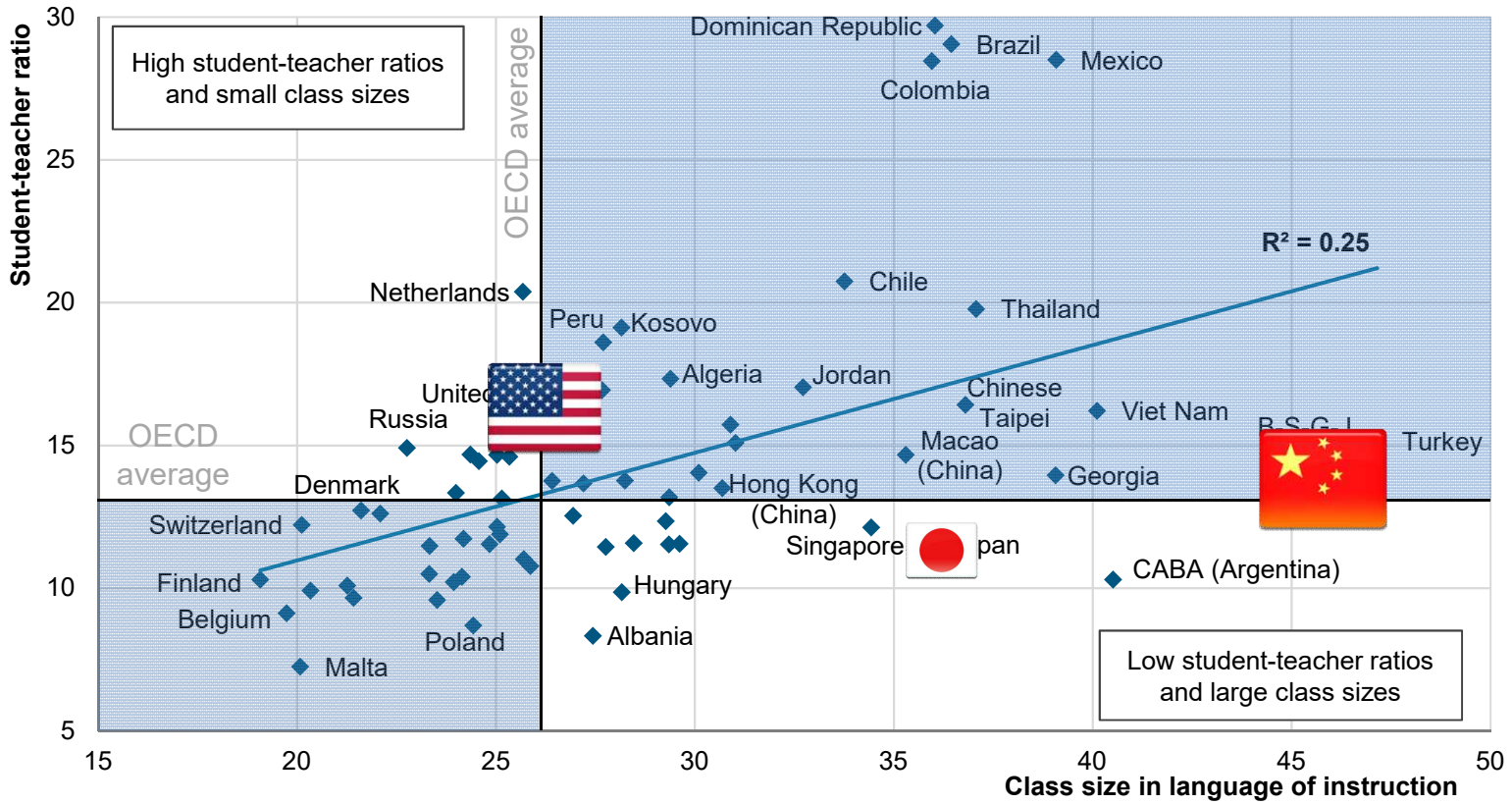

High impact on outcomes
Must haves
Quick wins
Capacity
at point of delivery
Coherence
Capacity at the point of delivery
Attracting, developing and retaining high quality teachers and school leaders and a work organisation in which they can use their potential
Instructional leadership and human resource management in schools
Keeping teaching an attractive profession
System-wide career development …
Low feasibility
High feasibility
Gateways, instructional systems
Money pits
Low hanging fruits
Low impact on outcomes
Lessons from PISA

