

Exhibit 4.18: Differences in Achievement for Science Cognitive Domains Across Assessment Years[◇]

Read across the row to determine if the performance in the row year is significantly higher (▲) or significantly lower (▽) than the performance in the column year.

Country	Average Scale Score	Knowing			Average Scale Score	Applying			Average Scale Score	Reasoning		
		Differences Between Years				Differences Between Years				Differences Between Years		
		2015	2011	2007		2015	2011	2007		2015	2011	2007
Australia												
2019	515 (3.5)	4	1	10 ▲	532 (3.4)	20 ▲	15 ▲	21 ▲	536 (3.1)	23 ▲	9	5
2015	510 (2.7)		-4	6	512 (2.9)		-5	1	513 (2.8)		-14 ▽	-18 ▽
2011	514 (5.1)			9	517 (4.5)			6	526 (5.0)			-4
2007	505 (3.7)				511 (3.7)				530 (4.1)			
Bahrain												
2019	493 (2.0)	31 ▲	35 ▲	25 ▲	481 (2.6)	17 ▲	31 ▲	15 ▲	482 (2.4)	16 ▲	33 ▲	18 ▲
2015	462 (2.5)		4	-6	464 (2.4)		15 ▲	-1	466 (2.8)		18 ▲	3
2011	457 (3.7)			-10 ▽	450 (2.1)			-16 ▽	449 (2.0)			-15 ▽
2007	468 (2.2)				465 (2.2)				464 (2.4)			
Chile												
2019	463 (3.3)	-3	-12 ▽		462 (3.0)	16 ▲	8 ▲		458 (3.1)	9	-2	
2015	466 (3.2)		-10 ▽		446 (3.0)		-7		448 (3.6)		-11 ▽	
2011	476 (3.1)				454 (2.3)				459 (2.7)			
Chinese Taipei												
2019	600 (2.4)	11 ▲	31 ▲	26 ▲	567 (2.1)	1	-3	3	559 (2.1)	-2	8 ▲	15 ▲
2015	589 (2.3)		20 ▲	15 ▲	565 (2.0)		-5	2	560 (2.0)		9 ▲	16 ▲
2011	569 (2.6)			-5	570 (2.6)			6	551 (2.9)			7
2007	574 (3.9)				564 (3.7)				544 (4.0)			
Cyprus												
2019	482 (3.0)			44 ▲	477 (1.9)			24 ▲	488 (2.3)			35 ▲
2007	438 (3.1)				454 (2.4)				453 (2.7)			
Egypt												
² 2019	396 (5.9)	24 ▲		-33 ▽	384 (5.7)	13		-14 ▽	378 (5.7)	19 ▲		-7
2015	372 (5.2)			-57 ▽	371 (4.4)			-27 ▽	359 (4.8)			-26 ▽
2007	429 (4.1)				398 (3.8)				385 (3.7)			
England												
2019	520 (5.0)	-3	-14	-17 ▽	515 (5.1)	-24 ▽	-17 ▽	-25 ▽	513 (5.0)	-31 ▽	-24 ▽	-35 ▽
2015	523 (4.1)		-11	-14 ▽	538 (3.9)		7	-1	545 (4.0)		8	-4
[‡] 2011	533 (5.1)			-3	531 (4.7)			-8	537 (4.9)			-12
[†] 2007	536 (5.2)				540 (4.3)				548 (4.6)			
Finland												
2019	545 (3.2)		-20 ▽		537 (3.3)		-12 ▽		548 (3.4)		0	
2011	564 (3.0)				549 (2.5)				547 (3.4)			
Georgia												
¹ 2019	459 (4.1)	6	31 ▲	21 ▲	440 (3.7)	-2	22 ▲	22 ▲	436 (4.2)	4	24 ▲	51 ▲
^{1,2} 2015	452 (3.3)		25 ▲	15 ▲	442 (3.1)		24 ▲	24 ▲	432 (3.5)		20 ▲	47 ▲
¹ 2011	428 (3.9)			-10	418 (3.8)			0	412 (3.7)			27 ▲
¹ 2007	438 (5.3)				418 (4.6)				385 (5.0)			
Hong Kong SAR												
[†] 2019	501 (5.7)	-46 ▽	-43 ▽	-36 ▽	501 (5.2)	-39 ▽	-27 ▽	-21 ▽	504 (5.2)	-47 ▽	-34 ▽	-31 ▽
2015	547 (3.7)		3	10	541 (4.3)		12 ▲	18 ▲	550 (4.4)		12 ▲	15 ▲
2011	544 (3.2)			7	529 (3.4)			6	538 (4.0)			3
[†] 2007	537 (4.8)				522 (5.1)				535 (5.6)			
Hungary												
2019	537 (3.0)	12 ▲	27 ▲	8	528 (3.1)	0	-4	-23 ▽	524 (3.1)	0	6	-6
2015	525 (3.5)		14 ▲	-5	528 (3.4)		-4	-23 ▽	524 (3.8)		6	-6
2011	511 (3.2)			-19 ▽	532 (3.5)			-19 ▽	518 (3.3)			-12 ▽
2007	530 (3.2)				551 (3.2)				530 (3.4)			
Iran, Islamic Rep. of												
2019	449 (4.1)	-7	-30 ▽	-19 ▽	452 (3.5)	-6	-18 ▽	0	444 (4.4)	-10	-31 ▽	-12 ▽
2015	455 (4.8)		-24 ▽	-13 ▽	457 (4.0)		-13 ▽	6	454 (4.0)		-22 ▽	-2
2011	479 (4.6)			11	470 (3.9)			18 ▲	475 (3.8)			19 ▲
2007	468 (4.1)				452 (4.0)				456 (4.0)			
Ireland												
2019	513 (3.0)	-10 ▽			521 (3.4)	-12 ▽			534 (3.4)	2		
2015	523 (3.2)				533 (3.0)				532 (3.0)			
Israel												
³ 2019	514 (4.6)	11	-4		509 (4.3)	5	-3		518 (4.6)	7	-1	
³ 2015	503 (4.3)		-15 ▽		504 (3.8)		-8		511 (4.4)		-8	
³ 2011	518 (4.2)				512 (4.0)				519 (4.4)			

