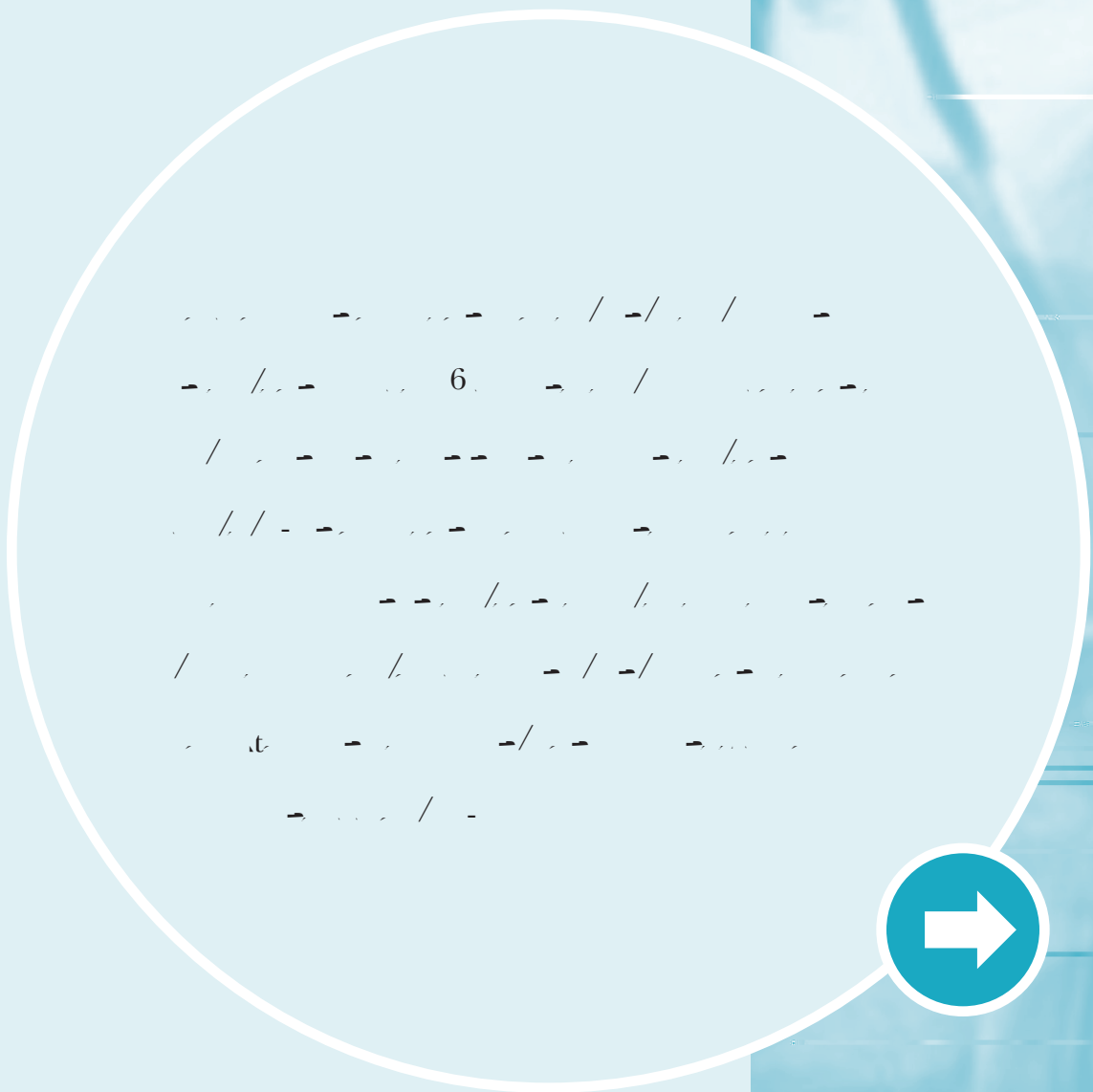


CHAPTER 6

Teachers and Instruction



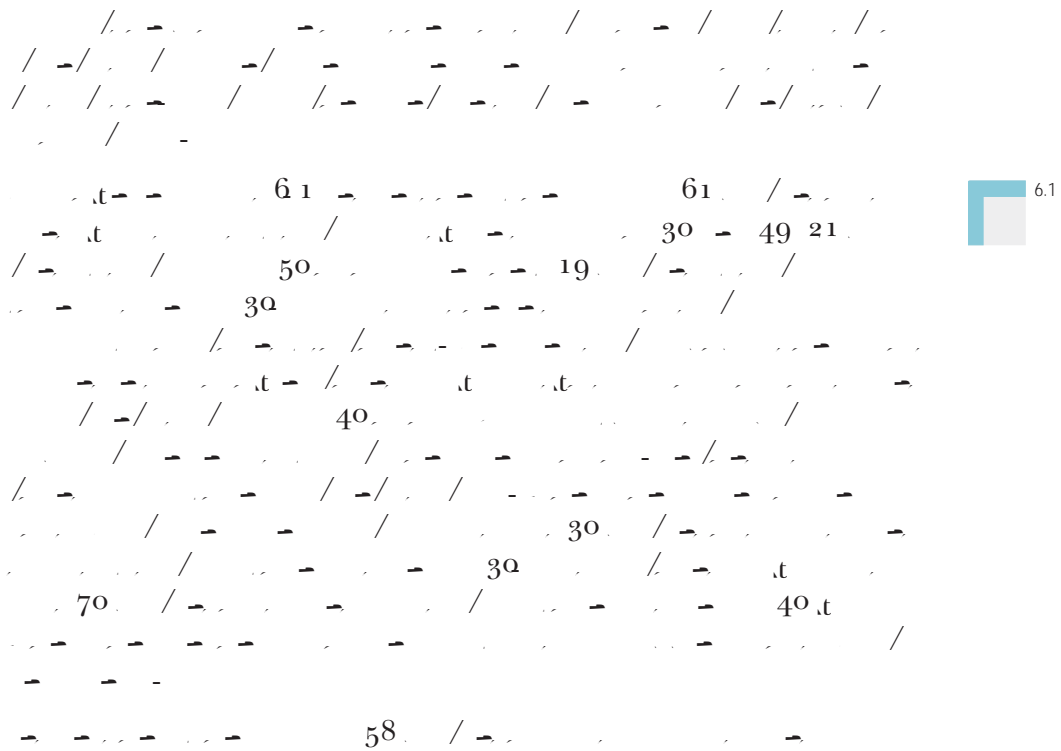




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What Preparation Do Teachers Have for Teaching Science?



² For earth science teachers, majors in all science fields were included. In Chinese Taipei, Finland, Morocco, and the Netherlands, data for the physical science teachers are reported in the physics panel; relevant science majors for these teachers were either physics or chemistry.

Australia Belgium (Flemish)						

Background data provided by teachers.

‡ Lithuania tested the same cohort of students as other countries, but later in 1999, at the beginning of the next school year.

Science teacher background data for Slovak Republic and Slovenia are unavailable.

() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

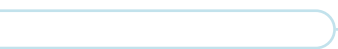
An "r" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students.



	Percent of Students Taught by Teachers Having Science as the Major Area of Study in Their BA, MA, or Teacher Training Program ¹	Percent of Students Taught by Certified Teachers ²	Percent of Students
General/Integrated Science			27 (3.6)87 (3.6)54/79.T323B
	s	s	s
	s		
	3		
	r		r
		r	r
Earth Science			
	t		
	r		
	r		r
	r		

Background data provided by teachers.

¹ Countries are classified as having either general/integrated science or separate science subject classes. Teachers having science as the major area of study in each subject are those who reported having a bachelor's degree (BA) or equivalent, master's degree (MA), or teacher training certificate





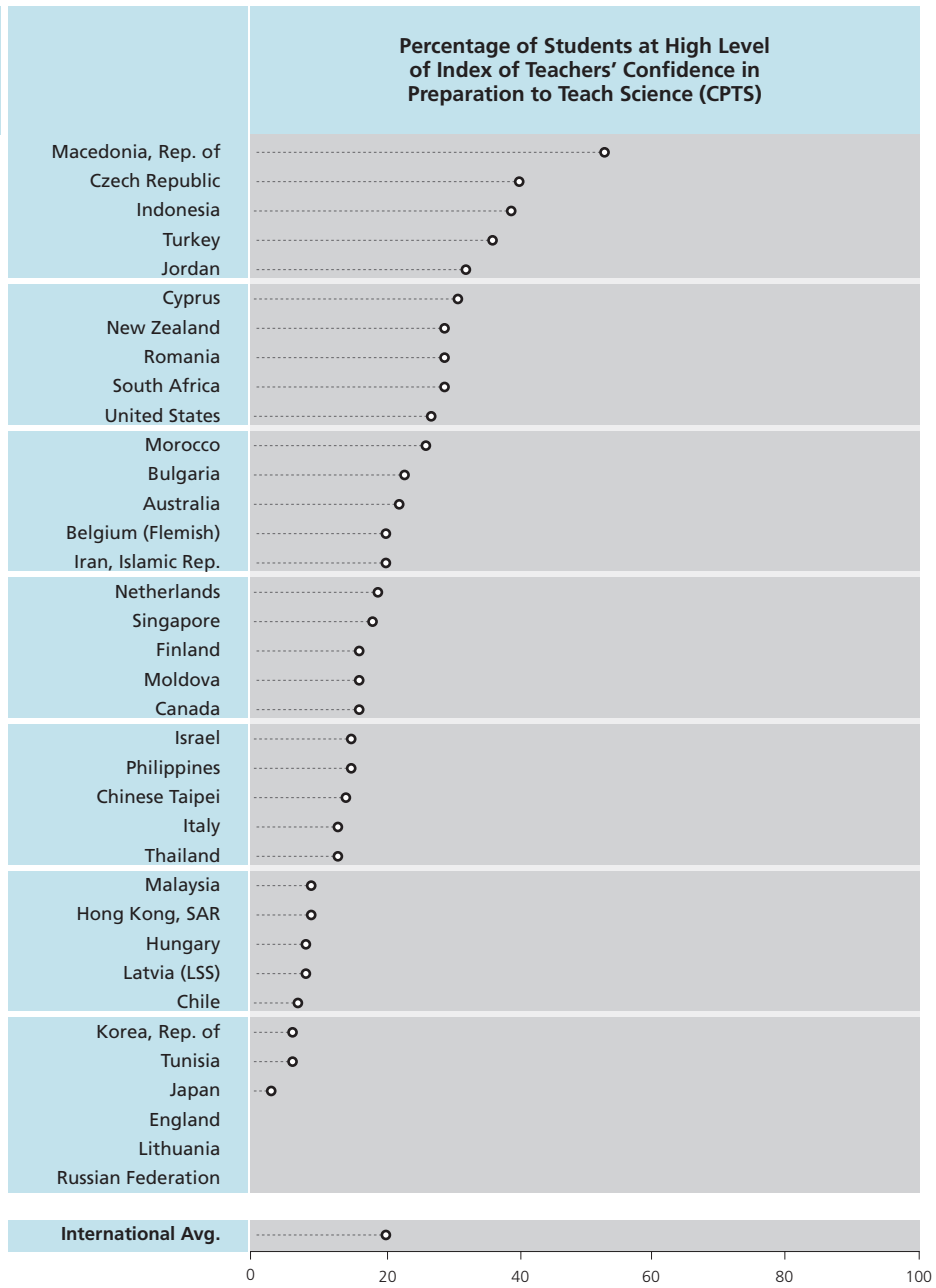
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Exhibit 6.3 Index of Teachers' Confidence in Preparation to Teach Science (CPTS)