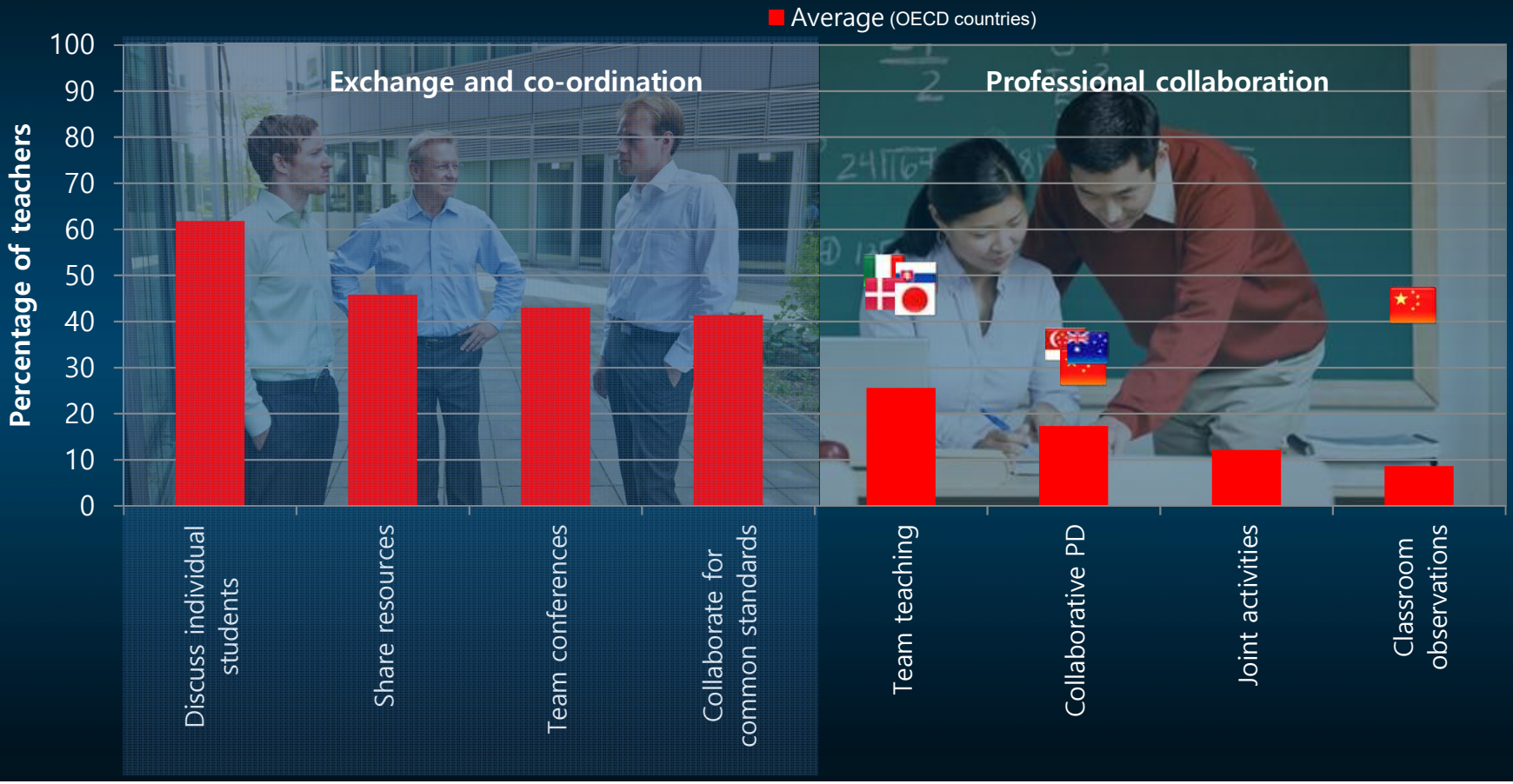
Figure II.6.14

# Student-teacher ratios and class size

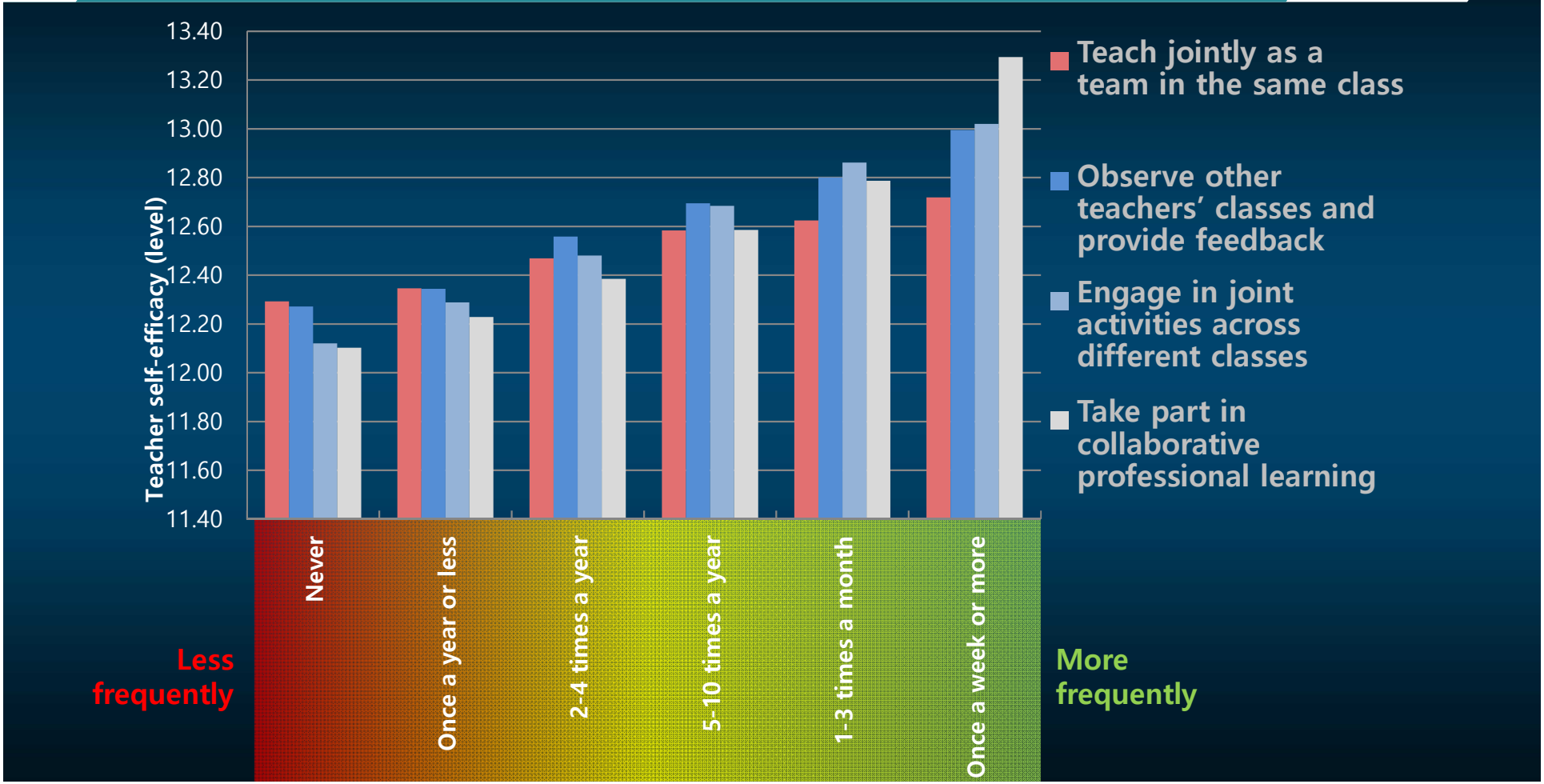


# Professional collaboration among teachers

Percentage of lower secondary teachers who report doing the following activities at least once per month

