

SDGs 4.7.4 & 4.7.5

An applied framework to measure indicators
on education for sustainable development
and global citizenship education



Proposal for a Measurement Strategy for Thematic Indicator 4.7.5 using International Large-Scale Assessments in Education

GAML6/WD/8

4.7.5 Percentage of 15-year-old students showing proficiency in knowledge of environmental science and geoscience.



Proposal for a Measurement Strategy for Thematic Indicator 4.7.4 using International Large-Scale Assessments in Education

GAML6/WD/7

4.7.4 Percentage of students by age group (or education level) showing adequate understanding of issues relating to global citizenship and sustainability.

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3



Definition of scores & proficiency levels

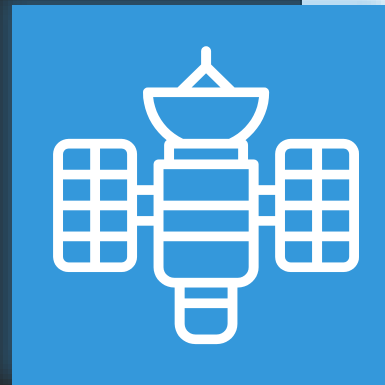
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Proportion of students reaching the targets established by SDG indicators 4.7.4 & 4.7.5

SDGs 4.7.4 & 4.7.5

1. Global content framework



We build on previous work conducted by UNESCO towards assessing GCE & ESD (e.g. Hoskins, 2016; IBE, 2016; UIS, 2017; UNESCO, 2012a, 2012b, 2013, 2014, 2015)

...but also other frameworks

The Council of Europe Reference Framework of Competences for Democratic Culture (RFCDC)

PISA 2018 Global Competence Framework

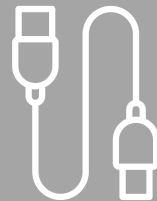


Based on the coding scheme developed by the IBE and GEMR in team 78 countries (IBE, 2016)

	Category	Sub-category	
Global Citizenship Education (GCED)	Interconnectedness and Global Citizenship	Globalization	
		Global/international citizen(ship), global culture/identity/community	
		Global-local thinking, local-global, think global act local, glocal	
		Multicultural(ism)/intercultural(ism)	
		Migration, immigration, mobility, movement of people	
		Global Competition/competitiveness/globally competitive/international competitiveness	
		Global Inequalities/disparities	
	Gender Equality	Gender Equality	Gender equality / equality / parity
			Empower(ment of) women/girls (female empowerment, encouraging female participation)
	Peace, Non-violence and Human Security	Peace, Non-violence and Human Security	Peace, peace-building
			Awareness of forms of abuse/harassment/violence (school-based violence/bullying, household-based violence, gender-based violence, child abuse/harassment, sexual abuse/harassment)
	Human Rights	Human Rights	Human rights, rights and responsibilities (children's rights, cultural rights, indigenous rights, women's rights, disability rights)
Freedom (of expression, of speech, of press, of association/organisation), civil liberties			
Social justice			
Democracy/democratic rule, democratic values/principles			
Education for Sustainable Development (ESD)	Health and Well-being	Physical health/activity/fitness	
		Mental, emotional health, psychological health	
		Healthy lifestyle (nutrition, diet, cleanliness, hygiene, sanitation, *clean water, being/staying healthy)	
		Awareness of addictions (smoking, drugs, alcohol)	
		Sexual and/or reproductive health	
	Sustainable Development	Sustainable Development	Economic sustainability, sustainable growth, sustainable production/consumption, green economy
			Social sustainability, (social cohesion re sustainability)
			Environmental sustainability/environmentally sustainable
			Climate change (global warming, carbon emissions/footprint)
			Renewable energy, alternative energy (sources) (solar, tidal, wind, wave, geothermal, biomass...)
Ecology, ecological sustainability (ecosystems, biodiversity, biosphere, ecology, loss of diversity)			
Waste management, recycling			
Environmental Science (geoscience)	Environmental Science (geoscience)	Physical systems	
		Living systems	
		Earth and space systems	

SDGs 4.7.4 & 4.7.5

2. Mapping from ILSAs into SDG



- Assessment criteria:
 - the assessment framework should refer to the concepts relevant to SDGs,
 - the instruments provide information on the categories and sub-categories, and
 - they should allow long-term monitoring.