Index of Teachers' Confidence in Preparation to Teach Science

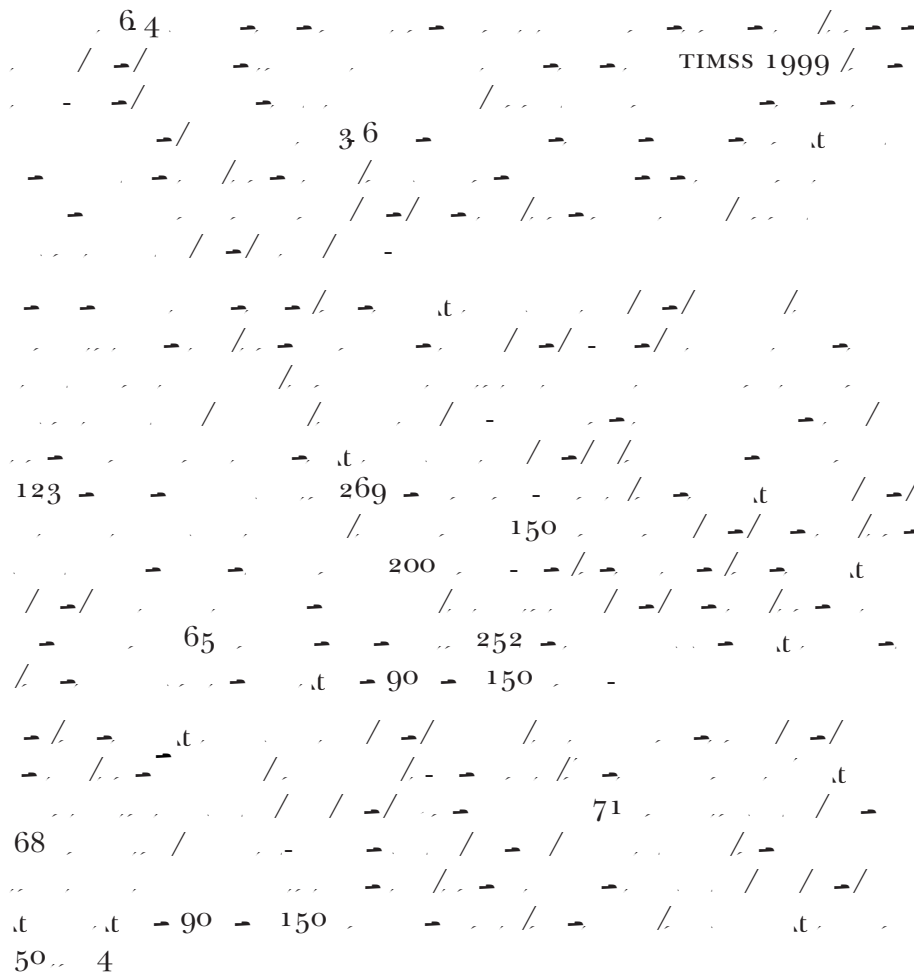
Index based on teachers' responses to 10 questions about how prepared they feel to teach different science topics (see reference exhibit R3.2) based on a 3-point scale: 1 = not well prepared; 2 = somewhat prepared; 3 = very well prepared. Average is computed across the 10 items for which the teacher did not respond do not teach. High level indicates average is greater than or equal to 2.75. Medium level indicates average is greater than or equal to 2.25 and less than 2.75. Low level indicates average is less than 2.25.

	High		Medium		Low	
		▲		▲		▲
Macedonia, Rep. of	53 (2.8)	463 (5.8)	35 (2.6)	457 (6.9)	12 (1.5)	442 (10.4)
Czech Republic	40 (2.8)	538 (4.8)	46 (2.8)	544 (5.8)	15 (2.4)	533 (6.2)
Indonesia	39 (4.4)	441 (7.7)	32 (3.6)	442 (7.5)	29 (3.3)	421 (6.9)
Turkey	36 (4.0)	443 (6.3)	47 (4.4)	430 (6.3)	17 (2.9)	420 (6.1)
Jordan	32 (4.1)	449 (7.7)	42 (4.3)	461 (6.0)	26 (4.1)	434 (8.7)
Germany	31 (2.4)	460 (3.4)	42 (2.2)	464 (3.2)	27 (2.1)	458 (6.2)
New Zealand	29 (3.6)	510 (9.0)	53 (3.9)	515 (7.4)	19 (3.2)	499 (8.7)
Romania	29 (2.5)	478 (7.9)	50 (2.5)	465 (6.4)	22 (2.3)	479 (7.9)
South Africa	29 (4.7)	240 (18.6)	38 (4.8)	265 (14.4)	33 (3.7)	225 (12.7)
United States	27 (3.0)	526 (8.7)	55 (3.5)	519 (5.8)	18 (2.5)	511 (9.2)
Morocco	26 (3.0)	326 (7.2)	47 (2.5)	321 (5.7)	27 (2.4)	321 (5.0)
Bulgaria	23 (1.9)	520 (9.1)	42 (3.4)	511 (5.3)	35 (3.4)	506 (5.8)
Australia	22 (2.9)	548 (8.5)	56 (3.5)	540 (5.7)	22 (3.1)	535 (6.4)
Belgium (Flemish)	20 (2.5)	536 (9.2)	44 (3.2)	542 (4.7)	36 (3.3)	525 (7.1)
Iran, Islamic Rep.	20 (4.4)	434 (10.5)	40 (4.2)	452 (5.1)	40 (4.3)	450 (5.5)
Netherlands	19 (2.9)	550 (10.4)	45 (3.8)	545 (10.2)	35 (3.5)	543 (7.4)
Singapore	18 (3.3)	568 (14.4)	44 (4.1)	576 (10.4)	38 (4.4)	559 (13.1)
Finland	16 (2.3)	534 (7.0)	51 (3.2)	535 (4.2)	32 (2.9)	536 (3.9)
Moldova	16 (1.8)	451 (6.7)	38 (2.6)	466 (5.9)	46 (2.6)	458 (5.1)
Canada	16 (2.4)	542 (5.3)	47 (3.2)	534 (3.6)	37 (2.8)	533 (4.6)
Israel	15 (2.4)	485 (8.7)	61 (3.8)	466 (7.2)	23 (3.2)	466 (9.8)
Philippines	15 (2.9)	384 (13.8)	43 (4.4)	337 (11.5)	42 (4.3)	340 (11.2)
Chinese Taipei	14 (3.0)	573 (7.9)	46 (4.8)	576 (5.9)	40 (4.5)	559 (6.3)
Italy	13 (2.8)	487 (11.6)	54 (3.9)	491 (5.6)	33 (3.4)	499 (5.9)
Thailand	13 (2.9)	499 (12.9)	30 (3.8)	486 (7.8)	58 (3.6)	476 (5.8)
Malaysia	9 (2.2)	498 (14.1)	30 (3.8)	500 (7.1)	61 (4.1)	488 (6.7)
Hong Kong, SAR	9 (2.3)	552 (12.4)	34 (4.1)	526 (6.1)	57 (4.3)	529 (5.4)
Hungary	8 (1.5)	575 (7.2)	34 (2.4)	546 (5.7)	58 (2.2)	552 (3.4)
Latvia (LSS)	8 (1.8)	515 (8.7)	40 (2.7)	508 (5.5)	52 (2.8)	500 (5.3)
Chile	7 (2.0)	419 (17.3)	27 (3.1)	450 (7.2)	66 (3.2)	411 (4.5)
Korea, Rep. of	6 (1.8)	543 (8.8)	32 (3.3)	552 (3.8)	62 (3.5)	548 (3.3)
Tunisia	6 (2.0)	441 (11.3)	21 (3.8)	429 (6.1)	73 (4.0)	429 (3.7)
Japan	3 (1.5)	564 (7.3)	15 (3.1)	548 (6.0)	82 (3.1)	549 (2.6)
England	--	--	--	--	--	--
Lithuania †	--	--	--	--	--	--
Russian Federation	--	--	--	--	--	--
International Avg.	20 (0.5)	487 (1.7)	41 (0.6)	485 (1.1)	39 (0.6)	477 (1.2)



SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

How Much School Time Is Devoted to Science Instruction?



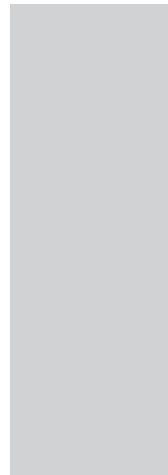
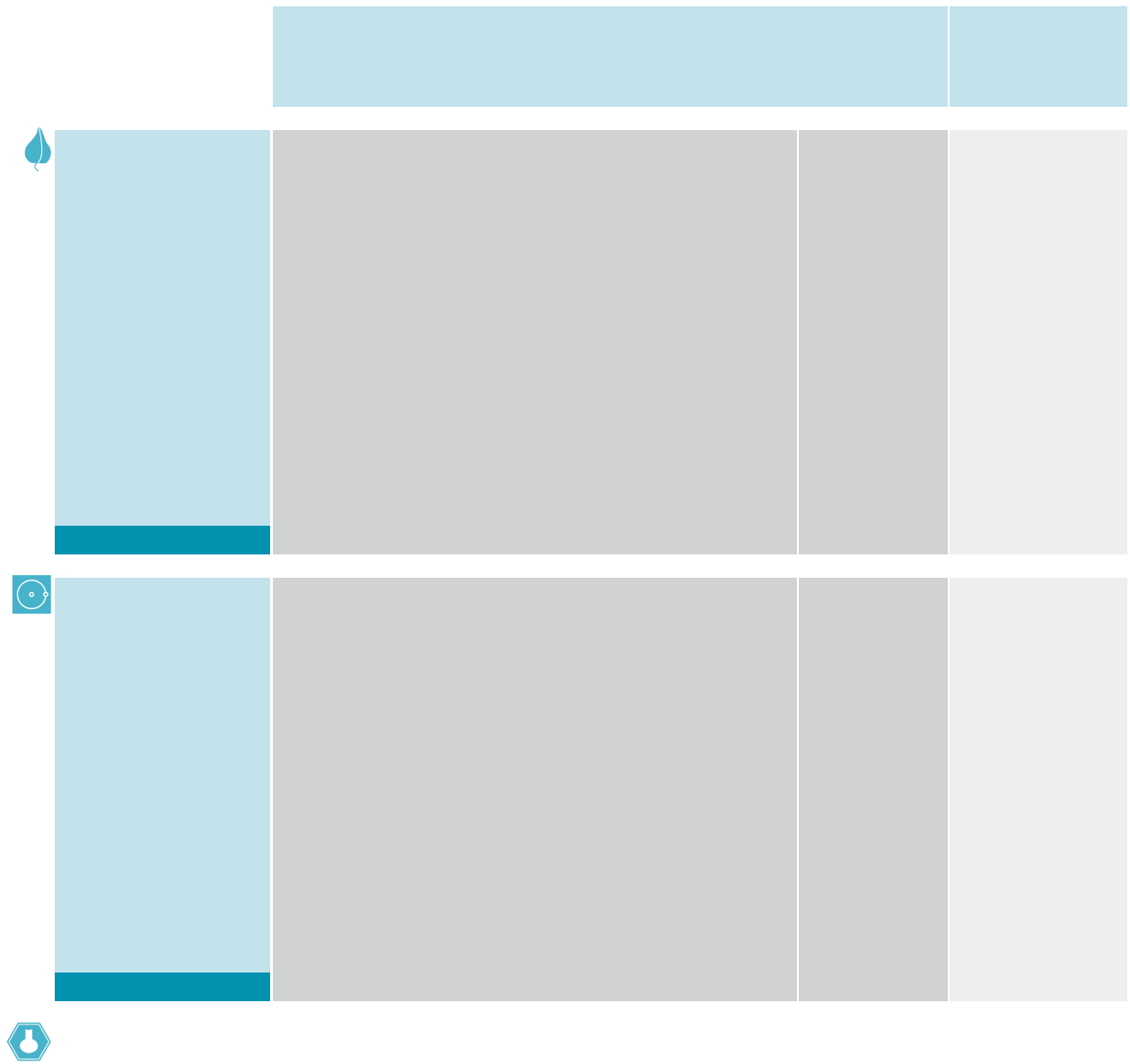


