

Exhibit 2.15: Differences in Achievement for Science Content 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	Life Science				Physical Science				Earth Science			
	Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years		
		2015	2011	2007		2015	2011	2007		2015	2011	2007
Armenia												
2019	476 (3.2)	31 ▲	51 ▲		454 (3.4)	18 ▲	55 ▲		451 (3.8)	16 ▲	53 ▲	
2015	444 (3.9)		20 ▲		436 (4.3)		37 ▲		435 (4.1)		37 ▲	
2011	424 (3.9)				399 (3.9)				398 (4.1)			
Australia												
2019	539 (2.8)	8	23 ▲	10 ▲	526 (2.7)	10 ▲	12 ▲	5	527 (2.8)	7	7	-9
2015	531 (3.0)		15 ▲	2	516 (2.7)		2	-5	520 (3.3)		0	-16 ▽
2011	516 (3.1)			-14 ▽	514 (3.1)			-7	520 (3.6)			-17 ▽
2007	529 (3.6)				521 (3.8)				536 (4.2)			
Austria												
2019	523 (2.3)		-3	-4	519 (2.6)		-16 ▽	3	524 (3.5)		-15 ▽	-11 ▽
2011	526 (2.8)			-2	535 (2.8)			18 ▲	539 (3.5)			4
2007	528 (2.4)				517 (3.0)				535 (2.6)			
Azerbaijan												
2019	423 (3.4)		-17 ▽		427 (3.3)		-9		424 (4.7)		16	
² 2011	440 (5.3)				436 (6.0)				408 (7.3)			
Bahrain												
2019	492 (3.6)	37 ▲	48 ▲		496 (3.8)	31 ▲	44 ▲		478 (4.0)	30 ▲	33 ▲	
² 2015	455 (2.9)		11 ▲		465 (3.2)		12 ▲		448 (3.2)		3	
2011	444 (4.2)				453 (4.6)				445 (3.7)			
Belgium (Flemish)												
[†] 2019	500 (2.5)	-13 ▽	-10 ▽		502 (2.3)	-4	-5		496 (2.2)	-16 ▽	-8 ▽	
[†] 2015	513 (2.4)		3		506 (3.2)		-1		513 (2.8)		8	
2011	510 (2.5)				507 (2.1)				505 (2.9)			
Bulgaria												
2019	525 (5.2)	-17 ▽			518 (6.4)	-11			514 (4.8)	-18 ▽		
2015	542 (6.3)				529 (6.5)				532 (6.9)			
Canada												
¹² 2019	532 (1.9)	-4			513 (1.8)	-5			519 (2.2)	6		
^{12†} 2015	536 (2.8)				518 (2.7)				513 (3.1)			
Chile												
2019	478 (2.5)	-9 ▽	-12 ▽		458 (3.8)	-8	-13 ▽		460 (4.3)	-5	-15 ▽	
2015	487 (2.6)		-2		466 (2.9)		-5		465 (3.4)		-10 ▽	
2011	490 (2.2)				471 (2.5)				475 (2.8)			
Chinese Taipei												
2019	540 (2.0)	-4	2	-7	573 (1.9)	5	5	9 ▲	568 (1.8)	13 ▲	15 ▲	5
2015	545 (2.0)		7 ▲	-2	568 (2.0)		0	5	555 (2.5)		3	-8 ▽
2011	538 (2.5)			-9 ▽	569 (2.1)			5	553 (2.6)			-10 ▽
2007	547 (2.7)				564 (2.4)				563 (2.9)			
Croatia												
2019	520 (2.3)	-11 ▽	-5		528 (2.4)	-8 ▽	26 ▲		523 (3.0)	-12 ▽	2	
2015	531 (2.6)		6		535 (2.9)		33 ▲		535 (3.4)		14 ▲	
² 2011	525 (2.0)				502 (2.7)				521 (2.7)			
Cyprus												
2019	515 (3.3)	34 ▲			511 (3.2)	25 ▲			500 (2.7)	37 ▲		
2015	481 (2.8)				486 (2.7)				463 (3.5)			
Czech Republic												
2019	535 (2.2)	-3	-14 ▽	13 ▲	528 (2.5)	-3	9 ▲	19 ▲	536 (3.0)	4	-2	22 ▲
2015	538 (2.0)		-12 ▽	16 ▲	531 (2.4)		11 ▲	22 ▲	531 (3.0)		-6	18 ▲
2011	550 (3.0)			27 ▲	519 (3.1)			10 ▲	537 (3.2)			24 ▲
2007	522 (3.4)				509 (3.5)				514 (3.6)			
Denmark												
[†] 2019	526 (2.2)	-8 ▽	-4	0	507 (2.3)	-9 ▽	-19 ▽	5	535 (2.7)	4	8 ▲	16 ▲
^{2†} 2015	534 (2.4)		4	7	516 (2.7)		-10 ▽	14 ▲	531 (3.0)		4	12 ▲
² 2011	530 (2.7)			3	526 (2.4)			24 ▲	527 (3.0)			8
[†] 2007	527 (3.4)				502 (3.1)				519 (3.3)			
England												
² 2019	537 (2.6)	1	7	2	537 (3.2)	-3	2	-9	533 (2.9)	5	11 ▲	-9 ▽
2015	536 (2.5)		6	0	540 (2.7)		5	-6	527 (3.3)		5	-14 ▽
2011	530 (3.0)			-6	535 (3.4)			-10 ▽	522 (3.8)			-19 ▽
2007	536 (3.1)				546 (3.2)				542 (3.4)			

