


Exhibit 2.13: Description of the TIMSS 2019 Advanced International Benchmark (625) of Science Achievement

Advanced International Benchmark
625 Summary

Students communicate their understanding of life, physical, and Earth sciences and demonstrate some knowledge of the process of scientific inquiry. Students demonstrate knowledge of characteristics and life processes of a variety of organisms. They can communicate understanding of relationships in ecosystems and interactions between organisms and their environment. They communicate understanding of properties and states of matter and physical and chemical changes. Students communicate understanding of Earth's physical characteristics, processes, and history and show knowledge of Earth's revolution and rotation.

Students demonstrate knowledge of characteristics and life processes of a variety of organisms. Students communicate understanding of relationships in ecosystems and interactions between organisms and their environment, such as explaining adaptations and identifying animals that compete for food. They can evaluate experimental designs to test how light and water affect the growth of plants.

Students communicate understanding of properties and states of matter and of physical and chemical changes. In the context of investigations, students can explain what makes a solid dissolve faster in water, can evaluate methods for separating mixtures of solids, and understand what is important when designing a fair test.

Students communicate understanding of Earth's physical characteristics, processes, and history. For example, they can relate two different environments to the weathering of rocks and recognize how fish fossils are formed. Students show knowledge of Earth's revolution and can describe how the Earth's rotation causes day and night.

Students demonstrate basic knowledge and skills related to scientific inquiry and can recognize how to set up a simple experiment. They can draw conclusions from descriptions and diagrams and from results of experiments.



Exhibit 2.13.1: Advanced International Benchmark of Science Achievement – Example Item 1

Content Domain: Life Science
Cognitive Domain: Applying
Description: Uses a food web to determine which animals are competitors

Country	Percent Full Credit	
Bulgaria	69 (2.3)	▲
Korea, Rep. of	56 (2.3)	▲
³ Singapore	54 (2.0)	▲
Chinese Taipei	45 (2.2)	▲
Sweden	45 (2.6)	▲
[†] Norway (5)	44 (2.2)	▲
Finland	43 (1.7)	▲
² Slovak Republic	42 (2.3)	▲
² Serbia	40 (2.7)	▲
^{2†} United States	40 (1.8)	▲
[†] Hong Kong SAR	40 (2.6)	▲
[†] Denmark	40 (2.4)	▲
[†] Northern Ireland	39 (2.8)	▲
Austria	38 (2.9)	▲
Germany	38 (2.3)	▲
Australia	37 (2.3)	▲
² England	37 (2.7)	▲
Japan	37 (1.9)	▲
² Russian Federation	37 (2.4)	▲
Poland	37 (2.2)	▲
France	36 (2.8)	▲
Bahrain	35 (1.8)	▲
Ireland	35 (2.1)	▲
Czech Republic	34 (2.2)	▲
Spain	34 (1.7)	▲
Malta	33 (2.1)	▲
Italy	31 (2.6)	▲
Hungary	31 (2.0)	▲
² New Zealand	31 (1.6)	▲
² Portugal	31 (2.2)	▲
^{1,2} Canada	31 (1.9)	▲
International Average	30 (0.3)	
Cyprus	30 (2.5)	▲
[†] Belgium (Flemish)	29 (2.2)	▲
United Arab Emirates	28 (1.1)	▼
[≡] Netherlands	27 (2.1)	▲
² Latvia	27 (2.1)	▲
Montenegro	26 (2.1)	▼
Croatia	26 (2.0)	▼
² Lithuania	26 (2.3)	▼
Chile	24 (2.0)	▼
Albania	22 (2.4)	▼
Armenia	22 (1.8)	▼
Oman	22 (2.0)	▼
Iran, Islamic Rep. of	22 (1.8)	▼
² Turkey (5)	20 (1.7)	▼
² Saudi Arabia	20 (1.4)	▼
Qatar	19 (2.1)	▼
Morocco	16 (2.0)	▼
¹ Georgia	16 (2.2)	▼
Bosnia and Herzegovina	15 (1.5)	▼
Kuwait	15 (1.9)	▼
South Africa (5)	15 (1.1)	▼
Azerbaijan	14 (1.4)	▼
² Kazakhstan	13 (1.6)	▼
North Macedonia	13 (1.8)	▼
² Pakistan	10 (2.3)	▼
² Philippines	6 (0.9)	▼
² Kosovo	5 (1.3)	▼
Benchmarking Participants		
Moscow City, Russian Fed.	52 (2.7)	▲
² Dubai, UAE	41 (2.0)	▲
Madrid, Spain	36 (2.3)	▲
² Ontario, Canada	32 (3.6)	▲
Quebec, Canada	30 (2.2)	▲
Abu Dhabi, UAE	19 (1.3)	▼

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

The picture below shows a food web in a forest ecosystem.

Based on what you see in the food web above, which two animals compete with each other for food?

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

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.