▲ Average from more recent year significantly higher
 ▽ Average from more recent year significantly lower

[◇] Trend reporting in cognitive domains using current methodology began with TIMSS 2007.

See Appendix B.7 for target population coverage notes 1, 2, and 3. See Appendix B.10 for sampling guidelines and sampling participation notes †, ‡, and ≡.

() Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.

Exhibit 4.18: Differences in Achievement for Science Cognitive Domains Across Assessment Years^o

(Continued)

Country	Average Scale Score	Knowing			Average Scale Score	Applying			Average Scale Score	Reasoning		
		Differences Between Years				Differences Between Years				Differences Between Years		
		2015	2011	2007		2015	2011	2007		2015	2011	2007
Italy												
2019	507 (2.6)	3	-5	11 ▲	499 (3.4)	2	-1	2	495 (4.0)	2	7	6
² 2015	505 (2.6)		-8 ▽	8	496 (2.4)		-4	-1	493 (2.8)		4	4
2011	512 (2.7)			16 ▲	500 (2.3)			3	489 (2.6)			-1
2007	496 (3.6)				497 (2.9)				489 (3.1)			
Japan												
2019	563 (2.4)	-5	22 ▲	21 ▲	576 (2.3)	1	15 ▲	19 ▲	570 (2.5)	0	3	7 ▲
2015	567 (2.2)		27 ▲	26 ▲	575 (1.9)		14 ▲	18 ▲	570 (2.1)		3	7 ▲
2011	541 (2.7)			-1	561 (2.6)			4	568 (2.4)			4
2007	542 (2.4)				556 (2.1)				564 (2.3)			
Jordan												
2019	455 (5.3)	25 ▲	2	-36 ▽	453 (4.9)	28 ▲	2	-31 ▽	443 (4.8)	23 ▲	1	-24 ▽
2015	430 (3.3)		-23 ▽	-62 ▽	425 (3.3)		-26 ▽	-59 ▽	419 (3.6)		-22 ▽	-47 ▽
2011	453 (4.4)			-39 ▽	451 (4.0)			-33 ▽	441 (4.3)			-25 ▽
2007	492 (4.8)				484 (4.3)				466 (4.2)			
Kazakhstan												
² 2019	463 (3.7)		-19 ▽		481 (3.4)		-10		482 (3.5)		-5	
2011	483 (4.9)				491 (4.1)				487 (4.4)			
Korea, Rep. of												
2019	558 (2.6)	3	4	8 ▲	560 (2.4)	8 ▲	-1	10 ▲	564 (2.3)	4	0	3
2015	555 (2.9)		2	6	552 (2.2)		-9 ▽	2	560 (2.8)		-3	-1
2011	554 (3.0)			4	561 (2.1)			11 ▲	564 (2.3)			2
2007	550 (2.3)				550 (2.4)				561 (2.3)			
Lebanon												
2019	388 (4.4)	-15 ▽	7	-13	375 (5.2)	-23 ▽	-33 ▽	-43 ▽	346 (5.2)	-36 ▽	-62 ▽	-64 ▽