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

◇ Trend reporting in content domains using current methodology began with TIMSS 2007.
 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 2.15: Differences in Achievement for Science Content Domains Across Assessment Years^o

(Continued)

Country	Life Science				Physical Science				Earth Science			
	Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years		
		2015	2011	2007		2015	2011	2007		2015	2011	2007
Finland												
2019	558 (2.9)	2	-16 ▽		544 (3.2)	-3	-24 ▽		563 (3.5)	3	-2	
2015	556 (2.6)		-18 ▽		547 (2.3)		-21 ▽		560 (2.6)		-5	
2011	574 (2.8)				568 (2.9)				566 (2.8)			
France												
2019	494 (3.1)	4			477 (3.1)	-4			488 (3.2)	4		
2015	490 (3.1)				482 (2.7)				485 (4.7)			
Georgia												
¹ 2019	457 (4.0)	-2	-4	36 ▲	452 (4.6)	15 ▲	12 ▲	50 ▲	435 (4.2)	-6	-23 ▽	18 ▲
¹ 2015	459 (4.1)		-2	37 ▲	438 (4.7)		-2	35 ▲	441 (4.3)		-17 ▽	25 ▲
¹ 2011	461 (3.7)			39 ▲	440 (4.2)			37 ▲	458 (4.2)			42 ▲
¹ 2007	421 (4.2)				403 (4.9)				416 (5.6)			
Germany												
2019	521 (2.3)	-7 ▽	-4	-9 ▽	518 (3.0)	-14 ▽	-17 ▽	-8	509 (4.0)	-10	-11 ▽	-15 ▽
2015	528 (2.0)		3	-3	532 (2.5)		-3	6	519 (4.0)		-1	-5
2011	525 (2.7)			-6	535 (3.1)			8	520 (3.8)			-4
2007	531 (2.2)				527 (3.2)				524 (2.8)			
Hong Kong SAR												
[†] 2019	523 (3.6)	-27 ▽	-1	-17 ▽	529 (3.5)	-26 ▽	-10	-33 ▽	549 (4.5)	-25 ▽	1	-19 ▽
[†] 2015	550 (3.7)		26 ▲	10	555 (3.5)		16 ▲	-7	574 (3.1)		26 ▲	6
² 2011	524 (3.9)			-16 ▽	539 (4.5)			-23 ▽	548 (3.4)			-20 ▽
2007	540 (3.8)				562 (3.9)				568 (4.2)			
Hungary												
2019	533 (3.4)	-17 ▽	-18 ▽	-19 ▽	524 (2.8)	-10 ▽	3	-5	531 (3.2)	-4	8	14 ▲
2015	550 (3.4)		-1	-2	534 (3.5)		13 ▲	5	535 (4.0)		11	18 ▲
2011	552 (3.4)			-1	520 (3.7)			-8	524 (4.4)			7
2007	553 (3.3)				529 (3.7)				517 (4.4)			
Iran, Islamic Rep. of												