Exhibit 6.4: Instructional Time in the Sciences at Grade 8* (Continued)







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R3.8

Exhibit 6.5 Number of Hours Science Is Taught Weekly*

		5 Hours or More		3.5 Hours to < 5		2 Hours to < 3.5		Less Than 2 Hours	
		▲	▲	▲	▲	▲	▲	▲	▲
 General/Integrated Science									
 Earth Science									

	5 Hours or More		3.5 Hours to < 5		2 Hours to < 3.5		Less Than 2 Hours	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Biology								
Belgium (Flemish) ^r	3 (1.5)	528 (14.2)	1 (0.0)	~ ~	17 (3.0)	547 (6.8)	79 (3.1)	547 (5.3)
Bulgaria ^r	1 (1.0)	~ ~	2 (1.1)	~ ~	21 (3.8)	508 (10.8)	76 (4.4)	515 (7.4)
Chinese Taipei ^a	--	--	--	--	--	--	--	--
Czech Republic	0 (0.0)	~ ~	0 (0.0)	~ ~	4 (2.1)	562 (16.7)	95 (2.1)	540 (4.6)
Finland ^b	1 (0.5)	~ ~	3 (1.5)	537 (9.3)	15 (2.9)	539 (8.4)	82 (3.2)	535 (3.5)
Hungary	1 (0.6)	~ ~	3 (1.4)	575 (23.6)	33 (4.1)	560 (7.1)	64 (4.3)	547 (4.9)
Indonesia	14 (3.2)	417 (14.4)	0 (0.3)	~ ~	8 (2.4)	434 (10.8)	78 (4.0)	440 (5.6)
Latvia (LSS)	0 (0.0)	~ ~	1 (1.4)	~ ~	17 (4.0)	498 (7.1)	82 (4.2)	513 (5.5)
Lithuania [‡]	--	--	--	--	--	--	--	--
Macedonia, Rep. of	1 (0.0)	~ ~	1 (0.8)	~ ~	11 (2.6)	426 (21.0)	87 (2.7)	465 (5.2)
Moldova	2 (1.0)	~ ~	6 (2.0)	468 (23.7)	19 (3.2)	445 (9.9)	74 (3.8)	461 (4.8)
Morocco ^c	0 (0.0)	~ ~	2 (1.0)	~ ~	81 (2.7)	320 (4.6)	17 (2.5)	335 (7.2)
Netherlands	0 (0.0)	~ ~	0 (0.0)	~ ~	1 (1.2)	~ ~	99 (1.2)	540 (8.9)
Romania	0 (0.3)	~ ~	1 (0.0)	~ ~	12 (3.0)	458 (15.0)	87 (3.1)	474 (6.2)
Russian Federation	0 (0.0)	~ ~	1 (0.5)	~ ~	9 (2.2)	548 (14.2)	90 (2.3)	526 (6.3)
International Avg.	2 (0.3)	~ ~	2 (0.3)	~ ~	19 (0.8)	487 (5.4)	78 (0.9)	495 (1.7)
Physics								
Belgium (Flemish)	3 (2.1)	553 (35.1)	0 (0.0)	~ ~	43 (6.7)	550 (5.6)	54 (7.0)	551 (6.6)
Bulgaria	1 (0.6)	~ ~	1 (0.7)	~ ~	11 (2.7)	499 (19.1)	88 (2.9)	507 (5.0)
Chinese Taipei ^a	1 (1.0)	~ ~	41 (4.4)	578 (6.8)	58 (4.5)	561 (4.9)	0 (0.0)	~ ~
Czech Republic	0 (0.0)	~ ~	0 (0.0)	~ ~	7 (2.5)	596 (18.2)	93 (2.5)	537 (4.3)
Finland ^b	3 (1.7)	544 (12.9)	6 (2.1)	521 (11.9)	11 (2.4)	530 (9.8)	81 (3.6)	535 (3.7)
Hungary	3 (1.4)	528 (16.3)	2 (1.2)	~ ~	10 (2.3)	548 (10.0)	85 (2.8)	554 (4.0)
Indonesia	14 (3.3)	421 (14.1)	1 (0.7)	~ ~	8 (2.5)	418 (13.5)	76 (4.1)	440 (5.7)
Latvia (LSS)	1 (0.5)	~ ~	2 (1.3)	~ ~	16 (3.2)	502 (10.8)	82 (3.5)	503 (5.3)
Lithuania [‡]	--	--	--	--	--	--	--	--
Macedonia, Rep. of	3 (1.9)	424 (107.2)	0 (0.5)	~ ~	91 (2.7)	458 (5.6)	6 (1.9)	457 (13.2)
Moldova	3 (1.6)	437 (18.4)	3 (1.5)	422 (29.9)	8 (2.5)	478 (21.2)	86 (3.3)	460 (4.7)
Morocco ^c	0 (0.0)	~ ~	1 (0.6)	~ ~	82 (4.3)	323 (5.5)	17 (4.4)	335 (16.3)
Netherlands ^d	1 (0.9)	~ ~	0 (0.0)	~ ~	15 (3.9)	543 (6.3)	84 (4.0)	547 (8.7)
Romania	0 (0.4)	~ ~	2 (1.3)	~ ~	9 (2.7)	435 (12.8)	88 (3.1)	479 (7.1)
Russian Federation	1 (0.8)	~ ~	0 (0.0)	~ ~	6 (1.7)	554 (17.2)	92 (2.1)	527 (6.7)
International Avg.	2 (0.4)	~ ~	4 (0.4)	507 (6.6)	27 (0.9)	500 (3.4)	67 (1.0)	495 (2.3)
Chemistry								
Belgium (Flemish)	--	--	--	--	--	--	--	--
Bulgaria	1 (1.1)	~ ~	1 (0.8)	~ ~	22 (3.5)	505 (11.2)	75 (3.9)	520 (7.4)
Chinese Taipei	--	--	--	--	--	--	--	--
Czech Republic	0 (0.0)	~ ~	0 (0.0)	~ ~	8 (2.7)	585 (18.5)	92 (2.7)	536 (4.0)
Finland	--	--	--	--	--	--	--	--
Hungary	1 (0.6)	~ ~	3 (1.0)	587 (10.6)	18 (3.1)	554 (9.0)	78 (3.2)	549 (4.4)
Indonesia	--	--	--	--	--	--	--	--
Latvia (LSS) ^s	2 (1.1)	~ ~	4 (1.9)	489 (8.9)	17 (3.7)	479 (9.1)	78 (3.9)	510 (5.4)
Lithuania [‡]	--	--	--	--	--	--	--	--
Macedonia, Rep. of	1 (0.9)	~ ~	1 (0.7)	~ ~	20 (3.3)	435 (15.2)	77 (3.1)	472 (5.7)
Moldova	2 (1.2)	~ ~	7 (2.2)	465 (21.0)	78 (3.0)	460 (4.4)	14 (2.4)	442 (11.2)
Morocco	--	--	--	--	--	--	--	--
Netherlands	--	--	--	--	--	--	--	--
Romania	1 (0.7)	~ ~	1 (1.1)	~ ~	13 (3.7)	446 (13.9)	84 (3.3)	477 (7.1)
Russian Federation	0 (0.0)	~ ~	1 (0.6)	~ ~	63 (3.8)	526 (6.0)	36 (3.9)	532 (11.6)
International Avg.	1 (0.3)	~ ~	2 (0.4)	~ ~	30 (1.2)	499 (4.2)	67 (1.2)	505 (2.8)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

^a Chinese Taipei: Data for grade 8 physics/chemistry teachers are reported in the physics panel; data for grade 7 biology teachers are not available.




^b Finland: Data for biology and biology/geography teachers are reported in biology panel; data for physics and physics/chemistry teachers are reported in physics panel. Small number of separate chemistry and geography teachers are not reported.

^c Morocco: Data for biology/geology teachers are reported in biology panel; data for physics/chemistry teachers are reported in physics panel.

^d Netherlands: Data for physics/chemistry teachers are reported in physics panel.



Exhibit 6.6: Frequency of Outside Interruption During Science Lessons* (Continued)