Cognitive

Socio-emotional

Behavioural

Mapping exercise for SDG global indicator 4.7.4

- OECD PISA & IEA ICCS

Mapping exercise for SDG global indicator 4.7.5

- OECD PISA & IEA TIMSS



Based on the
Global Content
Framework and
ILSAs' Frameworks

Cognitive test

Background
questionnaires

		Cognitive	Socio- emotional	Behavioural
	GCED and ESD as a general concept	X	X	X
GCED	Interconnectedness and Global Citizenship	X	X	X
	Gender Equality	X	X	X
	Peace, Non-violence and Human Security	X	X	X
	Human Rights	X	X	X
ESD	Health and Well-being	X	X	X
	Sustainable Development	X	X	X

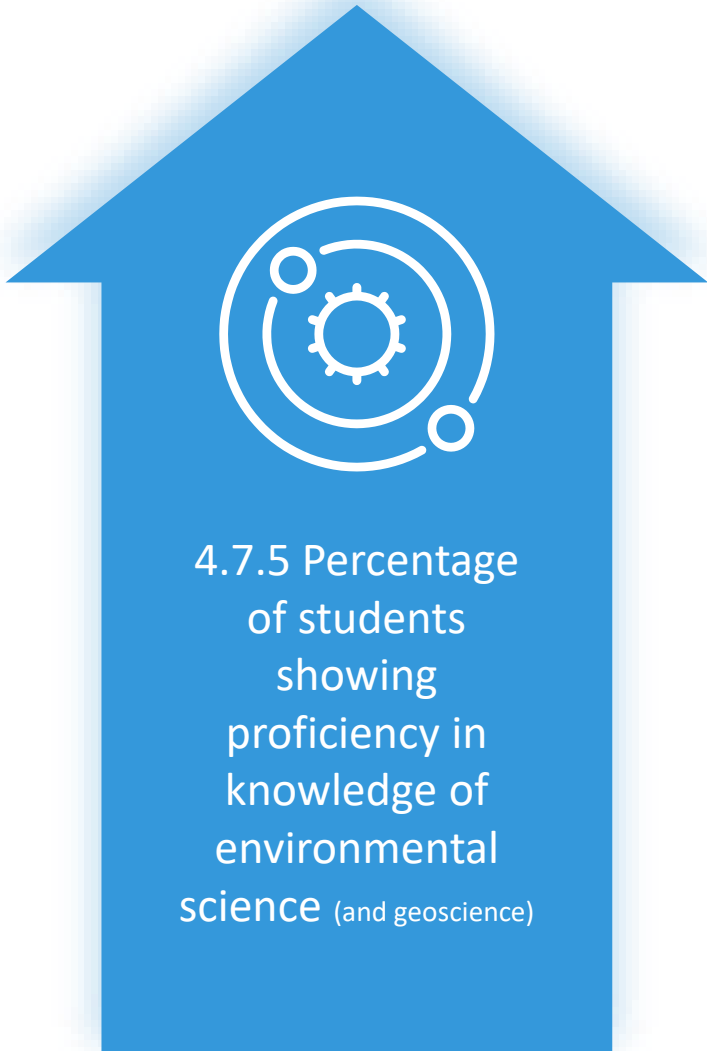
4.7.4 Example



4.7.4 Percentage of students showing adequate understanding of issues relating to global citizenship and sustainability.

Category / Sub-category	Dimension		
	Cognitive	Socio-emotional	Behavioural
Human rights, rights and responsibilities (children's rights, cultural rights, indigenous rights, women's rights, disability rights)	ICCS assessment test; Content domain 2: Civic principles; Sub-domain: Rule of law; Key concept: Human rights	ICCS student background questionnaire; Affective-behavioral domain 1: Attitudes; Content domain: Students' attitudes toward civic principles; Construct: Students' attitudes toward gender rights, Students' attitudes toward equal rights for all ethnic/racial groups, Students' attitudes toward equal rights for immigrants (European regional questionnaires)	
Freedom (of expression, of speech, of press, of association/organisation), civil liberties	ICCS assessment test; Content domain 2: Civic principles; Sub-domain: Freedom; Key concept: Human rights	ICCS student background questionnaire; Affective-behavioral domain 1: Attitudes; Content domain: Students' attitudes toward civic principles; Item: Which of the following situations do you think would be good, neither good nor bad, or bad for democracy? - People are allowed to publicly criticize the government One company or the government owns all newspapers in a country, People are able to protest if they think a law is unfair	
Social justice	ICCS assessment test; Content domain 2: Civic principles; Sub-domain: Equity; Key concept: Social justice	ICCS student background questionnaire; Affective-behavioral domain 1: Attitudes; Content domain: Students' attitudes toward civic society and systems; Construct: Students' perception of the importance of social movement related citizenship	ICCS student background questionnaire; Affective-behavioral domain 1: Engagement; Content domain: Behavioural intentions; Construct: Expectations to participate in legal and illegal forms of civic action in support of or protest against important issues
Democracy/democratic rule, democratic values/principles	ICCS assessment test; Content domain 1: Civic society and systems; Sub-domains: State institutions and Civil institutions; Key concept: Democracy	ICCS student background questionnaire; Affective-behavioral domain 1: Attitudes; Content domain: Students' attitudes towards democratic values	