2019	430 (4.5)	13 ▲	-19 ▽	-7	453 (4.7)	29 ▲	0	13 ▲	438 (4.2)	30 ▲	-19 ▽	22 ▲
2015	417 (4.5)		-31 ▽	-20 ▽	423 (5.0)		-30 ▽	-16 ▽	408 (4.8)		-49 ▽	-8
2011	449 (4.0)			11	453 (3.9)			13 ▲	457 (3.6)			40 ▲
2007	437 (5.1)				440 (4.8)				416 (5.0)			
Ireland												
2019	528 (3.5)	-3	15 ▲		523 (3.2)	-1	6		536 (3.8)	2	16 ▲	
2015	531 (2.4)		18 ▲		524 (2.8)		7		535 (3.0)		15 ▲	
2011	513 (3.5)				517 (3.0)				520 (3.8)			
Italy												
2019	514 (3.3)	-5	-21 ▽	-41 ▽	502 (3.4)	-11 ▽	-7	-18 ▽	507 (3.7)	-3	-16 ▽	-20 ▽
² 2015	519 (2.7)		-16 ▽	-36 ▽	513 (2.9)		4	-7	510 (3.5)		-13 ▽	-16 ▽
2011	535 (2.8)			-20 ▽	509 (3.1)			-11 ▽	523 (3.7)			-3
2007	555 (3.7)				520 (3.6)				527 (4.2)			
Japan												
2019	550 (2.0)	-6	10 ▲	14 ▲	579 (1.9)	-8 ▽	-11 ▽	7 ▲	559 (1.9)	-4	8 ▲	28 ▲
2015	556 (2.2)		16 ▲	20 ▲	587 (2.6)		-2	16 ▲	563 (2.5)		12 ▲	31 ▲
2011	540 (1.9)			4	589 (2.0)			18 ▲	551 (1.8)			20 ▲
2007	536 (2.3)				571 (2.8)				532 (3.5)			
Kazakhstan												
² 2019	486 (3.5)		-14 ▽		506 (3.3)		20 ▲		488 (3.2)		-3	
² 2011	500 (5.2)				486 (5.3)				491 (5.9)			
Korea, Rep. of												
2019	574 (2.5)	-7 ▽	3		607 (2.7)	9 ▲	10 ▲		587 (2.9)	-4	-16 ▽	
2015	581 (1.9)		11 ▲		597 (2.0)		1		591 (4.1)		-12 ▽	
2011	571 (2.2)				597 (2.6)				603 (2.0)			
Lithuania												
² 2019	537 (2.8)	10 ▲	16 ▲	18 ▲	547 (3.0)	12 ▲	33 ▲	36 ▲	525 (3.0)	9 ▲	24 ▲	16 ▲
² 2015	527 (3.0)		7	9 ▲	535 (2.5)		21 ▲	24 ▲	515 (3.7)		15 ▲	7
^{1,2} 2011	520 (3.0)			2	514 (3.1)			3	501 (3.0)			-8
¹ 2007	518 (2.2)				511 (2.1)				508 (2.8)			
Malta												
2019	499 (2.5)		61 ▲		492 (2.9)		39 ▲		491 (2.1)		45 ▲	
2011	439 (2.4)				453 (2.4)				447 (2.3)			

▲ Average from more recent year significantly higher

▽ Average from more recent year significantly lower

Exhibit 2.15: Differences in Achievement for Science Content Domains Across Assessment Years^o

(Continued)