	Never		Once in a While		Pretty Often		Almost Always		
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Biology									
 Belgium (Flemish)	36 (1.3)	538 (5.2)	55 (1.4)	543 (3.1)	6 (0.5)	542 (10.0)	4 (0.7)	485 (10.3)	
Bulgaria	22 (1.2)	524 (8.0)	63 (1.6)	523 (5.5)	8 (0.9)	509 (11.3)	7 (0.6)	470 (10.4)	
Czech Republic	40 (1.7)	540 (4.3)	52 (1.6)	541 (5.6)	5 (0.6)	527 (14.0)	3 (0.4)	530 (20.0)	
Finland	37 (1.5)	538 (3.9)	53 (1.3)	540 (4.0)	7 (0.6)	508 (9.9)	3 (0.3)	490 (13.2)	
Hungary	54 (1.2)	558 (4.2)	37 (1.1)	550 (4.2)	5 (0.5)	537 (12.2)	3 (0.4)	527 (10.7)	
Latvia (LSS)	46 (1.5)	503 (6.0)	47 (1.5)	508 (6.6)	5 (0.5)	479 (11.6)	2 (0.4)	~ ~	
Lithuania †	--	--	--	--	--	--	--	--	
Macedonia, Rep. of	39 (1.3)	480 (5.8)	42 (1.1)	476 (5.8)	10 (0.6)	413 (12.2)	9 (0.6)	412 (12.1)	
Moldova	33 (1.5)	471 (5.8)	48 (1.4)	468 (4.8)	11 (0.7)	433 (8.2)	8 (0.7)	431 (9.0)	
Morocco	x x	x x	x x	x x	x x	x x	x x	x x	
Netherlands	41 (1.8)	537 (9.0)	53 (2.0)	551 (8.1)	4 (0.7)	520 (16.1)	2 (0.6)	~ ~	
Romania	44 (1.7)	487 (6.7)	45 (1.5)	476 (5.5)	6 (0.6)	436 (10.3)	4 (0.4)	408 (11.8)	
Russian Federation	19 (1.5)	545 (13.4)	64 (1.3)	535 (6.0)	10 (0.7)	506 (7.2)	8 (0.5)	507 (9.3)	
Slovak Republic	46 (1.6)	539 (4.2)	48 (1.5)	538 (4.0)	4 (0.5)	506 (9.2)	2 (0.3)	~ ~	
Slovenia	12 (0.9)	513 (5.6)	60 (1.2)	542 (3.4)	18 (0.9)	535 (5.6)	10 (0.6)	512 (7.7)	
International Avg.	36 (0.4)	521 (1.9)	51 (0.4)	522 (1.6)	8 (0.2)	496 (3.4)	5 (0.1)	477 (3.1)	
Physics									
 Belgium (Flemish)	32 (1.8)	548 (6.5)	58 (1.7)	545 (4.6)	7 (0.7)	539 (16.0)	4 (0.7)	529 (22.4)	
Bulgaria	22 (1.2)	523 (7.9)	59 (1.4)	525 (5.5)	11 (0.7)	503 (12.5)	9 (0.8)	478 (10.2)	
Czech Republic	48 (1.8)	541 (4.2)	44 (1.5)	544 (6.7)	5 (0.8)	520 (14.0)	3 (0.6)	532 (16.0)	
Finland	40 (1.3)	543 (4.8)	48 (1.3)	536 (4.3)	7 (0.7)	488 (11.2)	5 (0.5)	493 (8.8)	
Hungary	58 (1.3)	560 (4.1)	33 (1.1)	551 (4.8)	5 (0.5)	523 (9.9)	4 (0.3)	539 (9.6)	
Latvia (LSS)	50 (1.4)	504 (5.4)	41 (1.3)	509 (6.2)	6 (0.5)	476 (11.0)	3 (0.4)	463 (14.6)	
Lithuania †	--	--	--	--	--	--	--	--	
Macedonia, Rep. of	41 (1.3)	488 (5.9)	37 (1.0)	478 (6.4)	11 (0.6)	415 (8.9)	12 (0.7)	408 (8.7)	
Moldova	35 (1.5)	475 (6.2)	45 (1.5)	466 (4.4)	11 (0.7)	445 (8.2)	8 (0.6)	429 (8.1)	
Morocco	x x	x x	x x	x x	x x	x x	x x	x x	
Netherlands †	42 (1.7)	544 (8.3)	50 (1.6)	550 (6.6)	5 (0.8)	533 (14.5)	3 (0.5)	521 (16.9)	
Romania	45 (1.5)	488 (6.3)	42 (1.4)	477 (5.8)	7 (0.6)	446 (10.2)	6 (0.6)	432 (12.1)	
Russian Federation	22 (1.5)	545 (10.8)	62 (1.4)	537 (6.4)	8 (0.5)	505 (9.5)	8 (0.5)	498 (7.5)	
Slovak Republic	50 (1.4)	543 (4.0)	43 (1.3)	535 (3.6)	5 (0.5)	509 (10.1)	2 (0.4)	~ ~	
Slovenia	13 (1.0)	519 (5.8)	60 (1.2)	543 (3.7)	17 (0.9)	527 (6.2)	10 (0.7)	516 (6.7)	
International Avg.	38 (0.4)	525 (1.7)	48 (0.4)	523 (1.6)	8 (0.2)	495 (3.0)	6 (0.2)	486 (3.4)	
Chemistry									
 Belgium (Flemish)	--	--	--	--	--	--	--	--	
Bulgaria	22 (1.1)	527 (8.0)	60 (1.2)	523 (5.4)	10 (0.8)	501 (10.7)	9 (0.7)	482 (11.3)	
Czech Republic	45 (1.8)	538 (4.2)	46 (1.6)	546 (5.4)	5 (0.6)	532 (10.8)	3 (0.7)	503 (14.8)	
Finland	40 (1.4)	542 (5.1)	50 (1.3)	538 (3.9)	6 (0.7)	498 (9.7)	4 (0.5)	496 (10.8)	
Hungary	56 (1.6)	558 (4.1)	35 (1.3)	553 (4.9)	5 (0.5)	521 (10.2)	4 (0.5)	538 (11.0)	
Latvia (LSS)	48 (1.3)	506 (5.3)	44 (1.3)	508 (6.1)	4 (0.4)	476 (13.8)	3 (0.4)	459 (13.9)	
Lithuania †	--	--	--	--	--	--	--	--	
Macedonia, Rep. of	40 (1.3)	481 (5.7)	39 (1.0)	477 (6.2)	10 (0.7)	410 (9.0)	11 (0.6)	413 (12.6)	
Moldova	34 (1.4)	472 (6.2)	47 (1.5)	465 (4.6)	10 (0.6)	431 (8.9)	8 (0.5)	441 (10.5)	
Morocco	x x	x x	x x	x x	x x	x x	x x	x x	
Netherlands	--	--	--	--	--	--	--	--	
Romania	46 (1.5)	485 (6.3)	41 (1.4)	479 (6.1)	8 (0.6)	440 (10.6)	5 (0.5)	423 (14.6)	
Russian Federation	21 (1.6)	548 (10.5)	62 (1.3)	534 (6.0)	9 (0.6)	503 (9.9)	8 (0.6)	509 (8.6)	
Slovak Republic	51 (1.5)	541 (3.8)	42 (1.3)	535 (4.3)	5 (0.5)	513 (9.1)	2 (0.3)	~ ~	
Slovenia	12 (0.9)	514 (5.9)	60 (1.1)	542 (3.5)	18 (1.0)	534 (6.2)	10 (0.6)	515 (8.2)	
International Avg.	38 (0.4)	519 (2.0)	48 (0.4)	518 (2.0)	8 (0.2)	487 (3.3)	6 (0.2)	478 (3.3)	

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

	Overall Average Class Size	1 - 20 Students		21 - 35 Students		36 or More Students	
			▲	▲	▲	▲	▲
Australia	26 (0.2)	11 (2.2)	485 (8.8)	88 (2.3)	546 (4.7)	1 (0.3)	~ ~
Belgium (Flemish)	20 (0.5)	61 (3.9)	527 (5.1)	38 (3.9)	540 (7.2)	1 (1.0)	~ ~
Bulgaria	22 (0.4)	40 (4.7)	493 (5.4)	59 (5.2)	525 (7.5)	1 (0.9)	~ ~
Canada	27 (0.3)	12 (2.1)	525 (7.8)	86 (2.2)	535 (3.1)	2 (0.8)	~ ~
Chile	34 (0.6)	6 (1.4)	376 (10.7)	47 (4.1)	415 (6.3)	48 (4.0)	428 (5.6)
Chinese Taipei	39 (0.5)	0 (0.0)	~ ~	14 (2.9)	564 (12.4)	86 (2.9)	569 (4.8)
Czech Republic	29 (0.2)	1 (0.3)	~ ~	99 (0.3)	462 (3.4)	0 (0.0)	~ ~
Czech Republic	24 (0.4)	19 (3.8)	525 (7.6)	81 (3.8)	544 (5.3)	0 (0.0)	~ ~
England	x x	x x	x x	x x	x x	x x	x x
Finland	18 (0.3)	80 (2.6)	533 (4.2)	20 (2.6)	543 (4.6)	0 (0.3)	~ ~
Hong Kong, SAR	39 (0.3)	1 (0.0)	~ ~	13 (3.1)	487 (8.2)	86 (3.2)	537 (4.1)
Hungary	23 (0.4)	39 (3.6)	531 (6.7)	61 (3.6)	561 (4.2)	1 (0.5)	~ ~
Indonesia	44 (0.8)	1 (0.1)	~ ~	12 (2.8)	425 (13.3)	88 (2.8)	443 (5.6)
Iran, Islamic Rep.	33 (0.5)	4 (1.3)	446 (10.0)	63 (4.2)	456 (4.2)	34 (4.4)	439 (8.6)
Israel	28 (0.7)	17 (3.6)	489 (11.3)	62 (4.6)	470 (9.3)	21 (3.8)	472 (9.1)
Italy	20 (0.3)	55 (3.9)	486 (5.3)	44 (3.9)	502 (6.1)	1 (0.0)	~ ~
Japan	36 (0.3)	1 (0.0)	~ ~	41 (3.1)	547 (3.4)	58 (3.0)	550 (2.8)
Jordan	36 (0.6)	4 (1.3)	463 (45.9)	42 (3.8)	444 (7.0)	54 (3.6)	454 (4.3)
Korea, Rep. of	43 (0.7)	0 (0.0)	~ ~	10 (2.2)	537 (6.1)	90 (2.2)	550 (2.7)
Latvia (LSS)	23 (0.4)	36 (3.4)	495 (8.0)	64 (3.5)	510 (5.5)	0 (0.2)	~ ~
Lithuania †	23 (0.3)	30 (2.6)	476 (6.6)	70 (2.6)	494 (4.9)	0 (0.0)	~ ~
Macedonia, Rep. of	28 (0.4)	10 (2.3)	413 (16.9)	84 (3.0)	458 (5.5)	7 (2.3)	492 (13.8)
Malaysia	38 (0.4)	0 (0.0)	~ ~	25 (3.6)	496 (7.3)	75 (3.6)	491 (5.7)
Moldova	25 (0.4)	17 (2.3)	454 (13.2)	82 (2.4)	460 (4.6)	1 (0.5)	~ ~
Morocco	30 (0.7)	19 (3.4)	326 (10.7)	60 (3.1)	322 (4.9)	21 (2.9)	321 (6.1)
Netherlands	25 (0.4)	11 (3.3)	492 (20.1)	89 (3.3)	554 (8.1)	0 (0.0)	~ ~
New Zealand	26 (0.5)	14 (2.4)	468 (15.4)	84 (2.6)	520 (5.5)	2 (1.2)	~ ~
Philippines	50 (0.8)	0 (0.0)	~ ~	4 (1.5)	316 (28.5)	96 (1.5)	349 (7.9)
Romania	24 (0.4)	31 (2.8)	449 (9.7)	64 (2.9)	479 (7.8)	5 (1.4)	493 (11.3)
Russian Federation	24 (0.5)	19 (3.1)	501 (11.3)	81 (3.1)	536 (6.7)	0 (0.0)	~ ~

Background data provided by teachers.

† Lithuania tested the same cohort of students as other countries, but later in 1999, at the beginning of the next school year.

Science teacher background data for Slovak Republic are unavailable.

() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A tilde (~) indicates insufficient data to report achievement.

An "*" indicates teacher response data available for 70-84% of students. An "s" indicates teacher response data available for 50-69% of students. An "x" indicates teacher response data available for <50% of students.