4.7.5 Example



Category / Sub-category	Dimension		
	Cognitive	Socio-emotional	Behavioural
Environmental Science (geoscience)			
Physical systems	TIMSS assessment test; Content domain: Physical science; Sub-domain: Physical States and Changes in Matter; Key concept: Changes in states of matter	TIMSS background questionnaire; Contextual framework level: Student attitudes toward learning; Construct: Students Like Learning Physics	TIMSS background questionnaire; Contextual framework level: Student attitudes toward learning; Construct: Students Confident in Physics
Living systems	TIMSS assessment test (eight grade); Content domain: Biology; Sub-domain: Life Cycles, Reproduction, and Heredity; Key concept: Life cycles and patterns of development, Sexual reproduction and inheritance in plants and animals TIMSS assessment test; Content domain: Biology; Sub-domain: Ecosystems; Key concept: The flow of energy in ecosystems, The cycling of water, oxygen, and carbon in ecosystems, Interdependence of populations of organisms in an ecosystem, Human impact on the environment	TIMSS background questionnaire; Contextual framework level: Student attitudes toward learning; Construct: Students Like Learning Biology	TIMSS background questionnaire; Contextual framework level: Student attitudes toward learning; Construct: Students Confident in Biology
Earth and space systems	TIMSS assessment test; Content domain: Earth Science; Sub-domain: Earth's Structure and Physical Features; Key concept: Earth's structure and physical characteristics, Components of Earth's atmosphere and atmospheric conditions TIMSS assessment test; Content domain: Earth Science; Sub-domain: Earth's Processes, Cycles, and History; Key concept: Geological processes, Earth's water cycle, Weather and climate TIMSS assessment test; Content domain: Earth Science; Sub-domain: Earth's Resources, Their Use and Conservation; Key concept: Managing Earth's resources, Land and water use TIMSS assessment test; Content domain: Earth Science; Sub-domain: Earth in the Solar System and the Universe; Key concept: Observable phenomena on Earth resulting from movements of Earth and the Moon, The Sun, stars, Earth, Moon, and planets	TIMSS background questionnaire; Contextual framework level: Student attitudes toward learning; Construct: Students Like Learning Earth Science	TIMSS background questionnaire; Contextual framework level: Student attitudes toward learning; Construct: Students Confident in Earth Science

SDGs 4.7.4 & 4.7.5

3. Definition of scores and proficiency levels for SDGs



- Task (scores): provide a “number” for each target!
- Task (proficiency levels): provide the “percentage” of students reaching each target

Scores & Thresholds

1

Availability

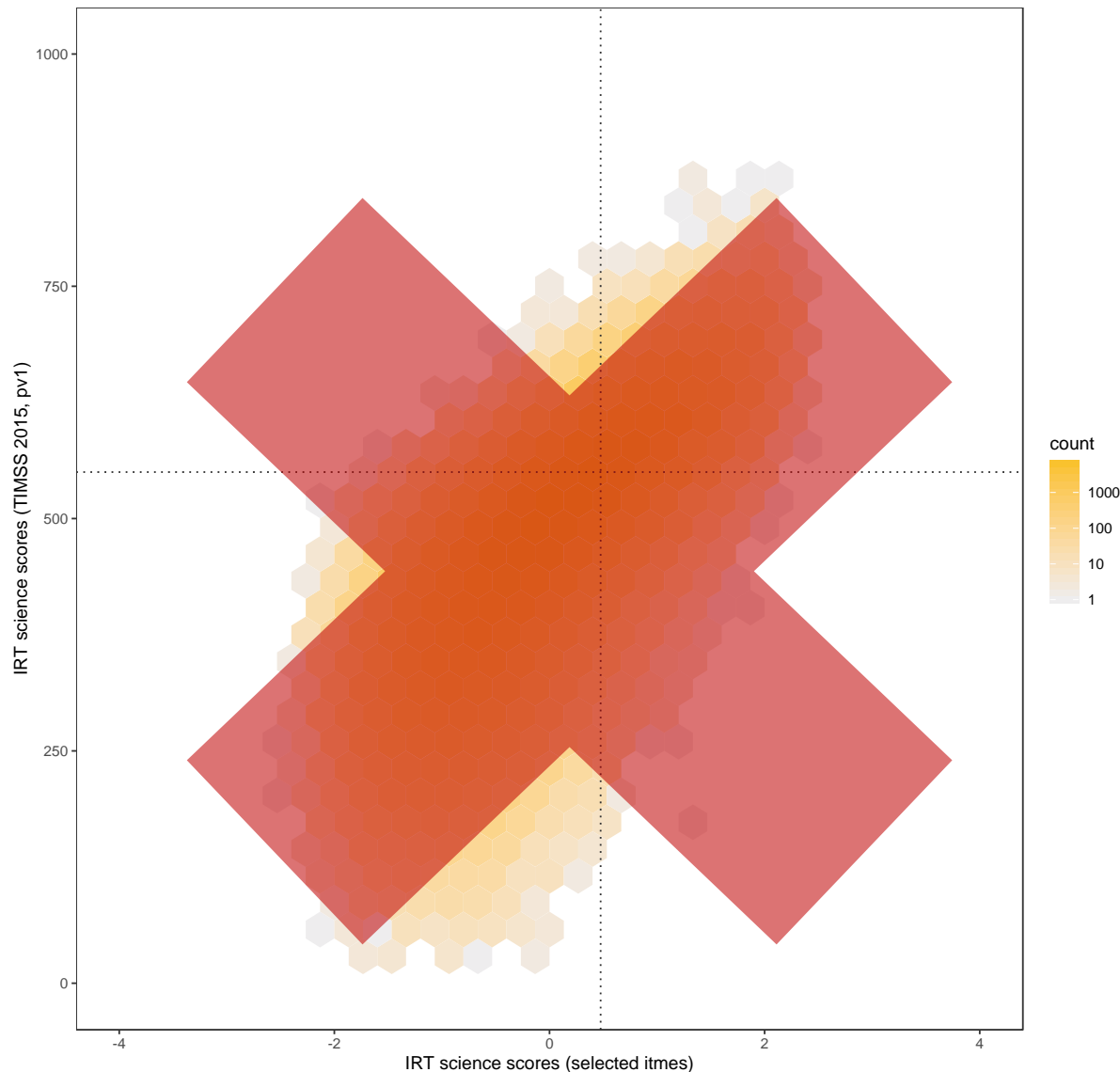
- Concepts might be in the framework but **often variables are missing for whole countries.**
- Especially important for generating item-person maps.

