

Chapter 7

Classroom Characteristics and Instruction

Although the school provides the general context for learning, it is in the classroom setting and through guidance by the teacher that most instruction and learning take place. To provide information about the environment of science classrooms and the instruction that takes place, Chapter 7 presents teachers' reports from the second part of the teacher questionnaire about their science classrooms and instructional practices, as well as students' reports about the classroom activities they do in learning science. Data are presented about class size, various limitations on instruction, instructional time, instructional emphases given different science topics, and science investigations. Information also is presented about textbook use, classroom activities, the use of computers in science lessons, the role of homework, and the reliance on different types of assessment approaches.

Teachers and the instructional approaches they use ultimately determine the science students learn. Teachers structure the content and pace of lessons, introducing new material, selecting various instructional activities, and monitoring students' developing understanding of the science concepts being studied. Teachers may help students use technology and tools to investigate scientific ideas, analyze students' work for misconceptions, and promote positive attitudes

toward science. They may also assign homework and conduct informal as well as formal assessments to evaluate achievement outcomes.

How Do the Characteristics of Science Classrooms Impact Instruction?

Because it can affect pedagogical strategies, class size data are shown in Exhibit 7.1. Teachers' reports about the sizes of their eighth-grade science classes reveal that across countries the average class size was 31 students, but there was considerable variation – from more than 54 students in the Philippines to 20 students in Belgium (Flemish). At the fourth grade, classes typically were smaller. The average class size for the TIMSS participants was 26 students, ranging from 40 in the Philippines to 20 in Belgium (Flemish), Italy, and Slovenia.

The relationship between class size and achievement is difficult to disentangle, given the variety of policies and practices that countries have in determining class size. For example, countries and schools cannot always control class size. Because of this, the ability to cap class sizes can indicate the availability of more resources in general. As another complicating factor, smaller classes can be used for advanced or practical classes such as computer or science laboratories on one hand, and for remedial learning or students with special needs on the other. The complexity of this issue is evidenced in the TIMSS results that show a curvilinear relationship, on average, between class size and science achievement at both the eighth and fourth grades.

At the eighth grade, science teachers were asked about the instructional impact of six characteristics of their students – differing academic abilities, range in backgrounds, students with special needs, uninterested students, low morale among students, and disruptive students. Responses were given on a four-point scale; “not at all,” “a little,” “some,” and “a lot.” TIMSS used the teachers' responses to construct an index and the results are presented in Exhibit 7.2. Students were placed in the high category, if, on average, teachers reported their classrooms were impacted only a little (or less) and in the low category, if,

on average, these factors impacted instruction at least somewhat. The remaining students fell in the medium category. The results show that average science achievement is related to the impact of student characteristics on classroom instruction, with lower achievement related to having more instructionally challenging and diverse students in the class. On average, internationally, 21 percent of the students were in such classrooms.