	Overall Average Class Size		1 - 20 Students		21 - 35 Students		36 or More Students	
	Average	1995-1999 Difference	Percent of Students 1999	1995-1999 Difference	Percent of Students 1999	1995-1999 Difference	Percent of Students 1999	1995-1999 Difference
Australia	x x	x x	x x	x x	x x	x x	x x	x x
Belgium (Flemish)	20 (0.5)	-1 (0.7) ●	61 (3.9)	15 (6.0) ●	38 (3.9)	-17 (6.0) ●	1 (1.0)	1 (1.0) ●
Canada	27 (0.3)	-1 (0.8) ●	12 (2.1)	1 (3.4) ●	86 (2.2)	-1 (3.6) ●	2 (0.8)	0 (1.2) ●
C prus	29 (0.2)	-2 (0.5) ▼	1 (0.3)	-1 (1.0) ●	99 (0.3)	1 (1.0) ●	0 (0.0)	--
C ech Republic	24 (0.4)	-1 (0.6) ●	19 (3.8)	8 (4.6) ●	81 (3.8)	-8 (4.6) ●	0 (0.0)	0 (0.0) ▲
England	x x	x x	x x	x x	x x	x x	x x	x x
Hong Kong, SAR	39 (0.3)	-1 (0.5) ●	1 (0.0)	1 (0.0) ▲	13 (3.1)	6 (4.3) ●	86 (3.2)	-6 (4.4) ●
Hungar	23 (0.4)	1 (0.6) ●	39 (3.6)	-1 (5.5) ●	61 (3.6)	1 (5.5) ●	1 (0.5)	1 (0.5) ●
Iran, Islamic Rep.	33 (0.5)	-4 (1.5) ●	4 (1.3)	1 (1.9) ●	63 (4.2)	18 (7.3) ●	34 (4.4)	-19 (7.5) ●
Israel †	27 (0.9)	-5 (1.8) ●	19 (4.2)	8 (7.0) ●	64 (5.2)	17 (12.3) ●	17 (4.2)	-25(11.2) ●
Ital	20 (0.4)	1 (0.6) ●	53 (4.8)	-9 (7.0) ●	47 (4.7)	8 (6.9) ●	1 (0.0)	1 (0.0) ▲
Japan	36 (0.3)	-1 (0.4) ●	1 (0.0)	0 (0.0) ▲	41 (3.1)	8 (5.2) ●	58 (3.0)	-9 (5.1) ●
Korea, Rep. of	43 (0.7)	-6 (1.3) ▼	0 (0.0)	-6 (1.8) ▼	10 (2.2)	8 (2.6) ▲	90 (2.2)	-2 (3.1) ●
Latvia (LSS)	23 (0.4)	-1 (0.9) ●	36 (3.4)	-1 (5.8) ●	64 (3.5)	10 (6.0) ●	0 (0.2)	-9 (2.2) ▼
Lithuania	23 (0.3)	1 (0.6) ●	30 (2.6)	-8 (5.1) ●	70 (2.6)	10 (5.1) ●	0 (0.0)	-2 (1.0) ●
Netherlands	25 (0.4)	0 (0.8) ●	11 (3.3)	-5 (6.2) ●	89 (3.3)	5 (6.2) ●	0 (0.0)	--
Ne Zealand	26 (0.5)	-1 (0.7) ●	14 (2.4)	8 (3.1) ●	84 (2.6)	-9 (3.4) ●	2 (1.2)	1 (1.2) ●
Romania	24 (0.4)	-2 (0.8) ●	31 (2.8)	10 (4.7) ●	64 (2.9)	-4 (5.0) ●	5 (1.4)	-6 (3.3) ●
Russian Federation	24 (0.5)	-1 (0.6) ●	19 (3.1)	4 (4.2) ●	81 (3.1)	-4 (4.2) ●	0 (0.0)	-1 (0.2) ▼
Singapore	37 (0.3)	0 (0.5) ●	1 (0.4)	1 (0.4) ●	32 (3.8)	-1 (5.9) ●	68 (3.8)	0 (5.9) ●
Slovenia	22 (0.3)	-2 (0.4) ▼	29 (3.2)	14 (4.2) ▲	71 (3.2)	-14 (4.2) ▼	0 (0.0)	0 (0.0) ▼
Thailand †	x x	x x	x x	x x	x x	x x	x x	x x
United States	x x	x x	x x	x x	x x	x x	x x	x x
International Avg. §	27 (0.1)	-1 (0.2) ▼	19 (0.6)	1 (1.0) ●	63 (0.7)	3 (1.2) ●	18 (0.4)	-4 (0.7) ▼

1999 significantly higher than 1995

No significant difference between 1995 and 1999

1999 significantly lower than 1995






	Average Percentage of Class Time Spent in a Typical Month of Lessons									
	Administrative Tasks	Homework Review	Lecture-Style Presentation by teacher	Teacher-Guided Student Practice	Re-teaching and Clarification of Content/ Procedures	Student Independent Practice	Tests and Quizzes	Teacher Demonstrations of Experiments	Students Conducting Experiments	Other
Australia								6 (0.3)	23 (1.0)	3 (0.3)
Belgium (Flemish)								10 (0.7)	8 (0.8)	2 (0.4)
Bulgaria								6 (0.17)	46833(82)m7.1((017)0.2) -1.42(15)-468.6((0.2)	
Canada								24 TD (21)-468.6(20.8) 11 0 -1.0.57(0.6) 1.5714 TD6((0.2)) T -5.		
Chile								13 (1.0)	3 (0.4)	
Chinese Taipei								13 (0.7)	1 (0.3)	
C prus								12 (1.1)	2 (0.4)	
C ech Republic								5 (0.3)	3 (0.2)	
England								24 (1.4)	x x	
Finland								21 (0.8)	2 (0.2)	
Hong Kong, SAR								29 (1.3)	2 (0.4)	
Hungar								5 (0.2)	4 (0.3)	
Indonesia								14 (1.1)	3 (0.3)	
Iran, Islamic Rep.								9 (0.8)	6 (0.7)	
Israel								12 (1.0)	3 (0.6)	
Ital								5 (0.4)	1 (0.3)	
Japan								24 (1.5)	2 (0.4)	
Jordan								22 (2.1)	7 (1.3)	
Korea, Rep. of								18 (1.0)	2 (0.3)	
Latvia (LSS)								8 (0.4)	6 (0.5)	
Lithuania †								--	2 (0.2)	
Macedonia, Rep. of								7 (0.4)	3 (0.3)	
Mala sia								23 (1.5)	4 (0.5)	
Moldova								6 (0.3)	4 (0.2)	
Morocco								14 (0.6)	5 (0.3)	
Netherlands								5 (0.5)	6 (0.7)	
Ne Zealand								23 (1.0)	1 (0.2)	
Philippines								19 (1.1)	4 (0.9)	
Romania								8 (0.4)	4 (0.5)	
Russian Federation								6 (0.2)	5 (0.2)	
Singapore								23 (1.1)	2 (0.2)	
South Africa								14 (2.1)	6 (1.3)	
Thailand								28 (1.8)	3 (0.8)	
Tunisia								21 (1.3)	3 (0.5)	
Turke								7 (0.7)	3 (0.5)	
United States								17 (0.9)	3 (0.5)	
International Avg.								15 (0.2)	3 (0.1)	



Percentage of Students Reporting
Almost Always or Pretty Often

		We Discuss Our Completed Homework	Teachers Shows Us How to Do Science Problems	We Work on Worksheets or Textbooks on Our own	We Work on Science Projects	We Begin Our
G	General/Integrated Science					
	Australia					
	Canada					
	Chile					
	Chinese Taipei ^a					
	Cyprus					
	England					
	Hong Kong, SAR					
	Indonesia ^b					
	Iran, Islamic Rep.					
	Israel					
	Italy					
	Japan					
	Jordan					
	Korea, Rep. of					
	Malaysia					
	New Zealand					
	Philippines					
	Singapore					
	South Africa					
Thailand						
Tunisia						
Turkey						
United States						
	International Avg.					
	Earth Science					
	Belgium (Flemish)					
	Bulgaria					
	Czech Republic					
	Finland					
	Hungary					
	Latvia (LSS)					
	Lithuania [†]					
	Macedonia, Rep. of					
	Moldova					
	Morocco					
	Netherlands					
	Romania					
	Russian Federation					
	Slovak Republic					
Slovenia						
	International Avg.					

(8th Grade) 110T 0.8519 -97.0.1 S(—Integr

	Percentage of Students Reporting Almost Always or Pretty Often				
	We Discuss Our Completed Homework	Teachers Shows Us How to Do Science Problems	We Work on Worksheets or Textbooks on Our own	We Work on Science Projects	We Begin Our Homework
Biology					
 Belgium (Flemish)	22 (1.1)	21 (1.7)	42 (1.5)	24 (1.3)	7 (0.9)
Bulgaria	31 (1.9)	35 (1.7)	32 (1.6)	23 (1.4)	13 (1.3)
Czech Republic	25 (1.6)	98 (0.6)	41 (2.5)	15 (1.2)	15 (1.2)
Finland	37 (1.3)	45 (1.2)	58 (2.2)	37 (1.6)	39 (2.0)
Hungary	45 (1.9)	52 (1.7)	55 (2.4)	58 (2.1)	14 (0.9)
Latvia (LSS)	33 (1.4)	35 (1.6)	54 (1.6)	--	35 (1.6)
Lithuania †	--	--	--	--	--
Macedonia, Rep. of	52 (1.3)	85 (1.0)	60 (1.8)	48 (1.5)	26 (1.2)
Moldova	63 (1.2)	61 (1.5)	66 (1.3)	38 (1.5)	41 (1.6)
Morocco	67 (1.5)	79 (1.1)	57 (1.4)	48 (1.8)	51 (1.4)
Netherlands	57 (4.0)	45 (2.1)	79 (3.6)	17 (1.7)	70 (3.1)
Romania	39 (1.7)	62 (1.8)	40 (1.6)	34 (1.8)	23 (1.5)
Russian Federation	38 (1.2)	36 (1.5)	64 (1.5)	27 (1.4)	18 (1.1)
Slovak Republic	25 (1.5)	60 (1.7)	42 (1.9)	21 (1.3)	15 (1.2)
Slovenia	24 (1.6)	44 (1.6)	27 (1.2)	24 (1.1)	14 (1.0)
International Avg.	40 (0.5)	54 (0.4)	51 (0.5)	32 (0.4)	27 (0.4)
Physics					
 Belgium (Flemish)	28 (2.1)	58 (2.6)	45 (2.0)	35 (1.8)	11 (1.3)
Bulgaria	39 (1.4)	87 (0.9)	37 (1.9)	35 (1.5)	22 (1.2)
Czech Republic	29 (1.7)	98 (0.4)	40 (1.6)	27 (1.4)	14 (1.4)
Finland	41 (1.7)	72 (1.2)	60 (1.8)	42 (1.4)	41 (2.0)
Hungary	57 (1.9)	88 (1.0)	46 (1.5)	87 (0.7)	23 (1.1)
Latvia (LSS)	37 (1.4)	86 (1.2)	54 (1.3)	--	29 (1.3)
Lithuania †	--	--	--	--	--
Macedonia, Rep. of	61 (1.7)	90 (0.8)	56 (1.6)	56 (1.6)	34 (1.2)
Moldova	60 (1.2)	94 (0.5)	72 (1.0)	39 (1.6)	46 (1.5)
Morocco	x x	92 (0.7)	x x	x x	x x
Netherlands ^c	64 (2.9)	55 (2.5)	81 (1.9)	17 (1.5)	73 (2.7)
Romania	50 (1.6)	84 (1.0)	42 (1.4)	47 (1.9)	32 (1.7)
Russian Federation	44 (1.2)	89 (0.9)	64 (1.3)	33 (1.1)	24 (1.0)
Slovak Republic	43 (1.5)	86 (0.9)	42 (1.6)	38 (1.8)	31 (1.7)
Slovenia	38 (1.5)	60 (1.3)	36 (1.3)	28 (1.1)	24 (1.3)
International Avg.	45 (0.5)	81 (0.3)	52 (0.4)	40 (0.4)	31 (0.4)
Chemistry					
 Belgium (Flemish)	--	--	--	--	--
Bulgaria	41 (1.6)	90 (1.1)	40 (1.5)	42 (1.9)	24 (1.7)
Czech Republic	30 (1.9)	97 (0.9)	40 (2.1)	35 (1.4)	13 (1.2)
Finland	40 (1.5)	69 (1.2)	59 (1.9)	44 (1.5)	39 (1.9)
Hungary	56 (2.1)	86 (0.9)	57 (2.2)	84 (1.2)	21 (1.2)
Latvia (LSS)	45 (1.7)	93 (0.8)	56 (1.4)	--	38 (1.6)
Lithuania †	--	--	--	--	--
Macedonia, Rep. of	52 (1.4)	89 (0.9)	43 (1.2)	54 (1.5)	27 (1.1)
Moldova	62 (1.3)	92 (0.6)	75 (1.0)	40 (1.5)	44 (1.6)
Morocco	x x	89 (0.8)	x x	x x	x x
Netherlands	--	--	--	--	--
Romania	51 (1.7)	85 (1.0)	46 (1.6)	46 (1.9)	32 (1.8)
Russian Federation	48 (1.2)	89 (0.8)	64 (1.6)	30 (1.2)	21 (1.1)
Slovak Republic	39 (1.8)	87 (0.8)	39 (1.7)	42 (1.8)	24 (1.6)
Slovenia	33 (1.5)	60 (1.4)	35 (1.3)	28 (1.2)	20 (1.3)
International Avg.	45 (0.5)	85 (0.3)	50 (0.5)	44 (0.5)	28 (0.4)