2

Unidimensionality

- **Can we represent a GCE by a single score?**
- We used latent variable models to assess unidimensionality. In particular, we used GRM-bifactor models and expected a high amount of common variance to generate a single score (ECV = 85%).

Scores & Thresholds



- If different measures have a common cause, then is more plausible these would be **highly correlated**.
 - In this scenario **we can summarize measures into a single score without a loss of information**.
- If different measures do not share a common cause, then is **less likely these measures are highly correlated**.
 - **In this scenario collapsing measures into single scores sacrifices information limiting public policy recommendations.**
- Standards indicators are more useful when these **represent a clear attribute**, where recommendations can hold.

Scores & Thresholds

3

Measurement Model

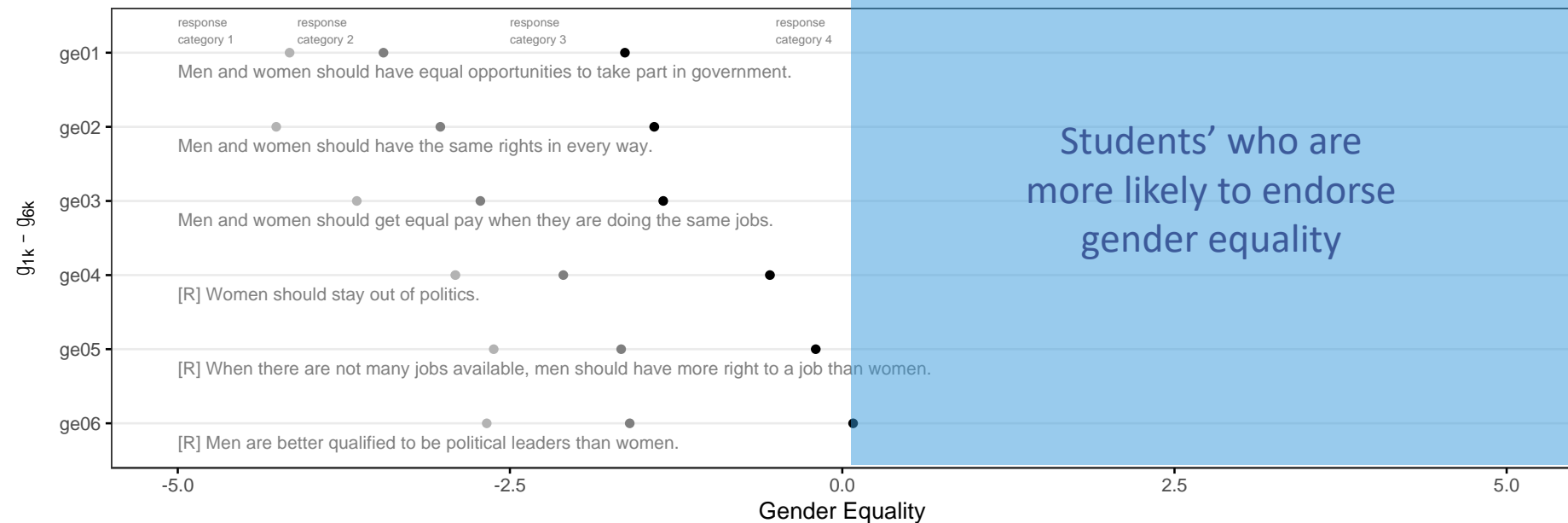
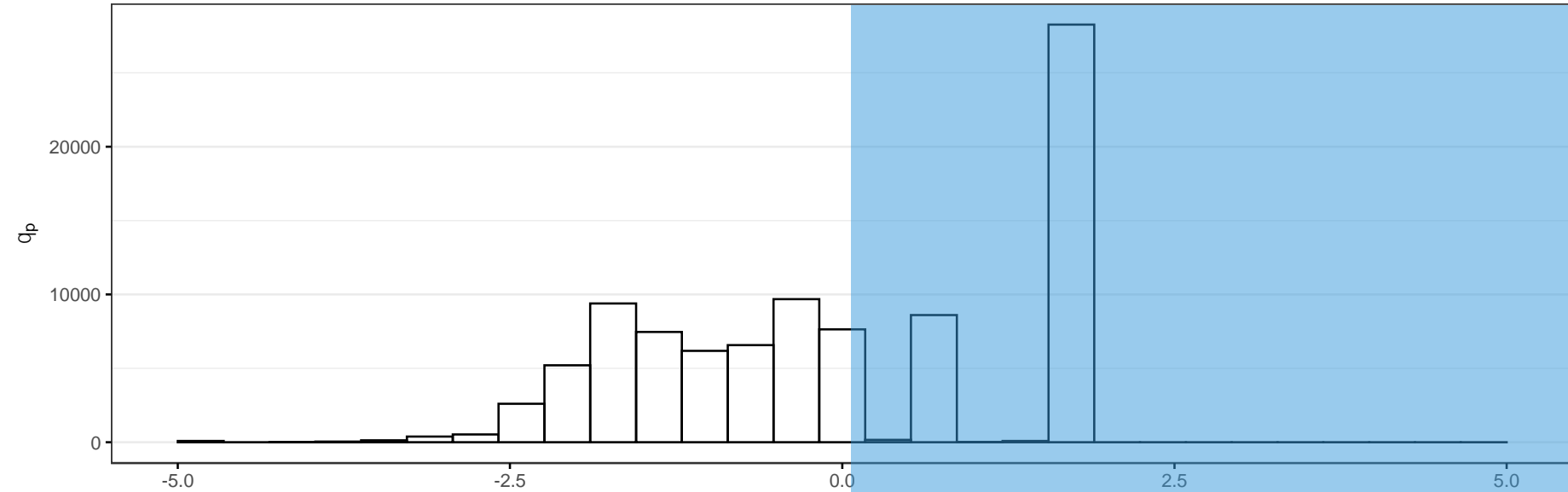
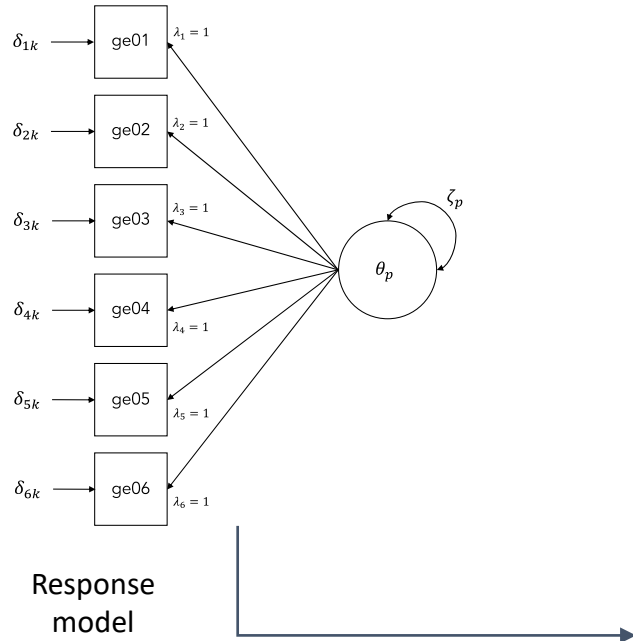
- To generate scores we used Partial Credit Models
- Allow us to obtain person and item parameters.

4

Proficiency Levels

- Point in a scale to classify people who achieve or not a given target
- We used Item-Person Maps

Scores & Thresholds



SDGs 4.7.4 & 4.7.5

4. Proportion of students reaching the targets



- Task: provide the “percentage” of students reaching each target

Description of cut-off points

4.7.4 – Percentage of students by age group (or education level) showing an adequate understanding of issues relating to global citizenship and sustainability.

COGNITIVE

At the threshold, students make connections between the processes of social and political organization and influence, and the legal and institutional mechanisms used to control them in relation with global citizenship and sustainability.

NON-COGNITIVE

At the threshold, students have more than 50% chance of endorsing the different non-cognitive components of SDG 4.7.4

Interconnectedness and Global Citizenship		Gender equality	Human Rights	
Global – Local Thinking	Multicultural	Peace, Non-Violence	Freedom of Expression	Social Justice
		Health & Well-being		
		Sustainable Development		

Description of cut-off points

4.7.5 – Percentage of 15-year-old students showing proficiency in knowledge of environmental science and geoscience

COGNITIVE

At the threshold, students apply and communicate their understanding of concepts from environmental science and geoscience in everyday and abstract situations.