Exhibit 7.1: Class Size for Science Instruction



Countries	Overall Average Class Size	1 - 24 Students		25 - 32 Students		33 - 40 Students		41 or More Students		
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Armenia	s	31 (0.8)	30 (2.5)	470 (7.6)	40 (3.4)	469 (6.4)	9 (1.9)	443 (7.4)	21 (2.8)	455 (5.8)
Australia	r	26 (0.4)	33 (3.8)	524 (7.7)	65 (3.9)	529 (4.2)	2 (0.9)	~ ~	0 (0.0)	~ ~
Bahrain		32 (0.2)	5 (0.8)	452 (7.4)	53 (2.3)	440 (2.2)	39 (2.2)	432 (3.2)	3 (0.0)	455 (6.0)
Belgium (Flemish)		20 (0.3)	88 (2.4)	515 (2.6)	12 (2.4)	532 (7.6)	0 (0.0)	~ ~	0 (0.0)	~ ~
Botswana		37 (0.4)	2 (0.9)	~ ~	14 (2.7)	392 (14.2)	57 (4.9)	357 (3.7)	27 (4.6)	363 (6.1)
Bulgaria	r	22 (0.6)	68 (4.7)	483 (4.9)	27 (4.2)	478 (9.0)	4 (3.0)	428 (5.0)	1 (0.0)	~ ~
Chile		35 (0.4)	8 (1.5)	412 (16.6)	25 (2.7)	408 (6.0)	45 (3.6)	416 (5.9)	22 (3.6)	415 (6.9)
Chinese Taipei		37 (0.4)	4 (1.5)	584 (21.1)	14 (2.8)	554 (7.8)	66 (4.1)	563 (3.9)	17 (3.2)	607 (6.3)
Cyprus		25 (0.1)	30 (1.7)	443 (3.2)	70 (1.7)	439 (2.3)	0 (0.0)	~ ~	0 (0.0)	~ ~
Egypt		39 (0.7)	2 (1.1)	~ ~	8 (1.9)	452 (11.1)	58 (4.7)	418 (5.1)	31 (4.3)	418 (7.9)
Estonia		28 (0.4)	27 (2.7)	545 (3.7)	45 (4.1)	549 (4.0)	28 (3.3)	565 (5.2)	0 (0.2)	~ ~
Ghana	r	37 (1.1)	17 (2.8)	205 (12.2)	17 (3.1)	224 (13.8)	28 (4.0)	273 (11.7)	38 (5.0)	266 (12.3)
Hong Kong, SAR		40 (0.3)	0 (0.0)	~ ~	4 (1.6)	481 (22.0)	52 (4.2)	548 (5.3)	44 (4.3)	574 (4.5)
Hungary		23 (0.4)	60 (4.1)	535 (3.8)	37 (4.1)	551 (5.2)	3 (1.2)	589 (12.8)	0 (0.0)	~ ~
Indonesia		40 (0.5)	3 (1.7)	437 (27.3)	8 (2.3)	391 (19.6)	41 (4.2)	420 (7.1)	48 (4.4)	429 (5.8)
Iran, Islamic Rep. of		29 (0.4)	21 (2.9)	442 (4.6)	49 (4.3)	456 (4.0)	26 (3.7)	457 (5.0)	4 (1.5)	448 (11.0)
Israel	r	34 (0.4)	10 (2.3)	507 (14.1)	18 (3.5)	494 (8.4)	69 (4.1)	484 (4.1)	3 (1.4)	522 (15.2)
Italy		22 (0.3)	78 (3.1)	490 (3.2)	22 (3.1)	496 (8.4)	0 (0.0)	~ ~	0 (0.0)	~ ~
Japan		35 (0.2)	2 (1.0)	~ ~	18 (2.4)	547 (3.0)	79 (2.3)	552 (2.4)	1 (1.0)	~ ~
Jordan		35 (0.6)	13 (2.6)	481 (7.3)	25 (3.5)	473 (12.0)	33 (4.4)	465 (6.0)	29 (3.8)	482 (6.8)
Korea, Rep. of	s	37 (0.4)	1 (0.8)	~ ~	20 (2.8)	550 (4.5)	56 (4.3)	562 (2.1)	23 (3.5)	566 (4.5)
Latvia	r	28 (0.9)	44 (3.6)	504 (3.8)	38 (3.8)	520 (4.3)	6 (1.5)	517 (9.4)	13 (2.6)	520 (9.3)
