Exhibit 2.12: Description of the TIMSS 2019 High International Benchmark (550) of Science Achievement

◯ **High** International Benchmark

550

Summary

Students communicate and apply knowledge of life, physical, and Earth sciences. Students communicate knowledge of characteristics of plants, animals, and their life cycles, and apply knowledge of ecosystems and of humans' and organisms' interactions with their environment. Students demonstrate knowledge of states and properties of matter and of energy transfer in practical contexts, and show some understanding of forces and motion. Students know various facts about the Earth's physical characteristics and show basic understanding of the Earth-Moon-Sun system.

Students communicate knowledge of characteristics of plants and animals. For example, they can distinguish living things from nonliving things and demonstrate some knowledge of life cycles of plants and animals. Students can apply knowledge of ecosystems and of organisms' interactions with their environment. They can complete food chains and recognize some plant and animal features that provide advantages in a given environment. Students demonstrate an understanding of how germs spread.

Students demonstrate knowledge of states and properties of matter. They understand basic properties of magnets, including the forces between two magnets. Students show some elementary knowledge about how shadows are formed. They apply knowledge of energy transfer in practical contexts and show some understanding of forces and motion, including gravity and air resistance.

Students know various facts about the Earth's physical characteristics and climates, and show basic understanding of the Earth-Moon-Sun system.

Students can make simple inferences using models, tables, and diagrams.

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Exhibit 2.12.1: High International Benchmark of Science Achievement – Example Item 1

Content Domain: Life Science
Cognitive Domain: Knowing
Description: Lists two living things and two nonliving things shown in a picture of a desert ecosystem

Country	Percent Full Credit	
[3] Singapore	84 (1.4)	▲
Armenia	79 (1.8)	▲
[2] Kazakhstan	71 (2.6)	▲
Cyprus	67 (2.4)	▲
[2] Russian Federation	67 (2.2)	▲
[2] Turkey (5)	67 (2.6)	▲
[2] Serbia	66 (2.7)	▲
Czech Republic	64 (1.7)	▲
Italy	63 (2.6)	▲
[2] Slovak Republic	62 (2.3)	▲
Hungary	62 (2.3)	▲
Croatia	62 (2.6)	▲
Bahrain	60 (1.5)	▲
United Arab Emirates	58 (1.1)	▲
Bulgaria	57 (2.6)	▲
Oman	56 (2.1)	▲
Montenegro	55 (1.9)	▲
[†] Norway (5)	55 (3.0)	▲
[2] Kosovo	55 (2.6)	▲
Malta	52 (2.2)	▲
[2†] United States	52 (1.6)	▲
Australia	51 (2.2)	▲
Qatar	51 (3.0)	▲
Sweden	50 (2.4)	
Poland	50 (2.6)	
Finland	49 (2.0)	▲
[2] Portugal	48 (2.3)	
[2] Latvia	47 (2.3)	
[2] Lithuania	47 (2.7)	
[2] Saudi Arabia	46 (2.0)	
[1 2] Canada	46 (1.3)	
Kuwait	46 (2.3)	
International Average	**45 (0.3)**	
Albania	39 (2.8)	▽
[2] England	38 (2.6)	▽
North Macedonia	38 (3.3)	▽
Bosnia and Herzegovina	38 (2.4)	▽
France	37 (2.2)	▽
Japan	37 (2.3)	▽
Korea, Rep. of	37 (2.4)	▽
Iran, Islamic Rep. of	35 (2.5)	▽
Ireland	34 (2.1)	▽
[†] Denmark	34 (2.4)	▽
[2] Pakistan	34 (3.6)	▽
Azerbaijan	33 (2.0)	▽
[2] New Zealand	32 (2.0)	▽
Spain	32 (2.2)	▽
[1] Georgia	31 (2.7)	▽
[≡] Netherlands	30 (2.3)	▽
[†] Northern Ireland	29 (2.4)	▽
Austria	27 (2.4)	▽
South Africa (5)	27 (1.6)	▽
Morocco	27 (2.0)	▽
Germany	23 (1.9)	▽
[†] Hong Kong SAR	23 (2.3)	▽
Chile	20 (2.0)	▽
[†] Belgium (Flemish)	18 (1.7)	▽
[2] Philippines	15 (1.5)	▽
Chinese Taipei	10 (1.2)	▽
Benchmarking Participants		
Moscow City, Russian Fed.	76 (1.9)	▲
[2] Dubai, UAE	72 (1.5)	▲
[2] Ontario, Canada	52 (2.1)	▲
Abu Dhabi, UAE	42 (1.3)	▽
Quebec, Canada	31 (2.0)	▽
Madrid, Spain	23 (1.9)	▽

The picture below shows a desert.