NON-COGNITIVE

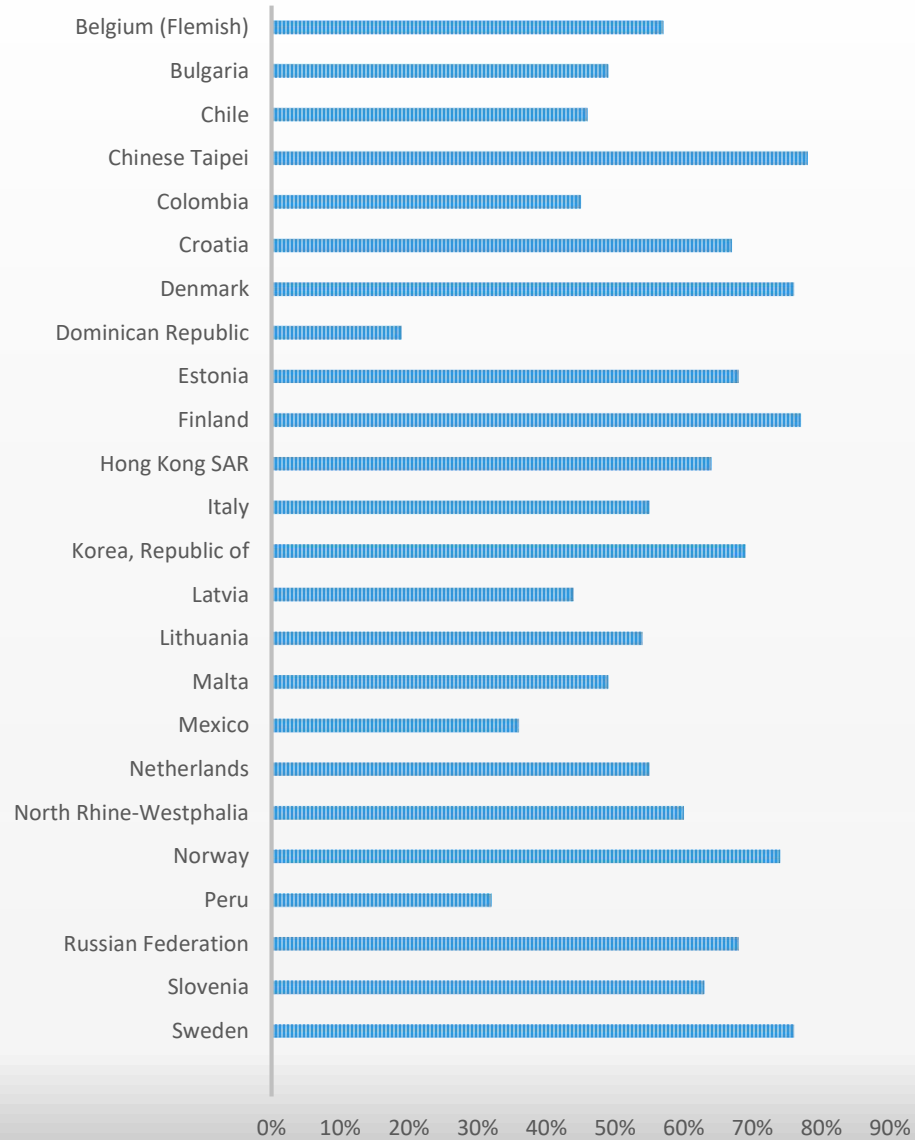
At the threshold, students have more than 50% chance of endorsing the different non-cognitive components of SDG 4.7.5