Exhibit 2.13.2: Advanced International Benchmark of Science Achievement – Example Item 2

Content Domain: Physical Science

Cognitive Domain: Reasoning

Description: Part A - Recognizes set-ups that will more quickly dissolve a solid in water

Country	Percent Full Credit
² Latvia	74 (2.0) ▲
Chinese Taipei	69 (2.0) ▲
Poland	61 (2.1) ▲
Japan	59 (1.9) ▲
Korea, Rep. of	57 (2.1) ▲
² Serbia	55 (2.6) ▲
Finland	54 (2.2) ▲
² Russian Federation	52 (2.0) ▲
² Lithuania	52 (2.5) ▲
† Belgium (Flemish)	50 (2.0) ▲
² Slovak Republic	49 (2.7) ▲
³ Singapore	48 (1.8) ▲
Sweden	46 (2.6) ▲
† Hong Kong SAR	45 (2.6) ▲
Czech Republic	44 (2.3) ▲
Ireland	44 (2.5) ▲
Hungary	44 (2.3) ▲
≡ Netherlands	43 (2.6) ▲
Bulgaria	43 (2.4) ▲
† Norway (5)	43 (2.6) ▲
† Denmark	42 (2.4) ▲
^{1,2} Canada	42 (1.6) ▲
Croatia	41 (2.2)
Germany	41 (2.0) ▲
Australia	41 (1.8) ▲
† Northern Ireland	41 (2.6)
Italy	40 (2.3)
Cyprus	40 (2.3)
² Portugal	38 (2.2)
² New Zealand	37 (1.9)
International Average	37 (0.3)
Austria	37 (2.1)
Albania	36 (2.6)
² England	36 (2.6)
Malta	34 (2.2)
France	32 (2.5) ▼
Spain	32 (2.4) ▼
Armenia	32 (2.0) ▼
^{2†} United States	31 (1.6) ▼
² Turkey (5)	30 (1.8) ▼
Bahrain	30 (2.1) ▼
Chile	29 (2.0) ▼
Azerbaijan	28 (2.1) ▼
North Macedonia	28 (2.9) ▼
² Kazakhstan	28 (2.0) ▼
United Arab Emirates	27 (0.8) ▼
Bosnia and Herzegovina	27 (1.8) ▼
Montenegro	26 (1.9) ▼
¹ Georgia	25 (2.5) ▼
Qatar	24 (1.7) ▼
Oman	22 (1.8) ▼
Kuwait	21 (1.7) ▼
² Philippines	19 (1.6) ▼
² Saudi Arabia	18 (1.4) ▼
² Kosovo	17 (1.7) ▼
Morocco	15 (2.2) ▼
South Africa (5)	14 (1.2) ▼
Iran, Islamic Rep. of	13 (1.5) ▼
² Pakistan	9 (1.9) ▼
Benchmarking Participants	
Moscow City, Russian Fed.	58 (2.2) ▲
Quebec, Canada	43 (2.5) ▲
Madrid, Spain	43 (2.8) ▲
² Ontario, Canada	42 (2.9)
² Dubai, UAE	36 (1.8)
Abu Dhabi, UAE	21 (1.4) ▼

- ▲ 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.

Karl is investigating ways to make the same amount of sugar dissolve quickly in water. He sets up three tests.

A. For each of the tests, click the circle under the set-up that will dissolve the sugar faster.

Test 1
different temperature

Test 2
one stirred

Test 3
different cube sizes

B. Why is it important that the amount of water in each beaker is the same?

To make sure the amount of water did not change the test. Different amounts of water would not make the test fair.

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

Exhibit 2.13.3: Advanced International Benchmark of Science Achievement – Example Item 3

Content Domain: Physical Science

Cognitive Domain: Reasoning

Description: Part B - Explains the importance of controlling a variable in an experiment

Country	Percent Full Credit
³ Singapore	66 (1.7) ▲
² England	53 (3.3) ▲
Japan	49 (2.0) ▲
Korea, Rep. of	48 (2.3) ▲
² Russian Federation	40 (2.5) ▲
Australia	38 (1.5) ▲
Ireland	35 (2.5) ▲
Finland	34 (2.1) ▲
† Northern Ireland	32 (2.3) ▲
Chinese Taipei	30 (2.5) ▲
Cyprus	30 (1.9) ▲
Armenia	29 (2.3) ▲
≡ Netherlands	28 (2.4) ▲
Oman	28 (2.0) ▲
² Serbia	27 (2.4) ▲
² Turkey (5)	27 (1.8) ▲
Poland	25 (1.7) ▲
Albania	25 (2.2) ▲
† Belgium (Flemish)	24 (1.7) ▲
^{1,2} Canada	24 (1.5) ▲
Czech Republic	23 (1.7) ▲
Malta	23 (1.7) ▲
² Lithuania	23 (1.9) ▲
Germany	22 (1.9) ▲
Bahrain	22 (1.8) ▲
Spain	21 (2.2) ▲
Croatia	21 (1.9) ▲
International Average	21 (0.2)
Hungary	21 (1.7) ▲
† Hong Kong SAR	20 (2.6) ▲
² Latvia	20 (1.8) ▲
France	20 (1.7) ▲
² Kazakhstan	20 (1.9) ▲
² Slovak Republic	19 (1.6) ▲
^{2†} United States	19 (1.2) ▲
† Denmark	18 (1.9) ▲
Bulgaria	18 (1.6) ▲
Austria	18 (1.9) ▲
² New Zealand	16 (1.5) ▼
United Arab Emirates	16 (0.6) ▼
² Portugal	14 (1.6) ▼
Sweden	14 (1.8) ▼
Iran, Islamic Rep. of	13 (1.7) ▼
Qatar	12 (1.6) ▼
† Norway (5)	11 (1.6) ▼
Italy	10 (1.5) ▼
Bosnia and Herzegovina	10 (1.3) ▼
Azerbaijan	9 (1.1) ▼
North Macedonia	8 (1.4) ▼
Chile	8 (1.0) ▼
Kuwait	6 (1.1) ▼
Montenegro	6 (0.9) ▼
² Pakistan	5 (1.6) ▼
¹ Georgia	5 (1.2) ▼
South Africa (5)	5 (1.0) ▼
² Saudi Arabia	4 (0.8) ▼
² Kosovo	4 (0.9) ▼
Morocco	4 (0.8) ▼
² Philippines	1 (0.3) ▼
Benchmarking Participants	
² Dubai, UAE	35 (1.9) ▲
Madrid, Spain	27 (2.1) ▲
² Ontario, Canada	24 (2.5) ▲
Moscow City, Russian Fed.	20 (2.2) ▲
Quebec, Canada	19 (2.0) ▲
Abu Dhabi, UAE	7 (0.7) ▼