39

68

42 69

52

15

613

13 1995 1999

310

Percentage of Students Reporting Almost Always or Pretty Often

		Teacher Uses the Board	Teacher Uses an Overhead Projector	Teacher Uses a Computer to Demonstrate Ideas in Science	Students Use the Board	Students Use an Overhead Projector
General/Integrated Science						
	Australia	93 (0.7)	44 (2.1)	7 (0.8)	18 (1.0)	
	Canada	81 (1.0)	55 (1.8)	10 (0.7)	19 (0.8)	
	Chile	87 (1.1)	18 (1.7)	14 (1.1)	66 (1.2)	
	Chinese Taipei ^a	92 (0.6)	7 (1.0)	5 (0.4)	39 (1.1)	
	Cyprus	90 (0.7)	40 (2.3)	10 (0.6)	60 (1.6)	
	England	93 (1.2)	36 (2.7)	8 (0.8)	16 (1.2)	
	Hong Kong, SAR	88 (0.9)	25 (2.1)	9 (1.2)	32 (1.2)	
	Indonesia ^b	80 (1.0)	12 (0.9)	3 (0.6)	11 (2-1.5714 TD (25)-468.6((26(3)-376)) T 0 -1.57145nm232 -46	
	Iran, Islamic Rep.	86 (0.8)	13 (0.8)	0 (0.2)		
	Israel	83 (1.2)	28 (1.4)	22 (1.2)		
	Italy	73 (1.4)	9 (0.9)	9 (0.9)		
	Japan	98 (0.3)	10 (1.5)	2 (0.8)		
	Jordan	87 (0.9)	34 (1.6)	15 (1.4)		
	Korea, Rep. of	86 (1.1)	26 (2.4)	13 (1.7)		
	Malaysia	87 (0.9)	35 (2.4)	1 (0.2)		
	New Zealand	94 (0.6)	53 (2.3)	12 (1.0)		
	Philippines	85 (0.8)	39 (1.5)	24 (1.8)		
	Singapore	92 (0.9)	81 (1.5)	19 (2.0)		
	South Africa	83 (1.1)	48 (1.6)	--		
	Thailand	86 (1.0)	14 (1.5)	9 (0.8)		
	Tunisia	78 (1.0)	44 (1.8)	2 (0.6)		
	Turkey	77 (0.9)	15 (1.1)	4 (0.4)		
	United States	75 (1.6)	59 (2.3)	20 (1.4)		
	International Avg.	86 (0.2)	32 (0.4)	10 (0.2)		

Earth Science						
	Belgium (Flemish)	68 (2.2)	57 (2.4)	3 (0.4)		
	Bulgaria	61 (1.8)	13 (1.1)	6 (0.8)		
	Czech Republic	65 (2.8)	12 (1.6)	3 (0.5)		
	Finland	81 (1.5)	68 (2.0)	7 (0.7)		
	Hungary	55 (2.1)	24 (2.3)	4 (0.4)		
	Latvia (LSS)	--	--	--		
	Lithuania [†]	--	--	--		
	Macedonia, Rep. of	58 (2.3)	22 (1.5)	8 (1.0)		
	Moldova	62 (1.6)	31 (1.7)	15 (1.2)		
	Morocco	x x	x x	x x		
	Netherlands	71 (2.5)	19 (3.0)	6 (1.0)		
	Romania	73 (1.4)	13 (0.9)	3 (0.6)		
	Russian Federation	78 (1.1)	8 (0.7)	2 (0.4)		
	Slovak Republic	41 (2.6)	8 (1.4)	1 (0.4)		
	Slovenia	--	--	--		
	International Avg.	65 (0.6)	25 (0.6)	5 (0.2)		

	Percentage of Students Reporting Almost Always or Pretty Often				
	Teacher Uses the Board	Teacher Uses an Overhead Projector	Teacher Uses a Computer to Demonstrate Ideas in Science	Students Use the Board	Students Use an Overhead Projector
Biology					
 Belgium (Flemish)	75 (1.9)				
Bulgaria					
Czech Republic					
Finland					
Hungary					
Latvia (LSS)					
Lithuania					
Macedonia, Rep. of					
Moldova					
Morocco					
Netherlands					
Romania					
Russian Federation					
Slovak Republic					
Slovenia					
International Avg.					
Physics					
 Belgium (Flemish)					
Bulgaria					
Czech Republic					
Finland					
Hungary					
Latvia (LSS)					
Lithuania					
Macedonia, Rep. of					
Moldova					
Morocco					
Netherlands					
Romania					
Russian Federation					
Slovak Republic					
Slovenia					
International Avg.					
Chemistry					
 Belgium (Flemish)					
Bulgaria					
Czech Republic					
Finland					
Hungary					
Latvia (LSS)					
Lithuania					
Macedonia, Rep. of					
Moldova					
Morocco					
Netherlands					
Romania					
Russian Federation					
Slovak Republic					
Slovenia					
International Avg.					







Exhibit 6.14 Index of Emphasis on Conducting Experiments in Science Classes (ECES)

Index of Emphasis on Conducting Experiments in Science Classes

Index based on teachers' reports on the percentage of time they spend demonstrating experiments; teachers' reports on the percentage of time students spend conducting experiments; students' reports on how often the teacher gives a demonstration of an experiment in science lessons; students' reports on how often they conduct an experiment or practical investigation in class (see exhibits 6.9, R3.11, and R3.13). In countries where science is taught as separate subjects, students were asked about each subject area separately, and only teachers who teach a particular subject are represented in the figures shown for that subject. High level indicates teacher reported that at least 25 percent of class time is spent on the teacher demonstrating experiments or students conducting experiments, and the student reported that the teacher gives a demonstration of an experiment or the student conducts an experiment or practical investigation in class almost always or pretty often. Low level indicates the teacher reported that less than 10 percent of class time is spent on the teacher demonstrating experiments or students conducting experiments, and student reported that the teacher gives a demonstration of an experiment and the student conducts an experiment or practical investigation in class once in a while or never. Medium level includes all other possible combinations of responses.

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	High ECES		Medium ECES		Low ECES	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
General/Integrated Science (ECES-G)						
Hong Kong, SAR	78 (3.3)	536 (3.8)	22 (3.2)	516 (9.3)	1 (0.4)	~ ~
England ^s	59 (4.9)	556 (7.9)	40 (4.9)	539 (8.0)	0 (0.0)	~ ~
Singapore	55 (4.1)	580 (10.0)	44 (4.0)	556 (12.7)	1 (0.6)	~ ~
Japan	54 (4.0)	552 (3.2)	45 (3.8)	549 (2.6)	1 (0.6)	~ ~
Malaysia	53 (3.8)	509 (6.6)	46 (3.8)	470 (5.8)	1 (0.7)	~ ~
Thailand	52 (3.8)	485 (5.7)	47 (3.6)	481 (6.3)	1 (0.6)	~ ~
New Zealand	52 (4.1)	517 (5.9)	48 (4.1)	511 (7.9)	0 (0.2)	~ ~
Tunisia	51 (3.9)	432 (3.8)	49 (3.8)	429 (4.8)	0 (0.2)	~ ~
Jordan	47 (3.7)	451 (5.8)	52 (3.6)	463 (4.8)	1 (0.3)	~ ~
Canada ^r	47 (3.8)	539 (4.1)	52 (3.9)	533 (3.6)	1 (0.5)	~ ~
Cyprus ^s	46 (3.9)	469 (4.4)	54 (3.9)	462 (4.0)	0 (0.1)	~ ~
Australia	45 (3.9)	544 (6.1)	54 (3.9)	536 (5.3)	1 (0.3)	~ ~
Philippines	44 (3.9)	335 (11.4)	56 (3.9)	355 (8.8)	0 (0.0)	~ ~
United States ^r	31 (2.6)	531 (6.8)	64 (2.6)	523 (5.3)	4 (1.1)	529 (7.5)
Korea, Rep. of	27 (3.1)	558 (3.4)	71 (3.0)	546 (3.0)	2 (0.7)	~ ~
South Africa	26 (3.6)	214 (10.5)	72 (3.4)	257 (11.1)	2 (0.4)	~ ~
Israel ^r	26 (3.5)	490 (8.8)	71 (3.2)	471 (6.2)	3 (0.9)	443 (18.4)
Indonesia ^b	18 (1.6)	435 (8.7)	78 (2.0)	439 (4.6)	5 (1.5)	430 (22.7)
Iran, Islamic Rep.	16 (2.4)	447 (7.1)	79 (2.6)	449 (4.4)	4 (1.2)	473 (13.4)
Chinese Taipei ^a	14 (2.8)	574 (9.2)	84 (2.9)	570 (4.9)	2 (0.6)	~ ~
Turkey	14 (2.2)	434 (7.2)	79 (2.4)	436 (4.9)	8 (1.5)	431 (8.4)
Chile	12 (1.8)	435 (11.0)	81 (2.1)	422 (3.9)	7 (1.4)	410 (10.3)
Italy	2 (0.6)	~ ~	73 (3.0)	493 (4.3)	25 (2.9)	498 (6.7)
International Avg.	38 (0.7)	483 (1.7)	59 (0.7)	478 (1.3)	3 (0.2)	459 (5.3)
Earth Science (ECES-E)						
Romania	2 (0.9)	~ ~	67 (2.7)	465 (6.1)	31 (2.8)	495 (8.1)
Belgium (Flemish) ^r	2 (0.6)	~ ~	43 (3.6)	530 (5.3)	56 (3.8)	549 (5.9)
Macedonia, Rep. of	1 (0.5)	~ ~	74 (2.6)	459 (5.9)	25 (2.5)	487 (7.6)
Moldova ^r	1 (0.6)	~ ~	72 (2.9)	460 (4.7)	27 (2.9)	478 (7.4)
Bulgaria ^r	0 (0.0)	~ ~	50 (4.9)	508 (7.5)	50 (4.9)	522 (5.6)
Hungary	0 (0.1)	~ ~	43 (3.1)	547 (5.7)	57 (3.2)	557 (4.9)
Czech Republic	0 (0.0)	~ ~	24 (4.4)	526 (5.3)	76 (4.4)	544 (4.3)
Netherlands ^r	0 (0.0)	~ ~	12 (1.9)	526 (15.6)	88 (1.9)	551 (7.3)
Russian Federation	0 (0.0)	~ ~	45 (2.8)	521 (8.6)	55 (2.8)	538 (7.0)
Finland	--	--	--	--	--	--
Latvia (LSS)	--	--	--	--	--	--
Lithuania [†]	--	--	--	--	--	--
Morocco	--	--	--	--	--	--
International Avg.	1 (0.2)	~ ~	48 (1.1)	505 (2.7)	52 (1.1)	525 (2.2)

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

[†] Lithuania tested the same cohort of students as other countries, but later in 1999, at the beginning of the next school year.

^a Chinese Taipei: Students were asked about 'natural science'; data pertain to grade 8 physics/chemistry course.