Lebanon		28 (0.6)	35 (3.6)	385 (7.9)	44 (4.4)	388 (6.9)	15 (2.4)	417 (11.9)	6 (2.7)	435 (7.8)
Lithuania	r	25 (0.3)	39 (2.7)	510 (3.9)	61 (2.7)	523 (2.4)	0 (0.3)	~ ~	0 (0.2)	~ ~
Macedonia, Rep. of		28 (0.4)	26 (3.5)	449 (8.4)	57 (3.9)	451 (5.7)	16 (3.4)	448 (11.9)	1 (1.1)	~ ~
Malaysia		37 (0.4)	2 (0.8)	~ ~	18 (3.5)	519 (10.2)	59 (4.6)	507 (4.4)	22 (3.4)	515 (9.4)
Moldova, Rep. of	s	25 (0.5)	54 (4.4)	465 (5.6)	38 (4.4)	473 (5.9)	5 (1.2)	481 (10.9)	3 (1.1)	484 (12.9)
Morocco	s	41 (1.2)	9 (4.2)	395 (12.6)	22 (5.0)	395 (7.5)	16 (3.6)	420 (11.4)	53 (4.9)	391 (5.7)
Netherlands	r	26 (0.3)	30 (3.7)	521 (8.0)	69 (3.9)	545 (4.6)	1 (1.2)	~ ~	0 (0.0)	~ ~
New Zealand		27 (0.4)	22 (3.4)	502 (7.2)	72 (4.0)	526 (6.5)	6 (3.6)	557 (10.9)	0 (0.0)	~ ~
Norway	r	25 (0.3)	33 (3.8)	498 (3.6)	65 (3.7)	490 (2.8)	0 (0.0)	~ ~	1 (0.8)	~ ~
Palestinian Nat'l Auth.		39 (0.6)	7 (2.1)	442 (17.2)	16 (2.7)	445 (6.8)	28 (3.7)	440 (7.2)	48 (3.5)	431 (4.7)
Philippines		54 (0.8)	1 (0.0)	~ ~	1 (0.8)	~ ~	6 (1.8)	433 (35.3)	93 (1.9)	376 (6.1)
Romania		24 (0.5)	52 (4.3)	465 (7.2)	44 (4.4)	470 (6.5)	2 (1.3)	~ ~	1 (0.8)	~ ~
Russian Federation		23 (0.4)	49 (3.7)	505 (4.0)	46 (3.5)	519 (4.6)	5 (2.7)	532 (11.0)	0 (0.0)	~ ~
Saudi Arabia		29 (0.9)	32 (5.0)	399 (8.3)	29 (5.6)	400 (9.3)	31 (5.7)	393 (6.7)	8 (3.3)	398 (4.7)
Scotland	s	19 (0.3)	94 (1.5)	516 (4.2)	4 (1.3)	547 (11.5)	2 (0.7)	~ ~	1 (0.4)	~ ~
Serbia		26 (0.5)	38 (3.6)	456 (4.1)	50 (3.8)	472 (3.7)	11 (2.9)	481 (7.1)	1 (0.4)	~ ~
Singapore		38 (0.2)	2 (0.6)	~ ~	8 (1.6)	587 (21.2)	63 (2.7)	577 (5.9)	26 (2.4)	583 (6.2)
Slovak Republic		25 (0.4)	40 (4.4)	509 (4.3)	54 (4.6)	520 (5.0)	5 (1.9)	543 (19.6)	0 (0.0)	~ ~
Slovenia		23 (0.3)	71 (3.7)	519 (2.2)	29 (3.7)	527 (3.4)	0 (0.0)	~ ~	0 (0.0)	~ ~
South Africa	s	45 (1.2)	4 (1.2)	247 (44.5)	12 (2.9)	250 (37.6)	31 (3.6)	268 (19.8)	53 (3.9)	230 (11.7)
Sweden	r	21 (0.4)	73 (3.4)	524 (3.3)	24 (3.5)	528 (5.3)	1 (0.4)	~ ~	2 (0.7)	~ ~
Tunisia		34 (0.3)	2 (1.2)	~ ~	25 (3.4)	398 (3.4)	72 (3.4)	405 (2.5)	1 (0.7)	~ ~
United States	r	24 (0.5)	50 (2.9)	534 (4.3)	39 (2.8)	526 (5.4)	7 (1.8)	542 (13.8)	3 (1.2)	539 (8.9)
‡ England	s	27 (0.6)	33 (4.6)	549 (12.3)	59 (4.5)	555 (7.6)	6 (2.5)	574 (29.1)	2 (1.0)	~ ~
International Avg.		31 (0.1)	29 (0.4)	471 (2.0)	33 (0.5)	477 (1.6)	24 (0.4)	472 (2.0)	14 (0.4)	454 (1.7)