Country	Life Science				Physical Science				Earth Science			
	Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years		
		2015	2011	2007		2015	2011	2007		2015	2011	2007
Morocco												
ψ 2019	364 (5.9)	13	119 ▲		379 (6.2)	22 ▲	122 ▲		350 (6.6)	60 ▲	141 ▲	
ψ 2015	350 (4.3)		106 ▲		357 (5.9)		101 ▲		289 (6.6)		81 ▲	
* 2011	245 (4.6)				256 (5.4)				208 (4.9)			
Netherlands												
≡ 2019	518 (3.3)	-7	-19 ▽	-21 ▽	516 (2.8)	12 ▲	-10 ▽	12 ▲	521 (3.5)	1	-4	-3
† 2015	525 (2.7)		-11 ▽	-14 ▽	504 (2.6)		-22 ▽	0	520 (3.0)		-5	-4
† 2011	537 (1.9)			-3	526 (2.0)			22 ▲	525 (2.8)			1
‡ 2007	539 (2.6)				503 (3.2)				524 (3.5)			
New Zealand												
² 2019	510 (2.3)	-1	13 ▲	4	492 (2.1)	-5	-1	-2	503 (3.1)	-2	5	-9 ▽
2015	511 (2.7)		14 ▲	5	497 (2.5)		4	3	506 (3.4)		7	-7
2011	497 (2.5)			-8 ▽	493 (2.7)			-1	499 (3.1)			-14 ▽
2007	506 (2.7)				494 (3.3)				513 (3.5)			
Northern Ireland												
† 2019	520 (2.8)	-1	1		511 (2.2)	-3	-9 ▽		525 (2.6)	3	17 ▲	
‡ 2015	521 (2.7)		3		514 (2.6)		-6		522 (3.0)		15 ▲	
† 2011	519 (2.9)				520 (3.2)				507 (2.7)			
Norway (5)												
† 2019	547 (3.0)	1			525 (3.0)	3			547 (2.9)	-2		
2015	546 (2.6)				522 (2.8)				549 (3.8)			
Oman												
2019	434 (4.6)	8	65 ▲		437 (4.7)	2	67 ▲		416 (4.5)	-7	45 ▲	
2015	426 (3.2)		56 ▲		435 (3.4)		65 ▲		423 (3.5)		53 ▲	
2011	370 (3.9)				370 (4.8)				371 (4.7)			
Poland												
2019	534 (3.1)	-23 ▽			526 (2.9)	-14 ▽			529 (3.3)	-11 ▽		
2015	557 (2.5)				540 (2.1)				540 (2.6)			
Portugal												
² 2019	509 (1.9)	1	-12 ▽		496 (2.4)	-5	-20 ▽		501 (3.0)	-12 ▽	-30 ▽	
² 2015	508 (2.1)		-13 ▽		502 (2.9)		-15 ▽		513 (2.5)		-18 ▽	
2011	520 (4.2)				517 (4.1)				531 (4.3)			
Qatar												
2019	448 (4.6)	12	65 ▲		451 (4.0)	16 ▲	54 ▲		442 (5.7)	15 ▲	42 ▲	
2015	436 (4.4)		53 ▲		435 (4.7)		39 ▲		427 (5.0)		26 ▲	
² 2011	383 (5.1)				397 (5.0)				401 (4.7)			
Russian Federation												
² 2019	570 (3.1)	2	14 ▲	26 ▲	572 (2.9)	5	24 ▲	20 ▲	554 (4.4)	-8	2	13
2015	569 (3.1)		13 ▲	24 ▲	567 (3.6)		19 ▲	15 ▲	562 (4.7)		10	21 ▲
2011	556 (3.7)			12	548 (4.0)			-4	552 (4.0)			11
2007	545 (4.7)				552 (5.6)				541 (5.6)			
Serbia												
² 2019	521 (3.8)	-10	3		524 (4.2)	-5	2		494 (4.5)	-1	-3	
³ 2015	531 (3.8)		13 ▲		529 (3.8)		6		496 (4.8)		-1	
² 2011	518 (3.0)				523 (3.8)				497 (3.6)			
Singapore												
³ 2019	603 (3.6)	-4	6	8	613 (3.7)	10	15 ▲	16 ▲	557 (3.9)	10	16 ▲	-8
² 2015	607 (4.4)		9	12	603 (3.7)		5	6	546 (3.7)		5	-18 ▽
² 2011	597 (4.4)			3	598 (3.6)			2	541 (3.1)			-24 ▽
2007	595 (4.8)				597 (4.3)				565 (4.1)			
Slovak Republic												
² 2019	520 (3.9)	3	-14 ▽	-15 ▽	525 (3.9)	0	-2	13 ▲	513 (4.4)	-1	-22 ▽	-19 ▽
2015	517 (2.9)		-16 ▽	-18 ▽	526 (3.4)		-2	14 ▲	514 (3.0)		-22 ▽	-18 ▽
2011	534 (3.7)			-1	527 (4.1)			15 ▲	535 (4.0)			3
2007	535 (4.7)				512 (4.9)				532 (6.5)			
Spain												
2019	514 (2.2)	-9 ▽	1		503 (2.3)	-3	7		518 (2.4)	-2	19 ▲	
² 2015	523 (2.6)		10 ▲		507 (2.9)		10 ▲		520 (3.0)		21 ▲	
2011	513 (3.0)				497 (2.9)				499 (3.7)			
Sweden												
2019	541 (3.3)	2	8	9 ▲	525 (3.3)	-9	-3	17 ▲	547 (3.8)	-5	8	7
² 2015	540 (3.3)		6	8	534 (3.6)		6	26 ▲	552 (4.1)		13 ▲	13 ▲
2011	534 (2.8)			2	528 (2.5)			19 ▲	538 (3.2)			-1
2007	532 (2.7)				509 (3.2)				539 (3.9)			