What are two **living things** shown in the picture?

1. Camel
2. Cactus

What are two **non-living things** shown in the picture?

1. Rock
2. Sand

The answer shown illustrates the type of response that would receive full credit (1 point).

▲ Percent significantly higher than international average

▽ Percent significantly lower than international average

See Appendix B.2 for population coverage notes 1, 2, and 3. See Appendix B.5 for sampling guidelines and sampling participation notes †, ‡, and ≡.
( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

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Exhibit 2.12.2: High International Benchmark of Science Achievement – Example Item 2

Country	Percent Correct	
Chinese Taipei	82 (1.8)	▲
Korea, Rep. of	81 (2.0)	▲
† Hong Kong SAR	80 (1.9)	▲
Sweden	77 (2.1)	▲
Croatia	75 (2.8)	▲
Finland	74 (2.0)	▲
Japan	74 (1.9)	▲
2 Lithuania	74 (2.1)	▲
Iran, Islamic Rep. of	73 (1.8)	▲
Poland	73 (2.0)	▲
Bulgaria	72 (2.5)	▲
3 Singapore	72 (1.6)	▲
† Belgium (Flemish)	71 (1.7)	▲
2 Slovak Republic	70 (2.3)	▲
2 Serbia	69 (2.1)	▲
† Norway (5)	69 (2.4)	▲
2 Russian Federation	69 (2.0)	▲
Spain	68 (2.0)	▲
Czech Republic	68 (2.2)	▲
† Denmark	67 (2.2)	
Australia	67 (2.0)	
2 Latvia	67 (2.6)	
France	66 (2.3)	
Bahrain	66 (1.8)	
Germany	66 (2.0)	
2 England	66 (2.3)	
Bosnia and Herzegovina	66 (1.8)	
Italy	65 (2.5)	
1 2 Canada	65 (1.4)	
2† United States	65 (1.6)	
Austria	64 (2.1)	
2 New Zealand	64 (2.1)	
International Average	**64 (0.3)**	
Hungary	64 (2.0)	
† Northern Ireland	63 (2.6)	
Ireland	62 (2.5)	
ᵋ Netherlands	62 (2.3)	
United Arab Emirates	62 (1.1)	
1 Georgia	62 (2.8)	
Qatar	61 (2.4)	
2 Turkey (5)	60 (2.4)	
2 Portugal	60 (2.1)	▽
Cyprus	59 (1.8)	▽
North Macedonia	59 (2.9)	
Malta	59 (2.0)	▽
2 Saudi Arabia	58 (2.1)	▽
Oman	57 (2.0)	▽
Kuwait	57 (2.2)	▽
Albania	56 (2.8)	▽
2 Kazakhstan	56 (2.1)	▽
Montenegro	56 (1.6)	▽
2 Kosovo	54 (2.5)	▽
Chile	52 (2.3)	▽
Azerbaijan	51 (2.4)	▽
Morocco	50 (1.9)	▽
South Africa (5)	50 (1.6)	▽
Armenia	49 (2.3)	▽
2 Philippines	42 (2.1)	▽
2 Pakistan	32 (3.3)	▽
Benchmarking Participants		
Moscow City, Russian Fed.	88 (1.4)	▲
2 Dubai, UAE	73 (1.5)	▲
Quebec, Canada	72 (2.2)	▲
Madrid, Spain	66 (2.5)	
2 Ontario, Canada	61 (2.3)	
Abu Dhabi, UAE	51 (1.7)	▽

Content Domain: Physical Science
Cognitive Domain: Knowing
Description: Recognizes the energy change that occurs when a flashlight is turned on

Jake switches on a flashlight.