Benchmarking Participants

Basque Country, Spain		24 (0.4)	49 (3.7)	483 (3.7)	48 (4.1)	495 (3.7)	3 (2.0)	525 (7.2)	0 (0.0)	~ ~
Indiana State, US		26 (1.5)	48 (6.2)	529 (6.8)	41 (5.9)	539 (7.4)	2 (2.2)	~ ~	9 (3.6)	518 (15.8)
Ontario Province, Can.		27 (0.4)	23 (3.7)	532 (4.2)	69 (4.1)	533 (3.8)	7 (2.7)	523 (7.0)	0 (0.0)	~ ~
Quebec Province, Can.	r	30 (0.4)	14 (2.9)	521 (5.7)	61 (4.2)	530 (4.8)	26 (3.3)	552 (5.3)	0 (0.0)	~ ~

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

() 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 "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 7.1: Class Size for Science Instruction

SCIENCE
Grade 4

Countries	Overall Average Class Size	1 - 19 Students		20 - 26 Students		27 - 32 Students		33 or More Students	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Armenia	x x	x x	x x	x x	x x	x x	x x	x x	x x
Australia	26 (0.5)	14 (2.9)	518 (9.0)	28 (3.5)	523 (6.1)	55 (4.4)	521 (8.2)	3 (1.7)	519 (7.5)
Belgium (Flemish)	20 (0.3)	41 (3.4)	517 (3.4)	52 (3.6)	519 (2.2)	6 (2.0)	518 (3.2)	1 (0.0)	~ ~
Chinese Taipei	32 (0.3)	2 (0.7)	~ ~	7 (2.0)	535 (12.0)	37 (4.0)	552 (3.0)	54 (3.7)	554 (2.3)
Cyprus	23 (0.3)	18 (2.2)	476 (3.7)	55 (4.5)	484 (3.7)	26 (4.2)	478 (4.1)	1 (0.5)	~ ~
England	r 28 (0.8)	8 (2.8)	531 (22.6)	28 (4.5)	542 (6.1)	46 (5.2)	542 (5.8)	18 (4.3)	535 (10.1)
Hong Kong, SAR	r 34 (0.4)	1 (0.6)	~ ~	2 (1.3)	~ ~	31 (4.7)	532 (5.2)	66 (4.7)	549 (3.6)
Hungary	24 (0.5)	19 (3.2)	511 (7.6)	53 (4.1)	526 (4.6)	27 (4.1)	544 (6.1)	1 (0.9)	~ ~
Iran, Islamic Rep. of	27 (0.6)	16 (2.6)	378 (11.6)	28 (3.7)	417 (5.9)	27 (4.0)	411 (9.0)	29 (4.0)	436 (6.5)
Italy	20 (0.3)	45 (3.4)	521 (5.2)	53 (3.4)	511 (5.1)	1 (0.7)	~ ~	0 (0.0)	~ ~
Japan	32 (0.3)	5 (1.1)	556 (6.4)	12 (2.3)	538 (4.8)	28 (3.0)	545 (2.5)	55 (2.8)	543 (2.2)
Latvia	x x	x x	x x	x x	x x	x x	x x	x x	x x
Lithuania	21 (0.4)	30 (3.0)	494 (5.9)	59 (3.5)	518 (2.4)	11 (2.5)	522 (6.0)	0 (0.3)	~ ~
Moldova, Rep. of	r 24 (0.4)	20 (3.6)	491 (9.0)	48 (4.7)	499 (5.8)	30 (3.8)	505 (10.1)	2 (1.3)	~ ~
Morocco	x x	x x	x x	x x	x x	x x	x x	x x	x x
Netherlands	23 (0.4)	24 (3.4)	530 (4.0)	41 (4.6)	522 (4.3)	33 (4.2)	529 (2.3)	2 (1.5)	~ ~
New Zealand	r 28 (0.3)	9 (1.4)	503 (11.5)	20 (2.3)	520 (7.5)	61 (3.2)	529 (3.0)	10 (2.6)	513 (8.4)
Norway	21 (0.4)	38 (3.2)	464 (5.1)	47 (3.5)	466 (3.6)	13 (3.2)	476 (5.0)	2 (1.3)	~ ~
Philippines	40 (1.0)	3 (1.0)	279 (39.9)	7 (2.4)	333 (31.6)	16 (3.8)	364 (38.8)	75 (4.2)	326 (9.0)
Russian Federation	21 (0.3)	33 (3.2)	523 (7.2)	45 (3.6)	532 (8.6)	20 (2.5)	514 (8.7)	1 (0.9)	~ ~
Scotland	s 26 (0.5)	17 (3.6)	506 (7.9)	26 (4.4)	502 (5.7)	49 (4.8)	508 (4.8)	8 (2.6)	516 (10.2)
Singapore	38 (0.2)	0 (0.1)	~ ~	2 (0.8)	~ ~	3 (1.0)	472 (37.8)	96 (1.3)	569 (5.4)
Slovenia	20 (0.4)	45 (4.0)	489 (4.0)	49 (4.3)	491 (3.7)	5 (2.1)	496 (9.4)	0 (0.0)	~ ~
Tunisia	r 30 (0.5)	5 (1.5)	297 (33.0)	19 (3.1)	295 (15.3)	40 (4.1)	316 (9.4)	37 (4.4)	316 (11.2)
United States	r 23 (0.4)	24 (2.7)	543 (6.4)	53 (3.3)	540 (3.5)	18 (2.4)	521 (5.3)	5 (1.3)	534 (14.9)
International Avg.	26 (0.1)	19 (0.6)	480 (3.4)	33 (0.7)	491 (2.2)	27 (0.8)	495 (2.9)	21 (0.5)	492 (2.5)
Benchmarking Participants									
Indiana State, US	r 23 (0.6)	19 (5.6)	553 (11.7)	69 (7.2)	550 (5.2)	7 (2.8)	555 (13.9)	5 (2.7)	560 (19.0)
Ontario Province, Can.	25 (0.5)	13 (3.2)	543 (8.1)	45 (5.2)	542 (6.9)	39 (5.3)	538 (5.4)	4 (1.7)	532 (10.1)
Quebec Province, Can.	26 (0.3)	5 (1.6)	512 (10.3)	49 (4.6)	495 (4.1)	46 (4.5)	505 (3.4)	0 (0.1)	~ ~