▲ 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%.
 * Reservations about reliability because the percentage of students with achievement too low for estimation exceeds 25%.

Exhibit 2.15: Differences in Achievement for Science Content Domains Across Assessment Years^o

(Continued)

Country	Life Science				Physical Science				Earth Science			
	Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years			Average Scale Score	Differences Between Years		
		2015	2011	2007		2015	2011	2007		2015	2011	2007
United Arab Emirates												
2019	467 (2.0)	18 ▲	47 ▲		477 (2.2)	24 ▲	49 ▲		474 (1.6)	26 ▲	39 ▲	
2015	449 (3.3)		29 ▲		453 (3.0)		25 ▲		448 (3.5)		13 ▲	
2011	420 (2.7)				429 (2.7)				435 (2.4)			
United States												
² † 2019	546 (2.5)	-9 ▽	-1	3	527 (2.8)	-10 ▽	-17 ▽	-8	539 (3.2)	-1	0	2
² † 2015	555 (2.3)		8 ▲	12 ▲	537 (2.6)		-6	3	539 (2.4)		0	2
² 2011	547 (2.0)			3	544 (2.0)			9 ▲	539 (2.2)			2
² † 2007	544 (2.8)				535 (3.1)				537 (3.2)			
Benchmarking Participants												
Ontario, Canada												
² 2019	535 (2.9)	-9 ▽	0	-4	512 (2.9)	-10 ▽	-15 ▽	-23 ▽	518 (3.4)	3	4	-15 ▽
2015	544 (2.6)		9 ▲	5	522 (2.5)		-6	-13 ▽	515 (3.7)		1	-18 ▽
2011	535 (3.4)			-4	528 (3.2)			-7	514 (3.7)			-19 ▽
² 2007	539 (3.9)				535 (3.4)				533 (4.2)			
Quebec, Canada												
2019	530 (2.4)	-3	5	5	514 (2.8)	-6	7	4	519 (3.2)	4	3	-3
[≡] 2015	533 (4.3)		9	9	519 (4.9)		12 ▲	10	515 (4.4)		-1	-7
2011	524 (2.6)			0	507 (3.3)			-2	516 (3.4)			-6
² 2007	524 (3.0)				509 (3.3)				522 (2.9)			
Abu Dhabi, UAE												
2019	413 (2.5)	0	10		418 (2.6)	5	3		422 (2.1)	14	4	
² 2015	413 (6.0)		10		413 (5.9)		-2		408 (6.9)		-10	
2011	403 (5.6)				415 (5.2)				418 (5.1)			
Dubai, UAE												
² 2019	537 (1.9)	20 ▲	82 ▲	81 ▲	556 (2.1)	35 ▲	96 ▲	100 ▲	542 (2.3)	31 ▲	73 ▲	81 ▲
2015	518 (2.6)		62 ▲	62 ▲	521 (2.2)		61 ▲	64 ▲	510 (2.9)		41 ▲	49 ▲
2011	455 (3.0)			-1	460 (3.1)			4	469 (3.0)			8
‡ 2007	456 (2.7)				456 (3.5)				461 (3.7)			

▲ Average from more recent year significantly higher

▽ Average from more recent year significantly lower