One kind of energy changes into another kind of energy in the flashlight.

Which statement describes this change?

Ⓐ Electrical energy changes into light energy.

Ⓑ Motion energy changes into light energy.

Ⓒ Light energy changes into electrical energy.

Ⓓ Light energy changes into motion energy.

▲ Percent significantly higher than international average
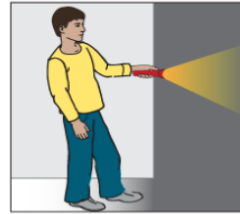
▽ Percent significantly lower than international average

See Appendix B.2 for population coverage notes 1, 2, and 3. See Appendix B.5 for sampling guidelines and sampling participation notes †, ‡, and ᵋ.
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Exhibit 2.12.3: High International Benchmark of Science Achievement – Example Item 3

Content Domain: Earth Science
Cognitive Domain: Applying
Description: Using two pictures of the same location, explains that the Moon can look different at different times

Country	Percent Full Credit	
Finland	61 (2.0)	▲
† Norway (5)	58 (2.5)	▲
Australia	58 (2.0)	▲
2 Lithuania	56 (2.4)	▲
2† United States	55 (1.7)	▲
Korea, Rep. of	54 (2.1)	▲
2 Turkey (5)	53 (2.4)	▲
2 Russian Federation	53 (2.4)	▲
2 Portugal	52 (2.3)	▲
Sweden	52 (2.5)	▲
Japan	51 (2.1)	▲
3 Singapore	51 (1.8)	▲
Austria	50 (2.3)	▲
Germany	50 (2.3)	▲
Hungary	49 (2.4)	▲
Malta	49 (2.3)	▲
† Belgium (Flemish)	48 (2.1)	▲
Croatia	46 (3.3)	▲
Spain	46 (2.2)	▲
Chinese Taipei	44 (2.3)	▲
2 New Zealand	44 (2.5)	▲
2 Latvia	43 (2.2)	▲
2 Kazakhstan	43 (2.5)	▲
1 2 Canada	43 (1.6)	▲
2 Slovak Republic	42 (2.3)	▲
≡ Netherlands	41 (2.6)	
2 Serbia	41 (2.2)	
Bahrain	40 (1.7)	
Ireland	40 (2.4)	
Cyprus	40 (2.2)	
† Northern Ireland	39 (2.2)	
France	37 (2.4)	
Italy	37 (2.4)	
Czech Republic	37 (2.5)	
International Average	**37 (0.3)**	
2 England	36 (2.6)	
Poland	34 (2.2)	
† Denmark	34 (2.4)	
Armenia	33 (2.2)	
United Arab Emirates	30 (1.0)	▽
Bulgaria	30 (2.4)	▽
Chile	30 (1.8)	▽
Montenegro	28 (1.8)	▽
Albania	28 (2.3)	▽
1 Georgia	27 (2.1)	▽
Bosnia and Herzegovina	26 (1.8)	▽
Qatar	25 (2.0)	▽
† Hong Kong SAR	24 (2.0)	▽
2 Saudi Arabia	20 (1.7)	▽
Oman	19 (1.5)	▽
Azerbaijan	18 (1.6)	▽
South Africa (5)	17 (1.3)	▽
North Macedonia	17 (2.4)	▽
2 Kosovo	15 (1.4)	▽
Morocco	15 (1.8)	▽
Kuwait	15 (1.6)	▽
Iran, Islamic Rep. of	15 (1.6)	▽
2 Pakistan	8 (1.7)	▽
2 Philippines	4 (1.1)	▽

Benchmarking Participants

Moscow City, Russian Fed.	58 (2.1)	▲
Madrid, Spain	53 (2.5)	▲
Quebec, Canada	48 (2.5)	▲
2 Dubai, UAE	46 (1.8)	▲
2 Ontario, Canada	40 (3.0)	
Abu Dhabi, UAE	23 (1.5)	▽

The answer shown illustrates the type of response that would receive full credit (1 point).

▲ Percent significantly higher than international average
▽ Percent significantly lower than international average

See Appendix B.2 for population coverage notes 1, 2, and 3. See Appendix B.5 for sampling guidelines and sampling participation notes †, ‡, and ≡.
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