2015	403 (5.9)		22 ▲	2	398 (5.3)		-10	-20 ▽	381 (6.3)		-27 ▽	-29 ▽
2011	381 (5.7)			-20 ▽	408 (5.2)			-10	408 (5.7)			-2
2007	401 (6.3)				418 (6.1)				410 (6.6)			
Lithuania												
2019	527 (3.1)	14 ▲	12 ▲	10 ▲	530 (3.0)	14 ▲	18 ▲	17 ▲	541 (3.2)	15 ▲	28 ▲	14 ▲
² 2015	513 (3.1)		-2	-4	517 (3.4)		4	4	525 (3.2)		13 ▲	-2
¹ 2011	516 (2.4)			-1	512 (2.3)			-1	513 (2.8)			-14 ▽
¹ 2007	517 (2.5)				513 (2.4)				527 (2.7)			
Malaysia												
2019	442 (3.9)	-23 ▽	39 ▲	-16 ▽	473 (3.4)	-3	49 ▲	3	459 (3.7)	-8	20 ▲	-24 ▽
2015	466 (5.1)		63 ▲	8	476 (4.2)		52 ▲	6	467 (3.9)		28 ▲	-15 ▽
2011	403 (7.1)			-55 ▽	424 (6.2)			-46 ▽	439 (6.0)			-44 ▽
2007	458 (6.8)				470 (6.2)				483 (5.5)			
Morocco												
2019	380 (3.1)	-15 ▽	17 ▲		393 (2.9)	2	13 ▲		398 (2.8)	13 ▲	31 ▲	
2015	395 (2.3)		32 ▲		391 (2.8)		11 ▲		385 (2.6)		18 ▲	
2011	363 (2.8)				381 (2.0)				366 (2.3)			
New Zealand												
[†] 2019	480 (3.6)	-23 ▽	-32 ▽		503 (3.8)	-11 ▽	-7		510 (3.5)	-10 ▽	-6	
[†] 2015	503 (3.2)		-8		513 (3.5)		4		520 (3.3)		4	
2011	511 (5.0)				509 (4.4)				515 (4.7)			
Norway (9)												
[†] 2019	497 (2.5)	-3			493 (3.5)	-14 ▽			494 (3.6)	-24 ▽		
2015	500 (3.1)				507 (2.9)				518 (3.0)			
Oman												
2019	461 (3.3)	7	45 ▲	36 ▲	456 (3.4)	3	37 ▲	37 ▲	450 (3.0)	-4	33 ▲	31 ▲
2015	455 (2.9)		38 ▲	30 ▲	454 (2.9)		34 ▲	34 ▲	454 (2.4)		37 ▲	36 ▲
2011	416 (3.4)			-8	419 (3.4)			0	417 (3.0)			-2
2007	425 (3.5)				419 (3.6)				419 (3.8)			
Qatar												
2019	487 (4.2)	39 ▲	69 ▲		469 (4.5)	10	49 ▲		464 (4.6)	10	55 ▲	
2015	448 (3.6)		30 ▲		460 (3.6)		40 ▲		454 (3.2)		45 ▲	
2011	418 (4.5)				420 (3.7)				409 (4.6)			
Romania												
2019	475 (4.4)		18 ▲	24 ▲	467 (4.2)		-1	-1	464 (4.4)		4	11
2011	457 (4.3)			6	468 (3.6)			0	460 (3.7)			7
2007	451 (4.3)				468 (3.7)				453 (3.8)			

▲ Average from more recent year significantly higher
 ▽ Average from more recent year significantly lower

Exhibit 4.18: Differences in Achievement for Science Cognitive Domains Across Assessment Years^o

(Continued)