Enjoy environmental
science and geoscience

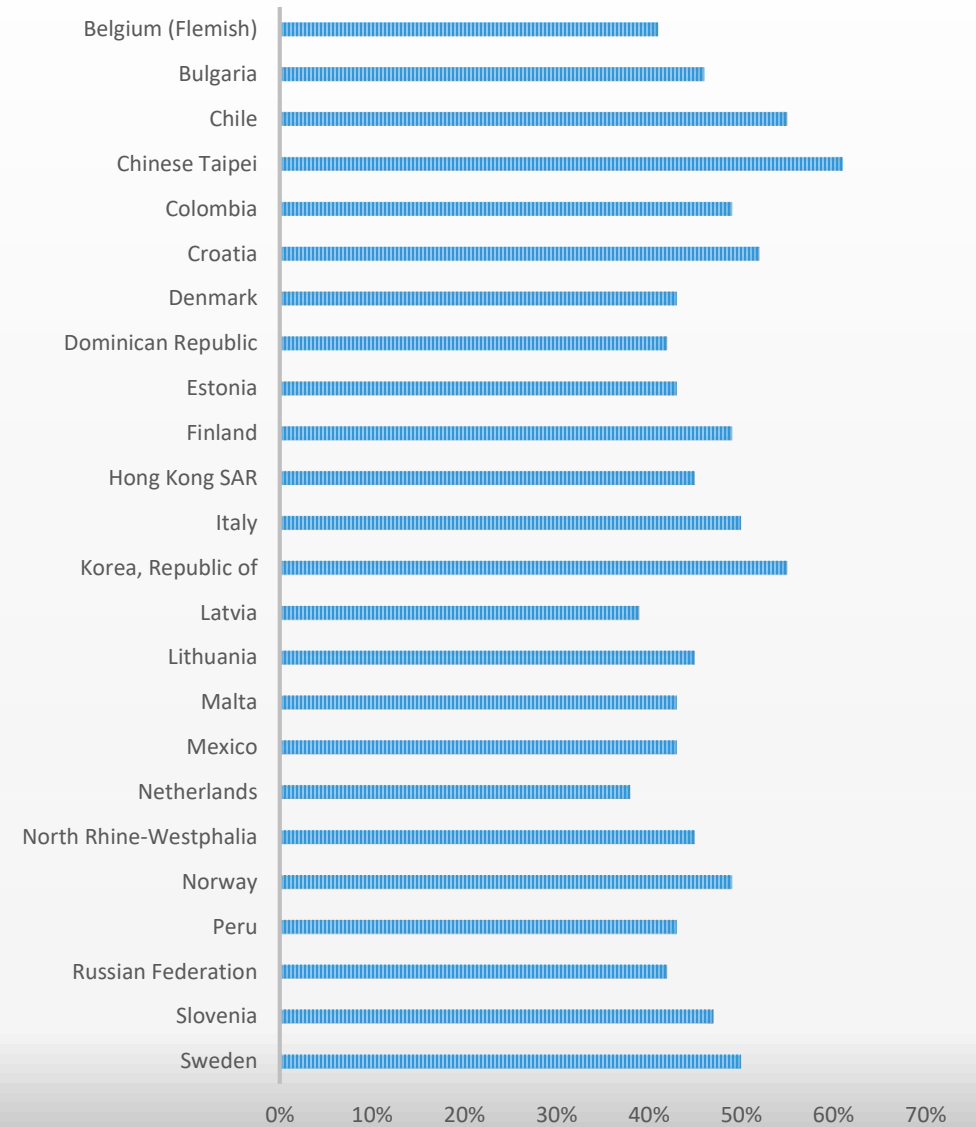
Confidence in
environmental science

Scores - SDG 4.7.4

% STUDENTS REACHING COGNITIVE TARGET

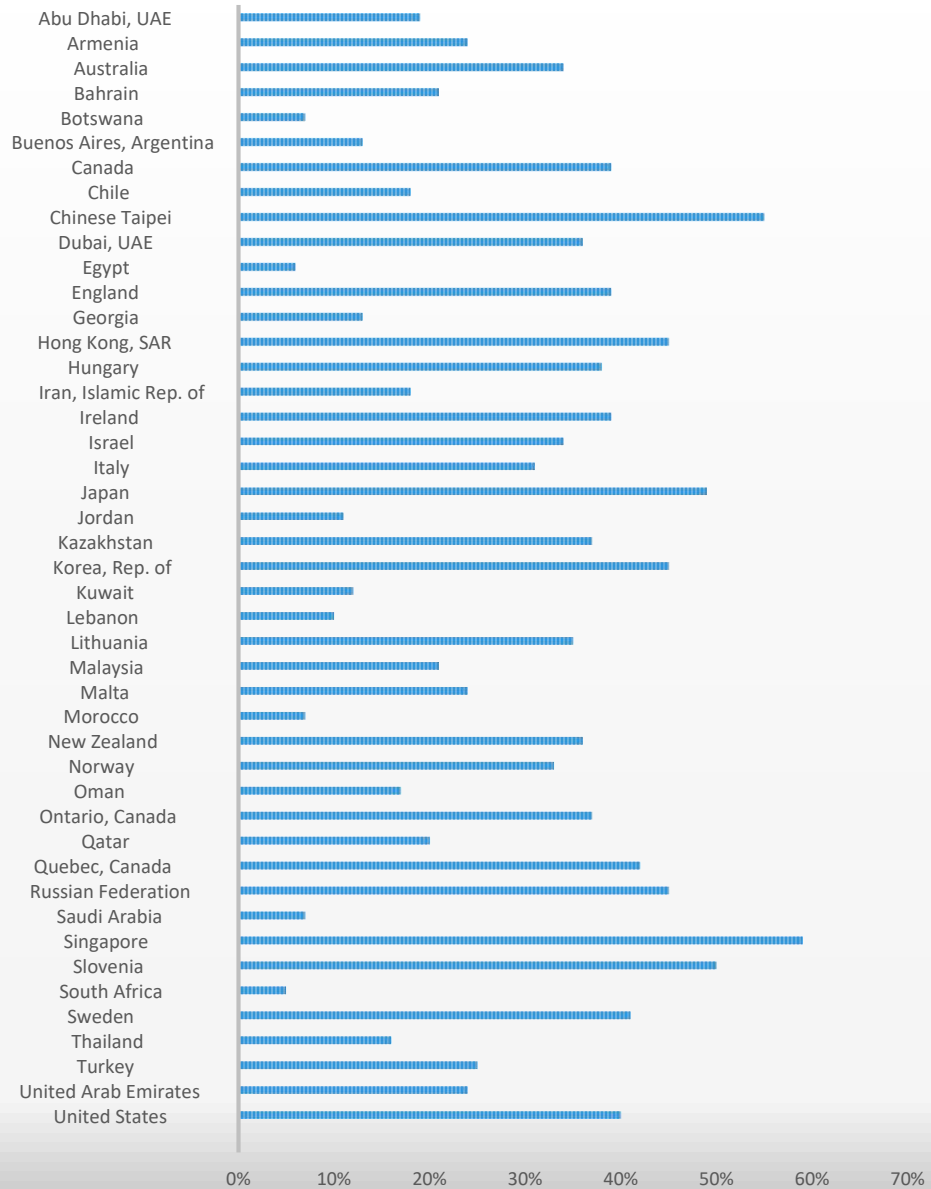


% STUDENTS REACHING ANY TARGET