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

() 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 "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 7.2: Index of Teachers' Reports on Teaching Science Classes with Few or No Limitations on Instruction Due to Student Factors (SCFL)

Countries		High SCFL		Medium SCFL		Low SCFL	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Netherlands	r	76 (2.8)	548 (3.8)	21 (2.7)	505 (4.6)	3 (1.1)	486 (8.6)
Lithuania		72 (1.6)	523 (2.2)	27 (1.6)	509 (3.0)	1 (0.5)	~ ~
Belgium (Flemish)		66 (3.2)	532 (2.8)	28 (3.3)	493 (7.1)	7 (1.5)	470 (19.6)
Malaysia		63 (4.3)	524 (4.2)	33 (4.0)	492 (6.3)	4 (1.6)	454 (16.7)
Japan		61 (3.0)	558 (2.4)	38 (3.2)	542 (2.9)	1 (1.0)	~ ~
Sweden		58 (3.0)	533 (2.8)	36 (3.0)	519 (4.5)	6 (1.7)	491 (11.0)
Estonia	r	57 (2.6)	565 (2.8)	32 (2.5)	547 (3.4)	11 (1.7)	543 (3.4)
Hungary		55 (2.7)	554 (3.2)	38 (2.6)	528 (3.4)	7 (1.1)	524 (5.7)
Latvia	r	55 (2.8)	516 (3.0)	37 (2.7)	510 (3.5)	9 (1.6)	513 (5.8)
Australia	r	49 (3.6)	541 (5.2)	36 (3.1)	522 (6.4)	16 (2.4)	504 (7.4)
Norway		46 (4.4)	500 (2.6)	41 (4.4)	491 (3.4)	13 (3.0)	478 (9.0)
Slovenia		44 (3.0)	522 (2.6)	43 (3.0)	519 (2.3)	13 (1.6)	526 (2.9)
United States	r	44 (3.0)	541 (4.8)	38 (3.0)	528 (4.3)	18 (2.1)	510 (7.6)
Macedonia, Rep. of		43 (2.8)	454 (4.7)	41 (2.6)	459 (4.9)	16 (2.0)	433 (9.7)
Scotland	s	43 (2.9)	524 (5.5)	40 (2.8)	517 (5.0)	17 (2.4)	493 (10.6)
Russian Federation		42 (2.0)	524 (4.1)	37 (1.8)	509 (3.7)	20 (2.6)	499 (6.6)
New Zealand		40 (4.7)	552 (8.8)	39 (4.6)	510 (3.6)	20 (3.3)	485 (8.2)
Philippines		38 (4.8)	417 (8.2)	39 (4.6)	358 (10.2)	23 (3.8)	348 (12.9)
Serbia		38 (2.4)	467 (3.5)	42 (2.2)	468 (3.4)	20 (1.9)	464 (4.0)
Lebanon		38 (3.9)	406 (7.9)	40 (3.8)	377 (6.2)	22 (2.4)	401 (8.7)
Romania		38 (2.8)	488 (6.6)	39 (2.3)	463 (6.1)	23 (2.1)	450 (7.0)
Bulgaria	r	37 (3.3)	483 (5.4)	40 (3.0)	474 (7.0)	23 (3.2)	479 (8.6)
Singapore		36 (2.4)	619 (5.8)	40 (2.5)	574 (7.3)	23 (2.3)	524 (9.2)
Indonesia		36 (3.2)	433 (6.4)	48 (3.5)	418 (5.5)	17 (2.6)	414 (9.2)
Moldova, Rep. of	r	35 (2.8)	474 (4.9)	42 (3.3)	463 (5.5)	23 (2.5)	470 (5.5)
Italy		34 (3.9)	511 (6.2)	43 (4.0)	482 (4.1)	23 (2.7)	479 (6.1)
Korea, Rep. of	r	33 (3.3)	557 (2.8)	56 (3.1)	561 (2.9)	11 (2.4)	560 (5.9)