^b Indonesia: Students were asked about 'IPA science'; data pertain to the composite course taught by biology and physics teachers.

() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

Science teacher background data for Slovak Republic and Slovenia are unavailable.

A dash (–) indicates data are not available. A tilde (~) indicates insufficient data to report achievement.

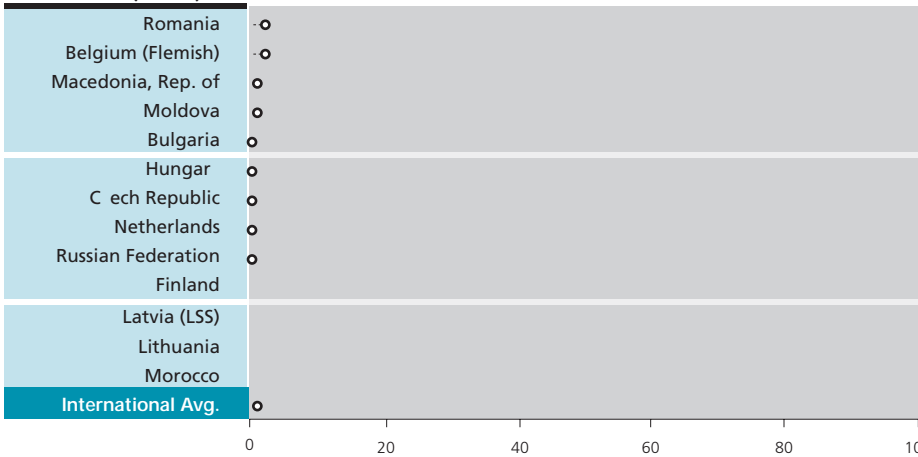
An "r" indicates teacher and/or student response data available for 70-84% of students. An "s" indicates teacher and/or student response data available for 50-69% of students. An "x" indicates teacher and/or student response data available for <50% of students.

Percentage of Students at High Level of Index of Emphasis on Conducting Experiments in Science Classes (ECES)

General/Integrated Science (ECES-G)



Earth Science (ECES-E)





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Percentage of Students Reporting Almost Always or Pretty Often

Countries with General/ Integrated Science		Countries with Separate Science Subjects				
		Earth Science	Biology	Physics	Chemistry	
Australia	10 (1.2)	Belgium (Flemish)	2 (0.4)	2 (0.6)	3 (0.5)	--
Canada	14 (0.7)	Bulgaria	6 (0.8)	3 (0.6)	6 (0.9)	5 (0.6)
Chile	10 (1.0)	Czech Republic	2 (0.4)	2 (0.8)	2 (0.6)	1 (0.5)
Chinese Taipei ^a	5 (0.3)	Finland	5 (0.6)	4 (0.6)	5 (0.7)	4 (0.6)
Cyprus	8 (0.5)	Hungary	3 (0.4)	2 (0.4)	4 (0.5)	3 (0.4)
England	10 (1.1)	Latvia (LSS)	--	2 (0.3)	3 (0.5)	3 (0.4)
Hong Kong, SAR	6 (0.6)	Lithuania [†]	--	--	--	--
Indonesia ^b	1 (0.3)	Macedonia, Rep. of	5 (0.7)	4 (0.6)	6 (0.8)	5 (0.6)
Iran, Islamic Rep.	1 (0.2)	Moldova	10 (0.9)	10 (0.9)	12 (1.0)	11 (0.9)
Israel	21 (1.7)	Morocco	x x	x x	x x	x x
Italy	10 (1.2)	Netherlands ^c	5 (0.7)	2 (0.3)	3 (0.4)	--
Japan	2 (0.8)	Romania	2 (0.5)	2 (0.4)	3 (0.5)	2 (0.5)
Jordan	15 (1.5)	Russian Federation	2 (0.3)	1 (0.2)	2 (0.3)	2 (0.2)
Korea, Rep. of	7 (0.9)	Slovak Republic	1 (0.2)	1 (0.3)	2 (0.5)	1 (0.2)
Malaysia	1 (0.2)	Slovenia	--	7 (0.9)	17 (1.3)	9 (0.8)
New Zealand	10 (1.0)	International Avg.	4 (0.2)	3 (0.2)	5 (0.2)	4 (0.2)
Philippines	9 (0.9)					
Singapore	15 (1.4)					
South Africa	--					
Thailand	5 (0.5)					
Tunisia	2 (0.4)					
Turkey	3 (0.2)					
United States	21 (1.4)					
International Avg.	8 (0.2)					

What Are the Roles of Homework and Assessment?

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R3.17

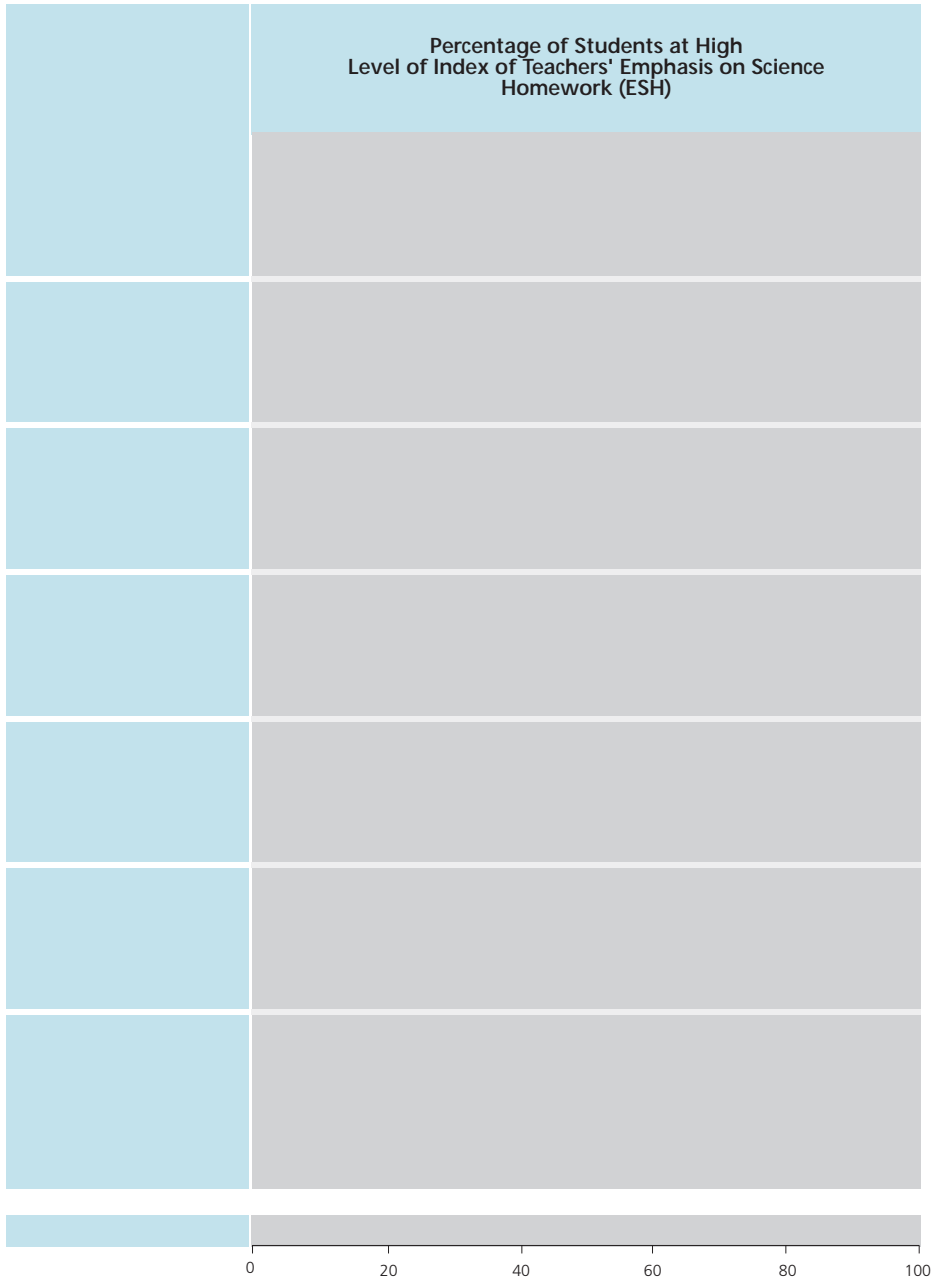


Index of Teachers' Emphasis on Science Homework

Index based on teachers' responses to two questions about how often the usually assign science homework and how many minutes of science homework the usually assign students (see reference exhibit R3.16). High level indicates the assignment of more than 30 minutes of homework at least once or twice a week. Low level indicates the assignment of less than 30 minutes of homework less than once a week or never assigning homework. Medium level includes all other possible combinations of responses.

	High		Medium		Low	
		▲		▲		▲
Iran, Islamic Rep.	61 (4.4)	449 (4.1)	32 (4.5)	447 (8.3)	7 (2.1)	449 (13.3)
Italy	58 (3.3)	493 (5.9)	34 (3.2)	495 (5.5)	8 (1.8)	486 (12.0)
Thailand	56 (4.0)	480 (5.0)	42 (3.9)	487 (6.7)	1 (1.0)	~ ~
Indonesia	53 (3.8)	436 (6.3)	42 (3.6)	438 (6.0)	5 (1.4)	405 (15.7)
Malaysia	46 (4.2)	486 (6.0)	51 (4.2)	497 (7.5)	3 (1.5)	497 (41.6)
Moldova	40 (2.6)	460 (5.0)	59 (2.7)	459 (4.9)	1 (0.5)	~ ~
Singapore	35 (4.3)	570 (12.3)	55 (4.1)	575 (11.2)	11 (2.4)	524 (19.3)
Russian Federation	32 (2.6)	527 (8.3)	66 (2.6)	530 (6.6)	3 (0.8)	542 (18.4)
Chile	26 (3.6)	424 (8.1)	47 (3.7)	421 (5.3)	26 (3.8)	418 (8.4)
Chinese Taipei	26 (3.8)	584 (7.8)	54 (4.4)	566 (5.5)	20 (3.3)	558 (7.9)
Turkey	24 (3.5)	430 (8.4)	64 (4.2)	434 (5.3)	11 (2.4)	432 (9.5)
South Africa	22 (3.6)	205 (14.0)	70 (4.0)	253 (10.5)	8 (2.6)	255 (31.8)
England	22 (2.9)	563 (11.3)	74 (3.1)	533 (5.2)	4 (1.3)	511 (12.4)
Morocco	16 (2.0)	319 (5.2)	54 (2.6)	324 (5.1)	30 (3.0)	324 (6.3)
Philippines	16 (3.0)	398 (15.5)	84 (3.0)	335 (8.0)	0 (0.0)	~ ~
United States	15 (1.8)	507 (9.5)	77 (2.4)	517 (5.2)	8 (1.7)	505 (15.6)
Israel	15 (2.7)	446 (13.3)	71 (3.6)	472 (6.3)	14 (2.5)	483 (9.0)
Germany	14 (2.4)	463 (4.9)	82 (2.7)	459 (2.6)	4 (1.7)	466 (15.3)
Hong Kong, SAR	14 (2.8)	527 (8.3)	68 (4.0)	533 (4.2)	19 (3.6)	521 (11.6)
Jordan	12 (2.8)	439 (12.7)	84 (2.9)	451 (4.1)	3 (1.5)	456 (38.5)
Macedonia, Rep. of	11 (1.6)	460 (8.9)	57 (3.1)	465 (6.9)	32 (2.7)	479 (6.5)
Canada	10 (2.3)	542 (8.9)	80 (2.8)	534 (2.6)	10 (1.9)	515 (6.4)
Lithuania †	9 (1.5)	497 (10.9)	81 (2.1)	487 (4.1)	9 (1.6)	484 (7.6)
Tunisia	9 (2.6)	436 (10.1)	54 (4.1)	429 (4.0)	37 (3.8)	427 (4.7)