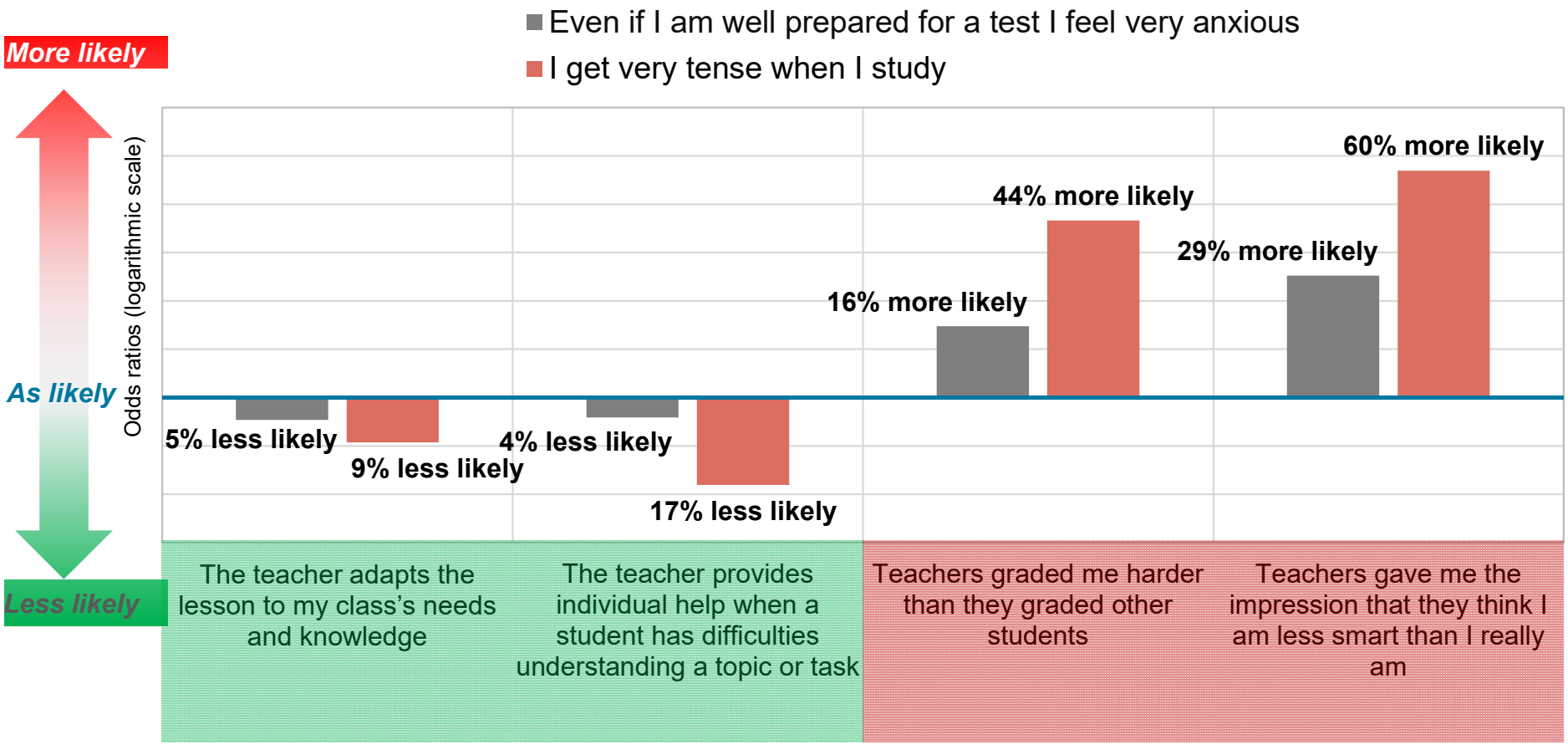


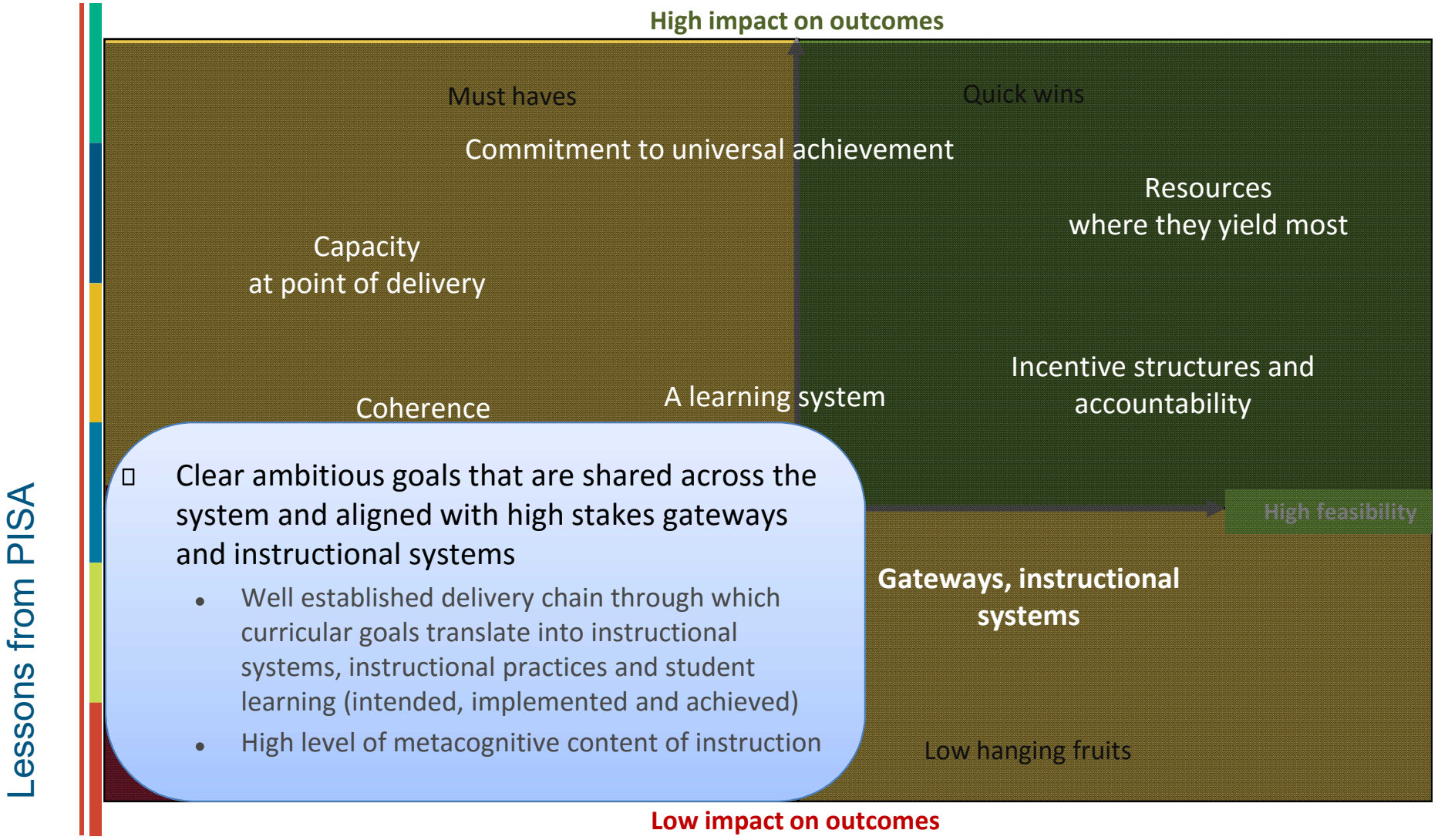
## Teachers Self-Efficacy and Professional Collaboration



# More teacher support and less anxiety

*Figure III.4.5*

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Resources
where they yield most
Capacity
at point of delivery
Incentive structures and
accountability
Coherence
A learning system
Clear ambitious goals that are shared across the system and aligned with high stakes gateways and instructional systems
Well established delivery chain through which curricular goals translate into instructional systems, instructional practices and student learning (intended, implemented and achieved)
High level of metacognitive content of instruction
High feasibility
Gateways, instructional systems
Low hanging fruits
Low impact on outcomes

# The ‘productivity’ puzzle

Making learning time productive so that students can build their academic, social and emotional skills in a balanced way