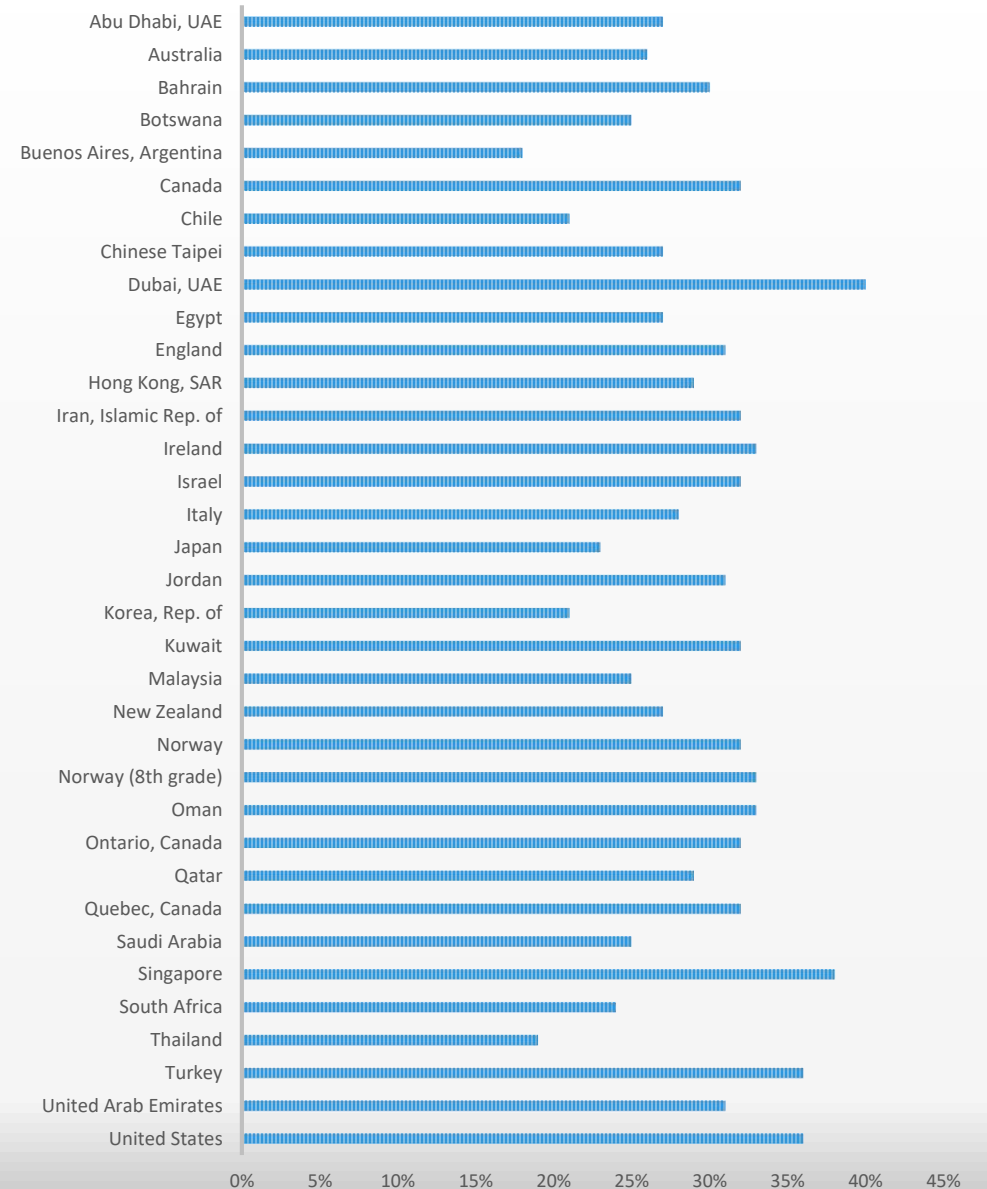


Scores - SDG 4.7.5

% STUDENTS REACHING COGNITIVE TARGET



% STUDENTS REACHING ANY SDG 4.7.5 TARGET





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Thank you

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