Percentage of Students at High Level of Index of Teachers' Emphasis on Science Homework (ESH)



	High			Medium			Low		
	1995	1999	1995-1999 Difference	1995	1999	1995-1999 Difference	1995	1999	1995-1999 Difference
Australia	2 (0.6)	7 (1.7)	5 (1.8) ●	87 (2.3)	75 (3.0)	-12 (3.8) ▼	11 (2.3)	18 (2.8)	7 (3.6) ●
Belgium (Flemish)	0 (0.0)	1 (0.5)	1 (0.5) ●	29 (4.4)	39 (3.5)	10 (5.6) ●	71 (4.4)	60 (3.4)	-11 (5.6) ●
Canada	7 (1.6)	10 (2.3)	3 (2.8) ●	77 (2.6)	80 (2.8)	3 (3.8) ●	16 (2.4)	10 (1.9)	-6 (3.1) ●
Czech Republic	17 (3.4)	14 (2.4)	-3 (4.1) ●	82 (3.4)	82 (2.7)	0 (4.4) ●	1 (0.9)	4 (1.7)	3 (1.9) ●
Denmark	0 (0.0)	0 (0.3)	0 (0.3) ●	32 (3.3)	29 (2.9)	-3 (4.4) ●	68 (3.3)	70 (2.9)	3 (4.4) ●
England	31 (2.9)	22 (2.9)	-9 (4.1) ●	59 (3.1)	74 (3.1)	14 (4.4) ▲	9 (2.0)	4 (1.3)	-5 (2.4) ●
Hong Kong, SAR	4 (2.1)	14 (2.8)	10 (3.5) ●	60 (5.7)	68 (4.0)	7 (7.0) ●	36 (5.6)	19 (3.6)	-17 (6.6) ●
Hungary	7 (1.2)	5 (0.9)	-2 (1.5) ●	67 (2.4)	70 (1.9)	3 (3.0) ●	26 (2.1)	25 (1.9)	-1 (2.8) ●
Iran, Islamic Rep.	50 (4.9)	61 (4.4)	11 (6.6) ●	40 (5.2)	32 (4.5)	-8 (6.8) ●	10 (3.2)	7 (2.1)	-3 (3.9) ●
Israel †	14 (5.1)	11 (2.7)	-3 (5.7) ●	70 (8.5)	73 (4.0)	3 (9.4) ●	17 (6.4)	16 (3.0)	0 (7.1) ●
Italy	50 (4.5)	57 (3.9)	7 (5.9) ●	35 (4.2)	34 (3.8)	-2 (5.7) ●	15 (4.0)	10 (2.4)	-5 (4.7) ●
Japan	5 (2.0)	4 (1.7)	-1 (2.6) ●	31 (3.9)	53 (4.1)	22 (5.7) ▲	64 (4.2)	43 (4.2)	-21 (5.9) ▼
Korea, Rep. of	10 (2.1)	8 (2.2)	-3 (3.1) ●	50 (4.0)	55 (3.9)	5 (5.6) ●	40 (4.1)	37 (3.8)	-2 (5.6) ●
Latvia (LSS)	3 (0.7)	5 (1.2)	2 (1.4) ●	81 (2.1)	81 (2.2)	1 (3.0) ●	16 (2.0)	14 (1.9)	-3 (2.7) ●
Lithuania	4 (1.0)	9 (1.5)	5 (1.8) ●	80 (1.9)	81 (2.1)	1 (2.8) ●	16 (1.6)	9 (1.6)	-6 (2.3) ●
Netherlands	3 (1.0)	5 (1.3)	2 (1.6) ●	87 (2.5)	82 (3.0)	-5 (3.9) ●	10 (2.2)	13 (3.1)	3 (3.8) ●
New Zealand	2 (1.7)	7 (2.1)	5 (2.7) ●	86 (3.4)	78 (3.1)	-8 (4.6) ●	12 (3.1)	14 (2.9)	2 (4.2) ●
Romania	12 (1.4)	7 (1.6)	-5 (2.1) ●	50 (2.1)	58 (2.5)	8 (3.3) ●	38 (2.1)	35 (2.3)	-3 (3.1) ●
Russian Federation	21 (2.1)	32 (2.6)	10 (3.3) ▲	78 (2.2)	66 (2.6)	-12 (3.4) ▼	1 (0.4)	3 (0.8)	2 (0.9) ●
Singapore	28 (4.4)	35 (4.3)	7 (6.2) ●	59 (4.9)	55 (4.1)	-4 (6.4) ●	13 (3.1)	11 (2.4)	-3 (3.9) ●
Thailand †	34 (4.7)	56 (4.0)	23 (6.2) ▲	61 (4.8)	42 (3.9)	-19 (6.2) ▼	5 (2.2)	1 (1.0)	-3 (2.4) ●
United States	5 (1.3)	15 (1.8)	10 (2.2) ▲	87 (1.8)	77 (2.4)	-11 (2.9) ▼	7 (1.6)	8 (1.7)	1 (2.3) ●
International Avg. §	13 (0.5)	16 (0.5)	3 (0.8) ▲	63 (0.8)	63 (0.7)	0 (1.1) ●	24 (0.7)	21 (0.6)	-3 (0.9) ▼

▲ 1999 significantly higher than 1995
 ● No significant difference between 1995 and 1999
 ▼ 1999 significantly lower than 1995

Significance tests adjusted for multiple comparisons

	Percentage of Students by Type of Assessment						
	External Standardized Tests						
Australia	16 (2.6)	71 (3.6)	67 (3.4)	37 (3.8)	66 (2.9)	38 (3.8)	30 (3.3)
Belgium (Flemish)	9 (2.1)	96 (1.6)	30 (2.7)	32 (2.9)	43 (3.6)	44 (3.3)	56 (3.3)
Bulgaria	67 (3.0)	90 (1.7)	38 (3.4)	69 (2.0)	66 (2.6)	84 (2.1)	96 (1.2)
Canada	13 (2.5)	66 (3.0)	59 (3.6)	60 (3.0)	84 (3.0)	50 (3.1)	44 (3.0)
Chile	27 (3.3)	78 (3.0)	87 (2.5)	56 (3.8)	68 (3.7)	77 (3.4)	80 (3.1)
Chinese Taipei	36 (4.1)	43 (4.5)	69 (4.1)	67 (3.6)	55 (4.1)	67 (3.8)	76 (3.4)
Cyprus	24 (4.3)	94 (2.1)	45 (4.6)	87 (2.6)	82 (3.9)	90 (2.5)	96 (1.6)
Czech Republic	45 (3.2)	96 (1.2)	40 (3.3)	23 (2.8)	56 (3.3)	78 (2.4)	97 (0.8)
England	57 (3.9)	68 (4.3)	25 (4.2)	77 (3.6)	80 (3.0)	74 (3.6)	71 (4.2)
Finland	9 (1.6)	47 (2.6)	37 (2.5)	70 (2.4)	83 (2.2)	85 (1.9)	94 (1.4)
Hong Kong, SAR	17 (3.1)	58 (4.2)	76 (3.5)	33 (3.8)	23 (3.8)	23 (3.6)	30 (4.1)
Hungary	52 (2.7)	80 (1.9)	31 (2.0)	29 (2.0)	47 (2.2)	72 (2.3)	92 (1.3)
Indonesia	53 (4.0)	83 (2.7)	48 (4.3)	64 (3.6)	61 (3.6)	71 (3.9)	72 (3.9)
Iran, Islamic Rep.	69 (3.9)	79 (3.9)	80 (3.5)	72 (3.8)	52 (3.9)	61 (4.2)	91 (2.3)
Israel	15 (3.5)	75 (3.7)	80 (3.4)	46 (3.9)	64 (3.3)	28 (3.7)	63 (3.6)
Italy	22 (2.8)	95 (1.7)	74 (3.2)	64 (4.0)	71 (3.4)	96 (1.6)	98 (1.2)
Japan	15 (2.6)	64 (4.3)	55 (4.3)	48 (4.3)	81 (3.6)	74 (3.9)	66 (3.5)
Jordan	28 (4.4)	84 (3.3)	41 (4.2)	59 (4.3)	49 (5.0)	72 (3.6)	84 (2.9)
Korea, Rep. of	51 (4.1)	84 (2.8)	76 (3.6)	89 (2.5)	99 (0.6)	92 (2.2)	81 (3.1)
Latvia (LSS)	81 (2.2)	92 (1.4)	59 (3.3)	59 (2.8)	93 (1.4)	78 (2.7)	97 (0.9)
Lithuania †	34 (2.1)	68 (2.8)	26 (2.1)	30 (2.3)	55 (2.1)	32 (2.5)	78 (2.2)
Macedonia, Rep. of	36 (2.6)	62 (2.5)	68 (2.5)	83 (2.1)	52 (2.5)	96 (1.3)	98 (0.6)
Malaysia	18 (3.2)	42 (4.2)	78 (3.6)	74 (4.0)	69 (4.0)	78 (3.2)	81 (3.2)
Moldova	58 (2.3)	93 (1.0)	76 (2.0)	89 (1.4)	76 (1.9)	90 (1.4)	92 (1.4)
Morocco	33 (2.5)	86 (1.5)	77 (2.1)	67 (2.0)	62 (2.1)	72 (2.0)	85 (2.3)
Netherlands	24 (3.2)	97 (1.0)	73 (4.6)	17 (2.6)	32 (3.6)	24 (3.5)	23 (3.1)
New Zealand	9 (2.2)	65 (4.0)	46 (3.8)	31 (4.1)	71 (3.9)	57 (3.9)	45 (4.4)
Philippines	42 (4.0)	84 (3.3)	89 (2.4)	77 (3.6)	83 (3.3)	87 (2.8)	91 (2.5)
Romania	51 (2.7)	87 (1.6)	81 (2.1)	62 (2.8)	65 (2.8)	87 (1.7)	99 (0.6)
Russian Federation	--	97 (0.6)	64 (1.9)	77 (2.2)	83 (1.6)	97 (0.7)	96 (1.1)
Singapore	28 (3.9)	70 (4.2)	67 (3.5)	39 (4.5)	61 (4.2)	40 (4.2)	36 (4.5)
South Africa	39 (3.2)	65 (4.2)	61 (4.6)	66 (3.9)	50 (4.3)	62 (4.5)	70 (3.6)
Thailand	29 (4.1)	73 (4.1)	70 (3.9)	83 (3.2)	70 (4.2)	77 (3.6)	82 (3.4)
Tunisia	20 (3.7)	82 (3.0)	77 (3.3)	47 (4.2)	71 (3.8)	85 (3.1)	88 (2.5)
Turkey	20 (3.4)	64 (3.6)	43 (3.8)	44 (4.0)	46 (4.5)	61 (3.7)	93 (1.8)
United States	18 (2.5)	70 (2.8)	60 (3.2)	66 (2.8)	82 (2.7)	49 (3.6)	49 (2.6)
International Avg.	33 (0.5)	76 (0.5)	60 (0.6)	58 (0.6)	65 (0.6)	68 (0.5)	75 (0.5)