Figure II.6.23

# Learning time and science performance

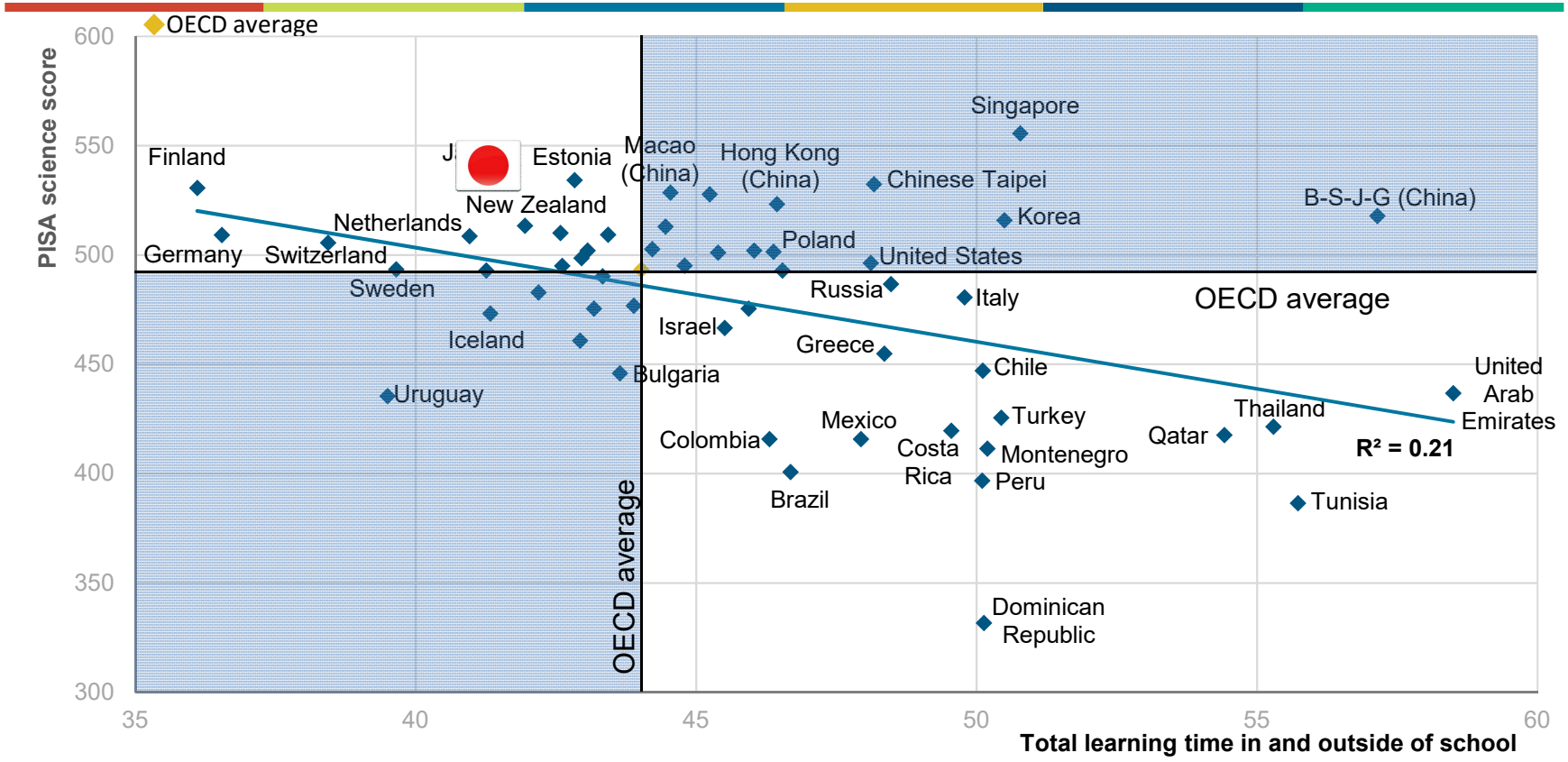
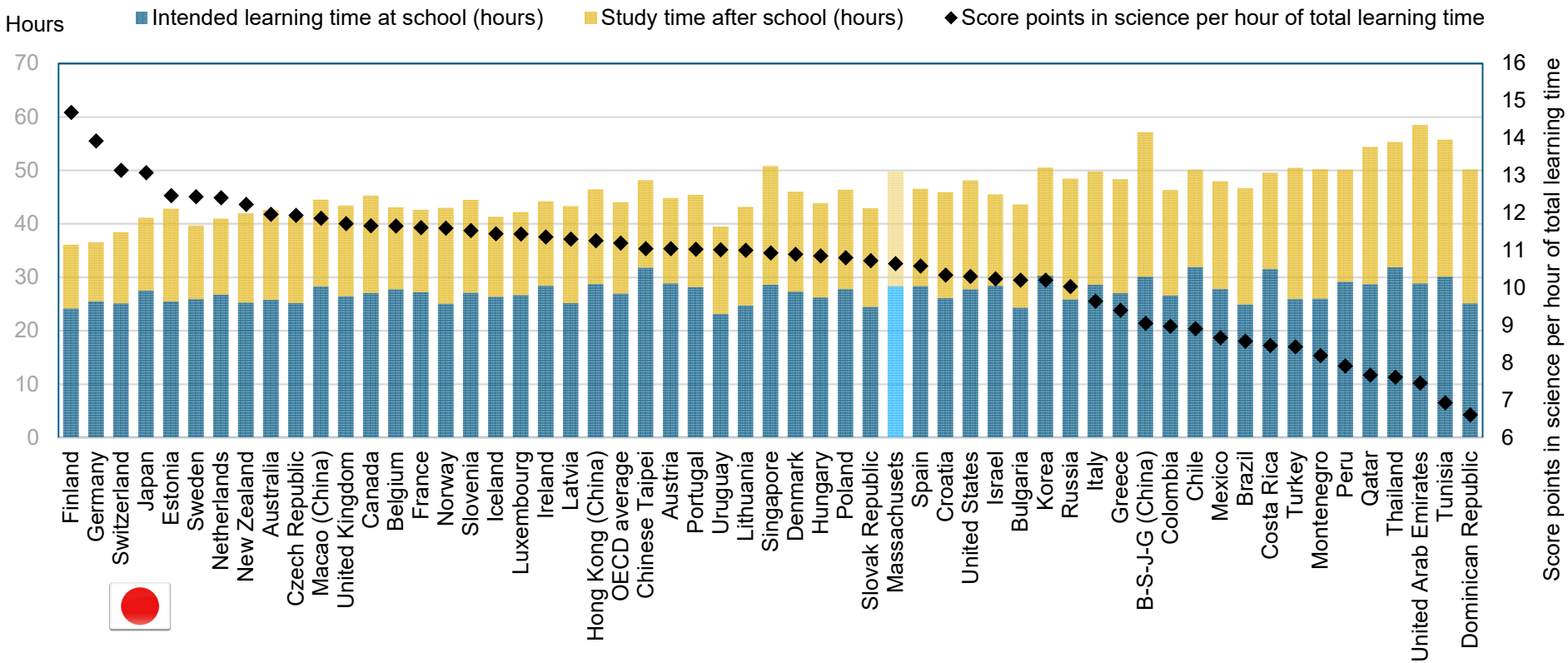
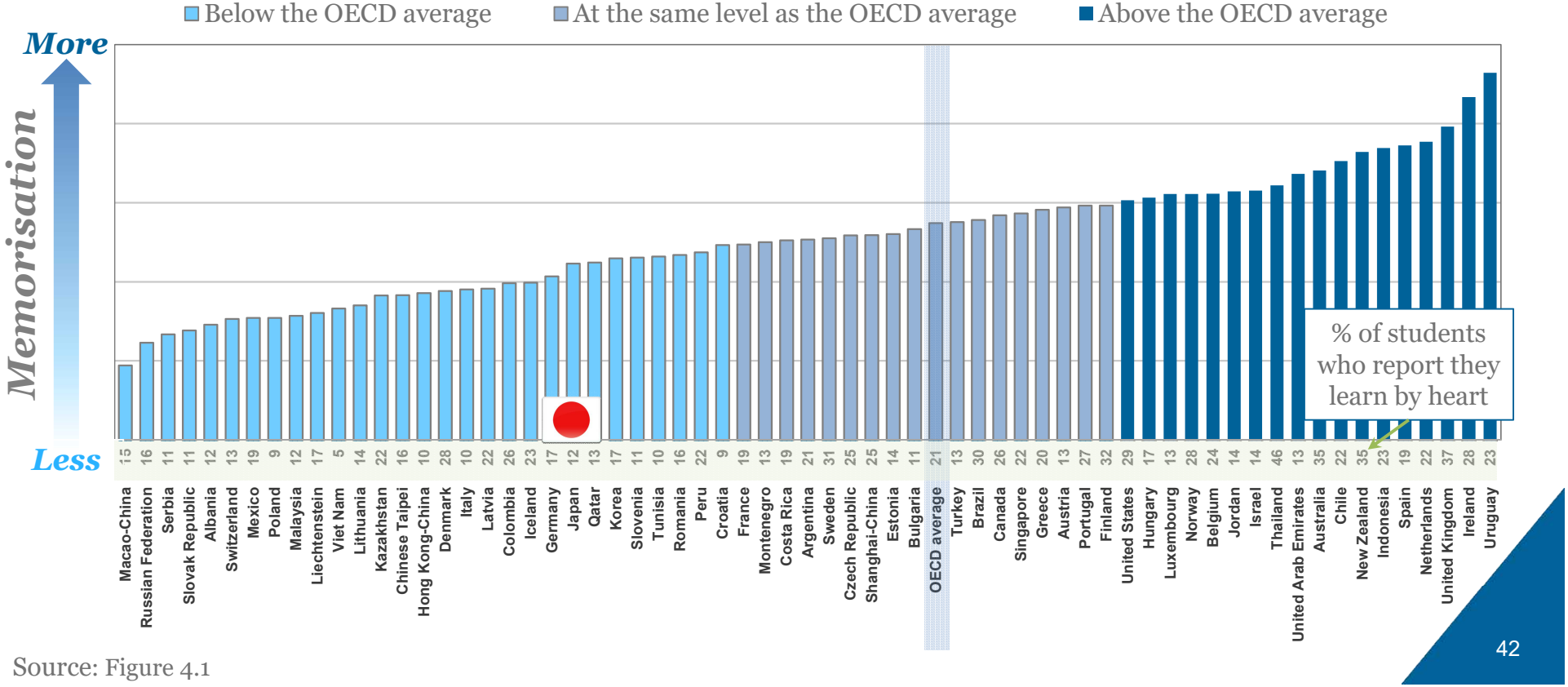