Country	Average Scale Score	Knowing			Average Scale Score	Applying			Average Scale Score	Reasoning		
		Differences Between Years				Differences Between Years				Differences Between Years		
		2015	2011	2007		2015	2011	2007		2015	2011	2007
Russian Federation												
² 2019	543 (4.7)	-14 ▽	-14 ▽	3	543 (4.5)	4	4	15 ▲	543 (4.5)	5	10	24 ▲
2015	558 (5.2)		1	17 ▲	538 (4.6)		0	11	538 (3.9)		5	18 ▲
² 2011	557 (3.8)			16 ▲	539 (3.3)			12 ▲	533 (3.2)			13 ▲
2007	541 (4.4)				527 (4.0)				519 (4.0)			
Singapore												
² 2019	621 (4.2)	27 ▲	33 ▲	59 ▲	608 (4.1)	8	19 ▲	38 ▲	595 (4.0)	0	2	26 ▲
² 2015	594 (3.4)		6	32 ▲	600 (3.4)		11 ▲	30 ▲	595 (3.2)		2	26 ▲
² 2011	588 (4.9)			26 ▲	589 (4.4)			19 ▲	592 (4.4)			24 ▲
2007	561 (4.9)				570 (4.5)				568 (4.5)			
South Africa (9)												
^ψ 2019	361 (3.2)	24 ▲	79 ▲		377 (2.9)	9	42 ▲		362 (3.0)	11	23 ▲	
2015	337 (6.7)		55 ▲		368 (5.9)		33 ▲		350 (5.6)		12	
^ψ 2011	282 (4.1)				335 (3.5)				338 (5.0)			
Sweden												
² 2019	521 (3.2)	2	10 ▲	14 ▲	518 (3.3)	0	10 ▲	9 ▲	524 (3.8)	-3	14 ▲	7
2015	519 (3.2)		8	12 ▲	518 (3.5)		10 ▲	9 ▲	526 (4.0)		17 ▲	10 ▲
2011	512 (2.5)			4	508 (2.7)			-1	510 (3.0)			-6
2007	508 (2.6)				509 (2.8)				516 (2.9)			
Turkey												
2019	506 (4.2)	17 ▲	16 ▲		515 (3.9)	22 ▲	37 ▲		524 (4.0)	29 ▲	41 ▲	
2015	489 (4.5)		-1		492 (3.9)		15 ▲		495 (4.2)		12 ▲	
2011	490 (3.7)				478 (3.4)				483 (3.3)			
United Arab Emirates												
2019	482 (2.7)	4	11 ▲		472 (2.2)	-6	8 ▲		461 (2.2)	-12 ▽	5	
2015	478 (2.5)		7		478 (2.4)		14 ▲		473 (2.4)		17 ▲	
2011	471 (2.4)				464 (2.1)				456 (2.5)			
United States												
[†] 2019	515 (4.6)	-17 ▽	-12 ▽	-1	523 (4.8)	-8	1	6	528 (4.7)	2	5	0
[†] 2015	532 (3.4)		5	16 ▲	531 (2.8)		9 ▲	14 ▲	526 (2.8)		3	-2
² 2011	527 (2.8)			11 ▲	522 (2.3)			5	524 (2.5)			-5
^{2†} 2007	516 (3.2)				517 (2.9)				529 (3.0)			
Benchmarking Participants												
Ontario, Canada												
2019	505 (3.3)	-9 ▽	-8	-10 ▽	523 (3.5)	-2	5	-1	533 (3.7)	1	0	-10
2015	514 (2.6)		1	-1	525 (2.4)		7 ▲	1	532 (2.6)		0	-10 ▽
² 2011	513 (2.8)			-2	518 (2.4)			-6	532 (3.0)			-10
² 2007	515 (3.6)				524 (3.8)				542 (4.2)			
Quebec, Canada												
[‡] 2019	529 (3.6)	2	9 ▲	30 ▲	538 (4.2)	13 ▲	20 ▲	37 ▲	540 (4.1)	5	19 ▲	18 ▲
[≡] 2015	527 (5.1)		7	28 ▲	524 (4.6)		7	24 ▲	535 (4.5)		13 ▲	13 ▲
2011	519 (2.8)			20 ▲	518 (2.9)			17 ▲	522 (3.1)			-1
³ 2007	499 (3.3)				500 (3.4)				523 (3.3)			
Abu Dhabi, UAE												
2019	422 (4.3)	-31 ▽	-44 ▽		421 (3.5)	-36 ▽	-40 ▽		412 (3.6)	-42 ▽	-43 ▽	
2015	453 (6.1)		-13		457 (5.9)		-4		454 (5.7)		-1	
2011	466 (4.2)				461 (3.9)				455 (4.3)			
Dubai, UAE												
² 2019	560 (2.3)	33 ▲	68 ▲	65 ▲	545 (2.5)	19 ▲	59 ▲	57 ▲	538 (2.3)	18 ▲	59 ▲	60 ▲
2015	527 (2.5)		35 ▲	32 ▲	525 (2.2)		39 ▲	37 ▲	521 (2.0)		41 ▲	43 ▲
2011	492 (2.9)			-4	486 (2.8)			-2	479 (2.6)			1
[‡] 2007	496 (3.5)				488 (3.0)				478 (3.5)			

▲ Average from more recent year significantly higher
 ▽ Average from more recent year significantly lower

^ψ Reservations about reliability because the percentage of students with achievement too low for estimation exceeds 15% but does not exceed 25%.