- ▲ 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.

Karl is investigating ways to make the same amount of sugar dissolve quickly in water. He sets up three tests.

A. For each of the tests, click the circle under the set-up that will dissolve the sugar faster.

Test 1
different temperature

Test 2
one stirred

Test 3
different cube sizes

B. Why is it important that the amount of water in each beaker is the same?

To make sure the amount of water did not change the test. Different amounts of water would not make the test fair.

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

Exhibit 2.13.4: Advanced International Benchmark of Science Achievement – Example Item 4

Content Domain: Earth Science

Cognitive Domain: Applying

Description: Places the Earth in a model to show its position relative to the Sun when a labeled city is experiencing summer

Country	Percent Full Credit
Chinese Taipei	59 (2.6) ▲
Sweden	55 (2.7) ▲
² Russian Federation	54 (2.4) ▲
³ Singapore	53 (2.3) ▲
† Norway (5)	52 (2.4) ▲
² England	48 (2.4) ▲
² Latvia	47 (2.2) ▲
Finland	47 (2.5) ▲
² Lithuania	47 (2.1) ▲
Korea, Rep. of	46 (2.4) ▲
² Slovak Republic	45 (2.4) ▲
Ireland	44 (2.5) ▲
^{2†} United States	44 (1.5) ▲
Germany	43 (2.2) ▲
Australia	43 (2.7) ▲
† Denmark	42 (2.6) ▲
Poland	41 (2.4) ▲
Croatia	41 (3.2) ▲
United Arab Emirates	41 (1.1) ▲
Hungary	40 (2.5)
† Hong Kong SAR	40 (2.1)
Czech Republic	40 (2.6)
² Turkey (5)	40 (2.4)
Bulgaria	40 (2.3)
France	39 (2.2)
¹² Canada	39 (1.4)
Austria	39 (2.4)
† Belgium (Flemish)	38 (2.5)
² New Zealand	38 (1.8)
† Northern Ireland	37 (2.6)
≡ Netherlands	37 (2.5)
Japan	37 (2.0)
² Portugal	36 (2.2)
International Average	36 (0.3)
² Kazakhstan	36 (2.3)
² Serbia	35 (2.3)
¹ Georgia	35 (2.6)
Italy	33 (2.3)
Qatar	32 (2.3)
Malta	31 (2.2) ▼
Spain	30 (2.0) ▼
Chile	28 (2.0) ▼
Albania	27 (2.7) ▼
Armenia	27 (2.1) ▼
Oman	27 (1.8) ▼
² Saudi Arabia	27 (1.7) ▼
Bahrain	27 (1.7) ▼
Kuwait	26 (2.1) ▼
Bosnia and Herzegovina	26 (1.6) ▼
Azerbaijan	26 (1.8) ▼
Cyprus	26 (2.2) ▼
South Africa (5)	26 (1.3) ▼
Morocco	24 (2.0) ▼
² Kosovo	23 (2.3) ▼
² Pakistan	22 (2.4) ▼
North Macedonia	21 (2.2) ▼
² Philippines	21 (1.9) ▼
Montenegro	18 (1.6) ▼
Iran, Islamic Rep. of	15 (1.7) ▼
Benchmarking Participants	
Moscow City, Russian Fed.	69 (2.6) ▲
² Dubai, UAE	53 (1.8) ▲
Quebec, Canada	42 (2.5) ▲
² Ontario, Canada	36 (2.6)
Madrid, Spain	35 (2.3)
Abu Dhabi, UAE	33 (2.0)

▲ 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.

Earth's seasons are caused by the tilt of its axis.

It is summer in City A. In what position is the Earth when it is summer in City A?

Drag the Earth to the position that shows it is summer in City A.

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