Figure II.6.23

# Learning time and science performance

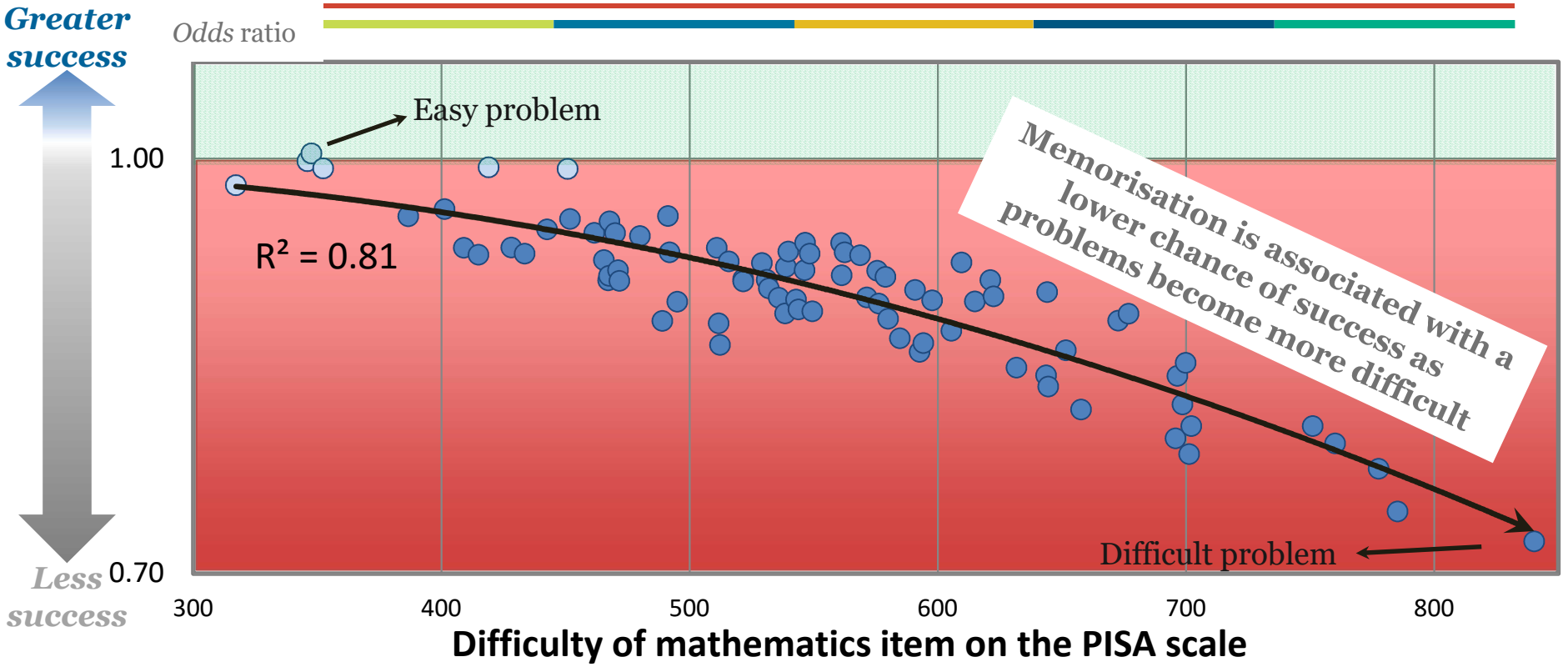


# Students' use of **memorisation strategies**



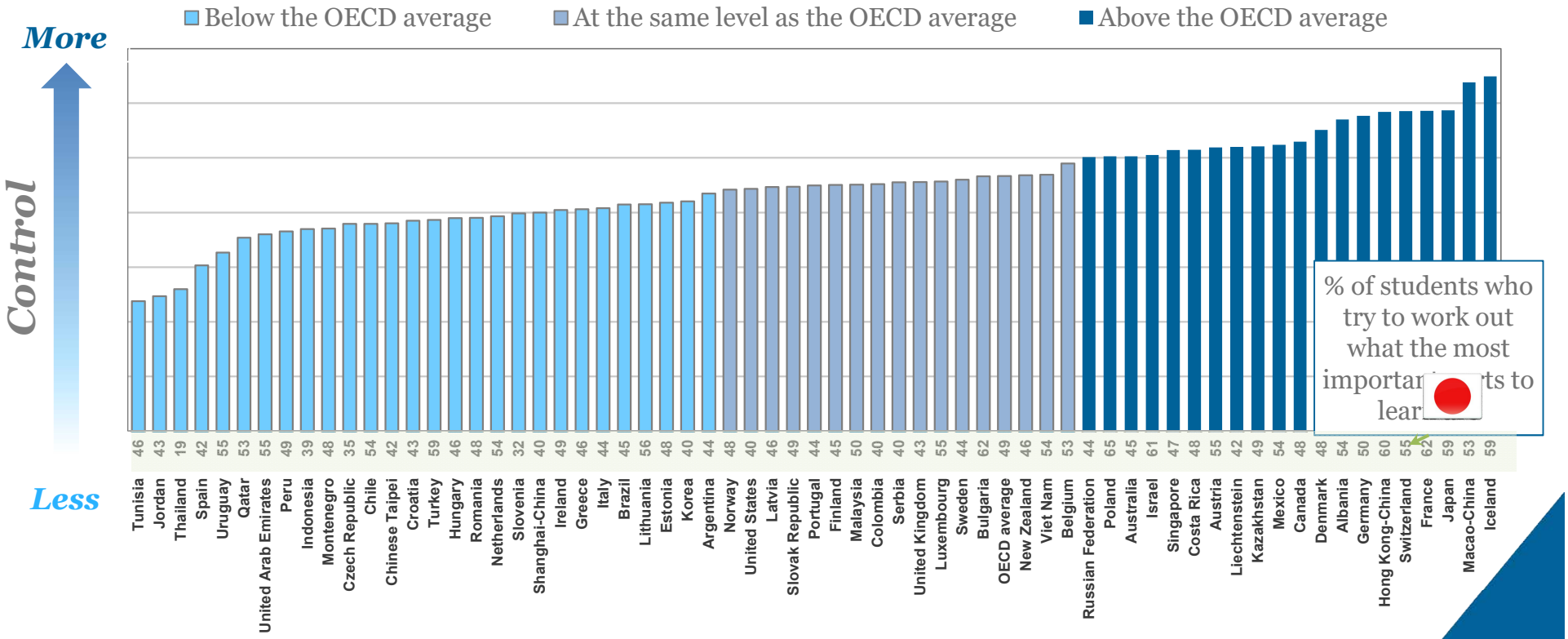

Source: Figure 4.1

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



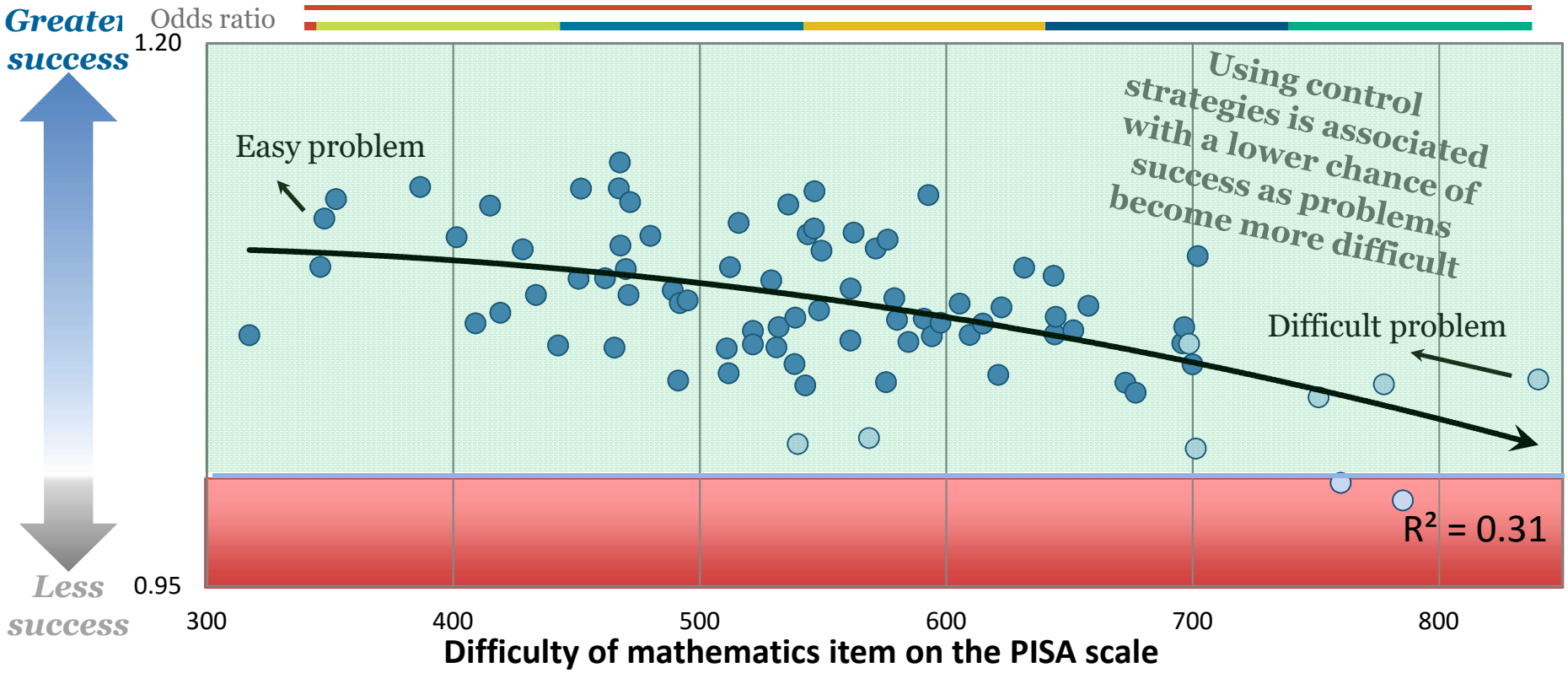

Source: Figure 4.3

# There are large international differences in the use of **control strategies**



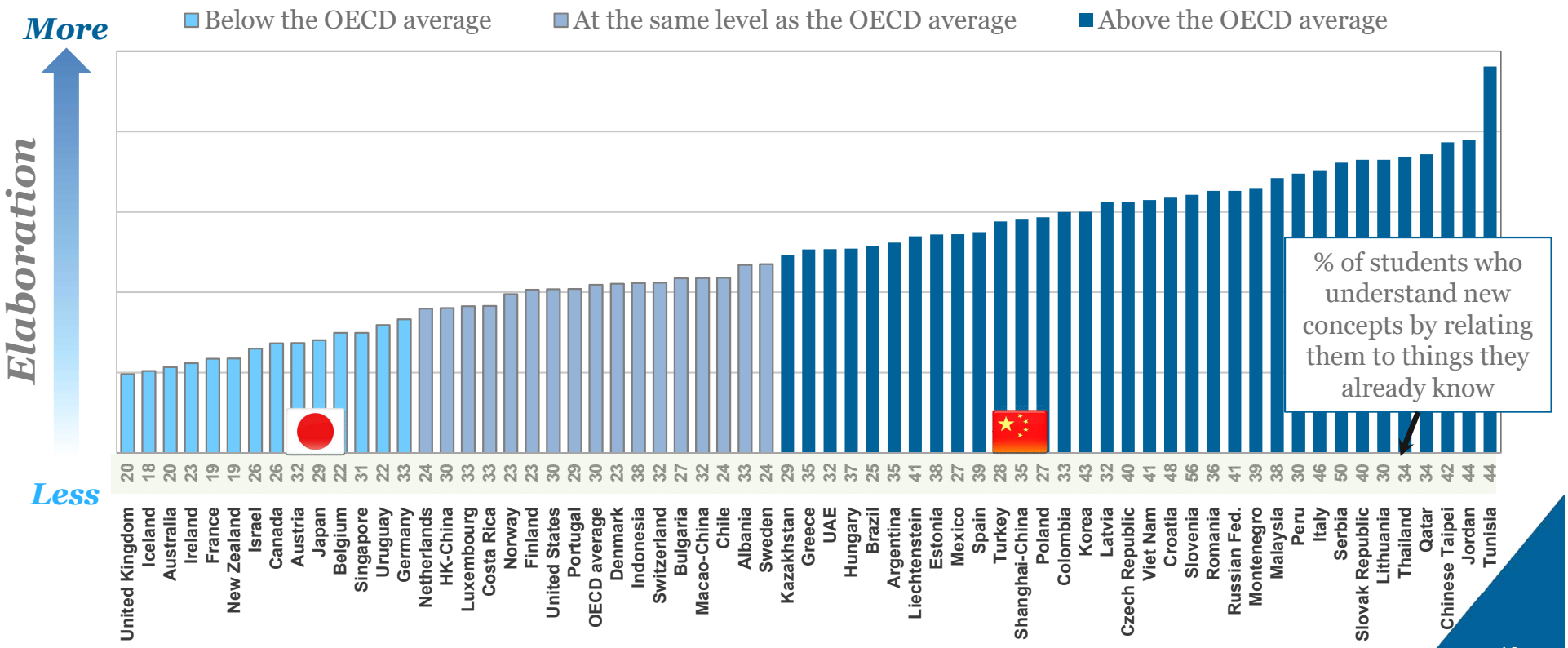

Source: Figure 5.1

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



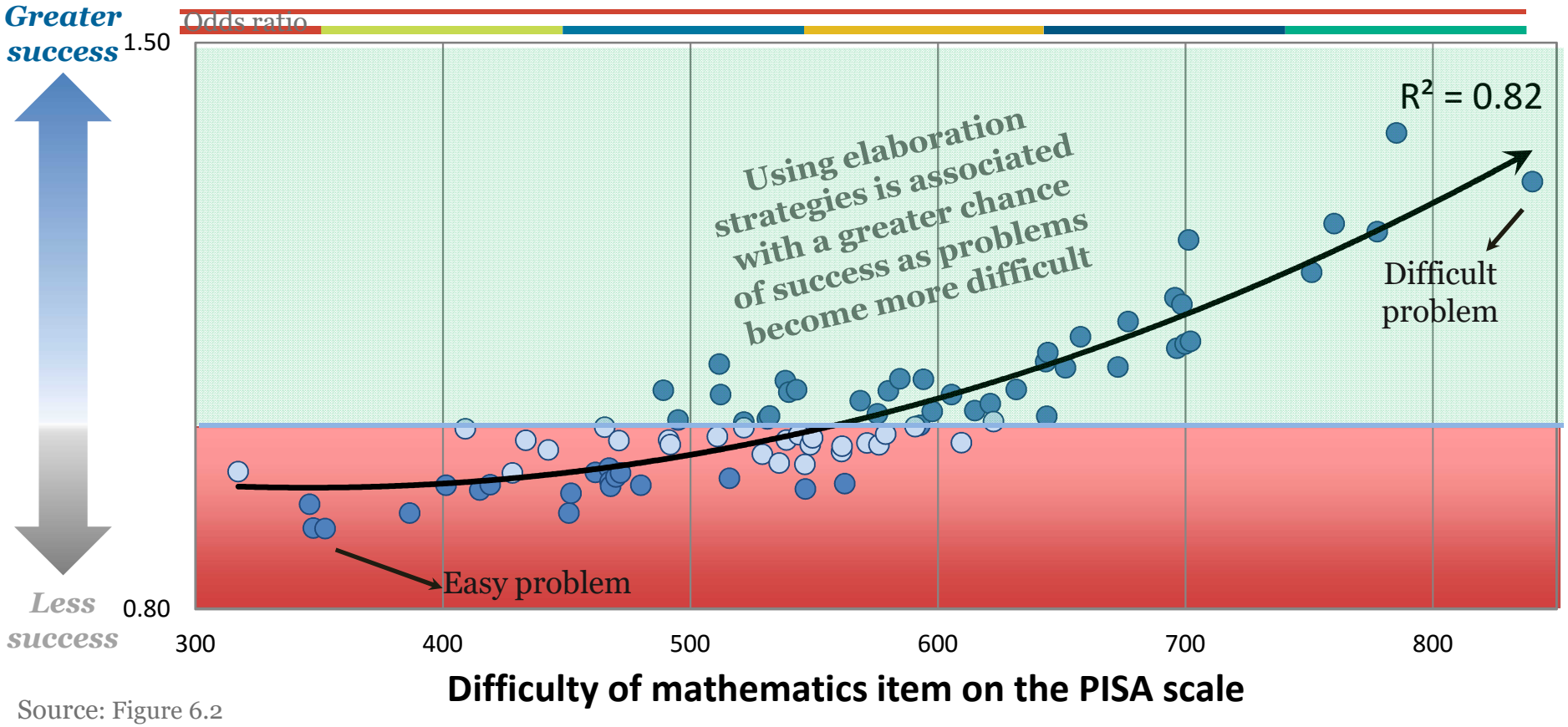

Source: Figure 5.2

# Students' use of **elaboration strategies**



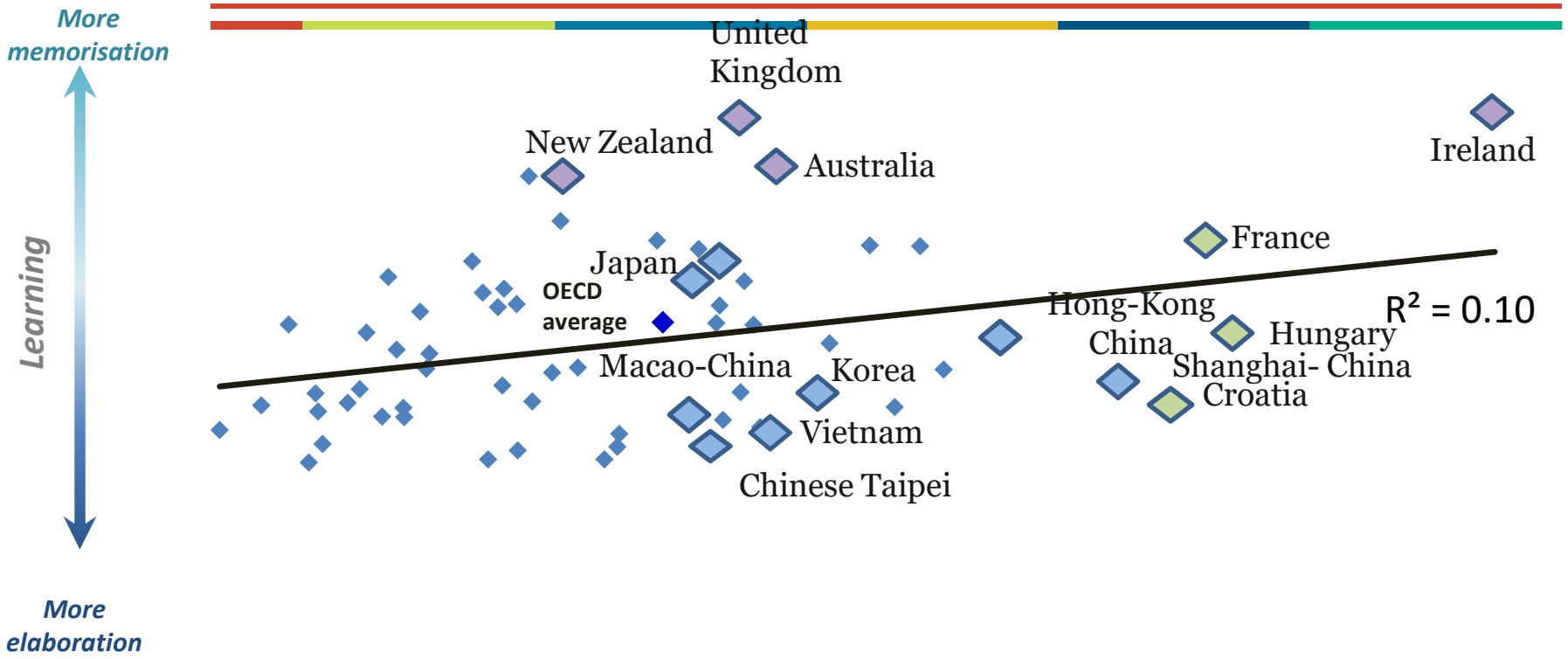

Source: Figure 6.1

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

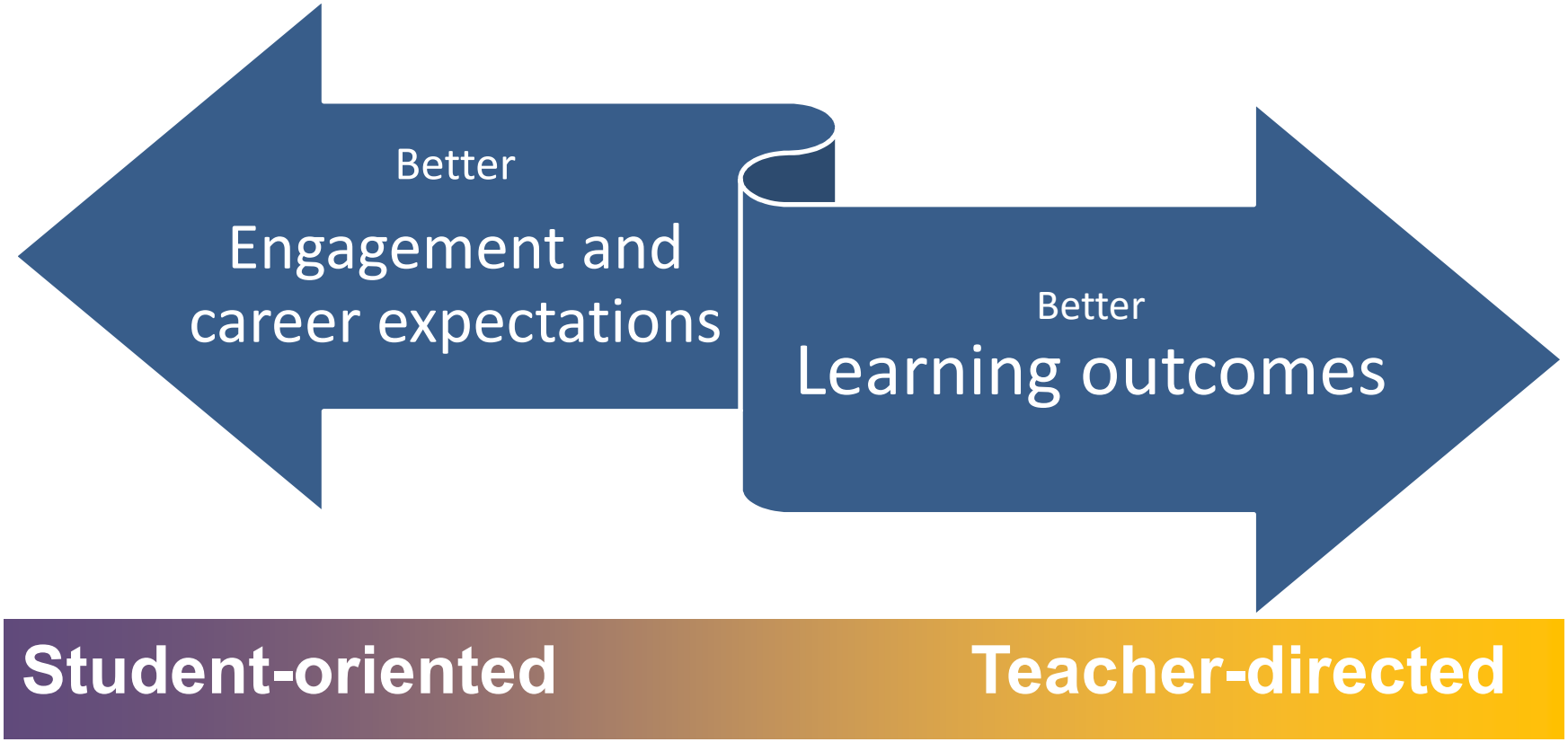


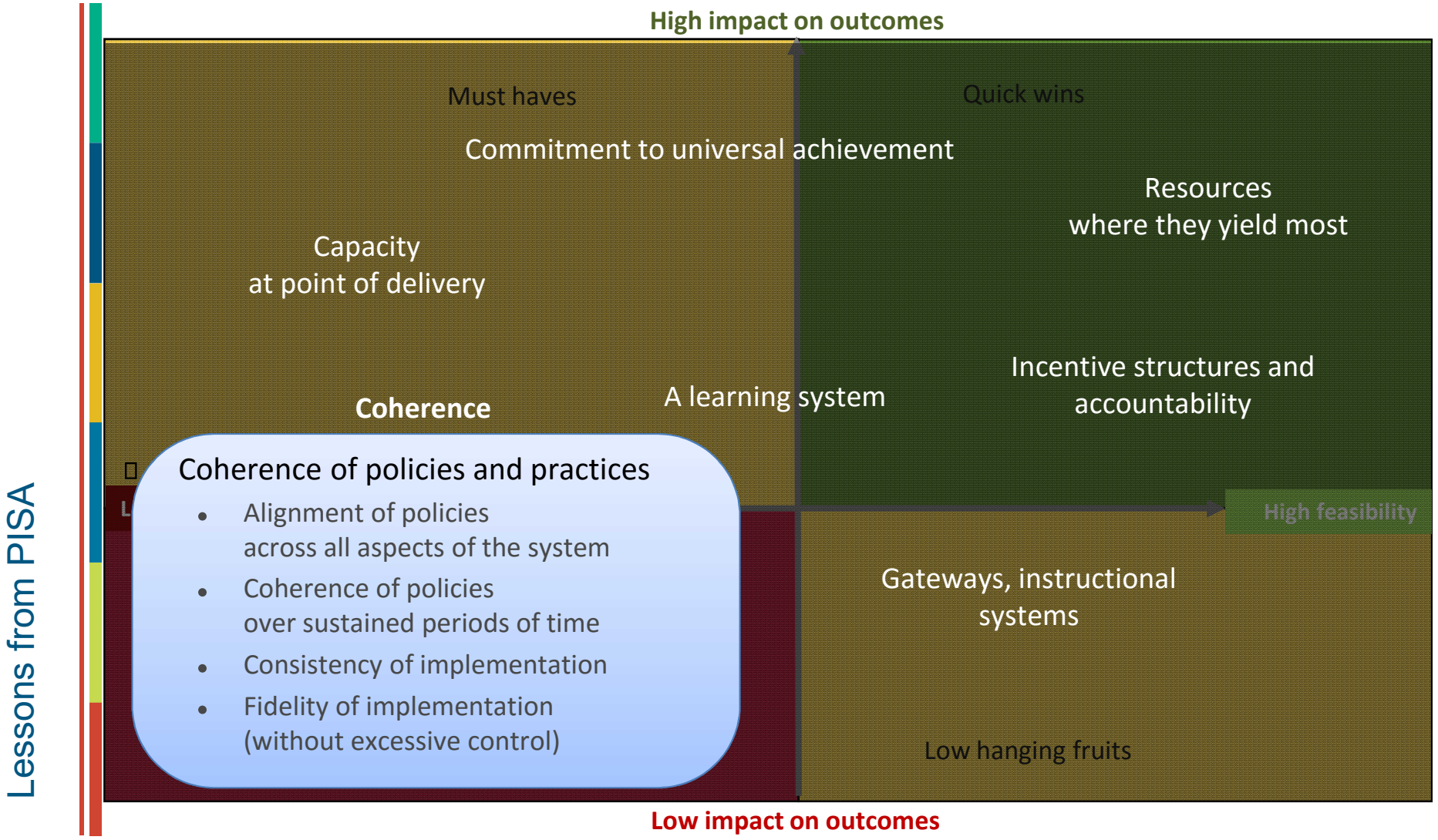

Source: Figure 6.2

# **Teaching** and **learning strategies** in **mathematics**

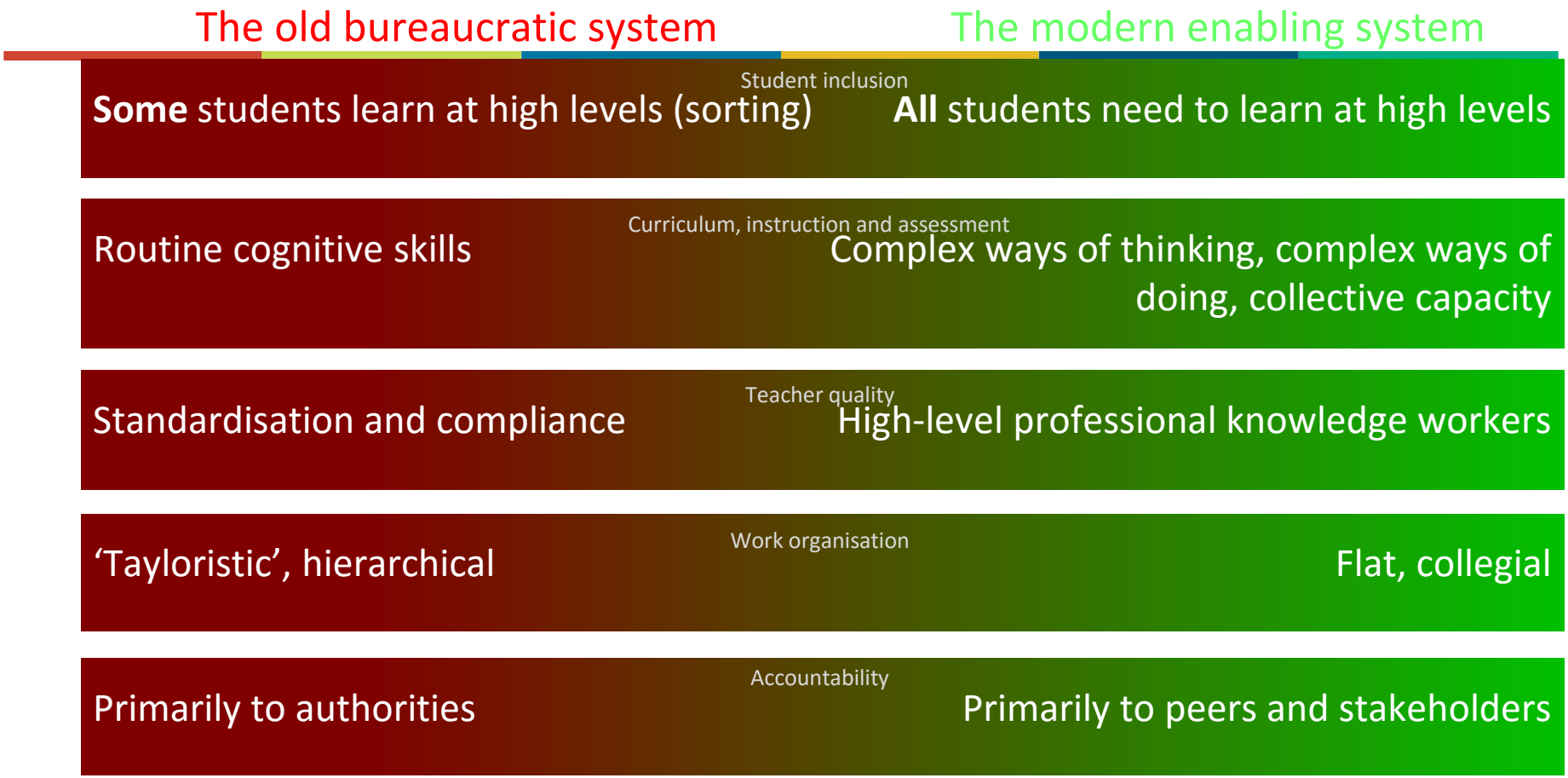


# Approaches to teaching




Lessons from PISA
High impact on outcomes
Must haves
Quick wins
Commitment to universal achievement
Resources
where they yield most
Capacity
at point of delivery
Incentive structures and
accountability
A learning system
Coherence
Coherence of policies and practices
Alignment of policies
across all aspects of the system
Coherence of policies
over sustained periods of time
Consistency of implementation
Fidelity of implementation
(without excessive control)
High feasibility
Gateways, instructional
systems
Low hanging fruits
Low impact on outcomes

# System transformations




Thank you
Find out more about our work at www.oecd.org/pisa
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