Chile		32 (3.7)	435 (6.0)	41 (4.0)	408 (4.8)	27 (3.8)	393 (5.4)
Armenia	r	32 (3.0)	466 (7.8)	45 (2.8)	460 (3.6)	23 (2.1)	463 (5.0)
Egypt		31 (3.5)	443 (6.7)	48 (4.1)	418 (5.6)	21 (3.4)	398 (10.5)
Ghana		31 (4.6)	267 (11.2)	48 (4.7)	252 (9.7)	21 (4.0)	238 (11.3)
Hong Kong, SAR		30 (4.0)	571 (5.3)	38 (4.3)	556 (5.2)	32 (4.3)	539 (7.4)
Israel		30 (3.4)	507 (5.7)	40 (3.6)	489 (4.7)	30 (3.0)	474 (5.6)
South Africa	r	29 (3.5)	272 (19.4)	42 (4.1)	242 (13.3)	29 (3.7)	229 (10.9)
Slovak Republic		27 (2.5)	536 (5.5)	47 (2.8)	509 (3.4)	26 (2.3)	511 (3.9)
Chinese Taipei		26 (4.1)	583 (6.8)	34 (3.7)	576 (5.5)	39 (4.4)	560 (4.8)
Saudi Arabia		25 (4.2)	400 (7.9)	51 (5.7)	399 (6.2)	24 (5.2)	390 (8.4)
Tunisia		21 (3.4)	406 (5.1)	50 (3.7)	402 (3.0)	28 (3.4)	403 (3.0)
Jordan		20 (3.2)	478 (6.8)	54 (4.2)	475 (6.0)	26 (3.7)	472 (7.5)
Palestinian Nat'l Auth.		20 (3.1)	435 (6.7)	46 (4.4)	436 (5.8)	35 (4.4)	434 (6.3)
Bahrain		18 (2.6)	449 (4.2)	45 (4.1)	440 (3.1)	37 (3.9)	431 (3.3)
Cyprus		18 (1.0)	446 (3.4)	40 (1.3)	438 (2.7)	42 (1.2)	440 (2.3)
Botswana		15 (3.5)	377 (8.6)	49 (4.6)	361 (5.8)	37 (4.1)	361 (4.5)
Iran, Islamic Rep. of		11 (2.6)	471 (12.2)	34 (4.1)	458 (4.9)	55 (3.7)	448 (2.8)
Morocco		5 (2.0)	377 (9.0)	41 (4.7)	400 (4.2)	54 (5.2)	400 (5.5)
‡ England	s	64 (4.0)	573 (7.3)	25 (3.1)	514 (10.5)	11 (2.9)	508 (9.3)
International Avg.		38 (0.5)	486 (1.0)	40 (0.5)	469 (0.9)	21 (0.4)	457 (1.3)
Benchmarking Participants							
Basque Country, Spain		31 (4.9)	492 (5.6)	46 (5.4)	492 (3.8)	23 (4.1)	481 (7.2)
Indiana State, US		36 (4.5)	538 (7.9)	46 (4.9)	532 (5.5)	18 (4.5)	515 (13.2)
Ontario Province, Can.		49 (4.8)	540 (2.9)	32 (4.7)	532 (4.9)	19 (3.3)	516 (8.4)
Quebec Province, Can.	r	65 (4.2)	542 (4.4)	30 (4.3)	521 (4.8)	5 (1.6)	510 (12.6)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

() 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 "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

How Much School Time Is Devoted to Science Instruction?

Exhibit 7.3 presents information about the amount of science instruction given to students at the eighth and fourth grades. Since different systems have school years of different lengths and different arrangements of weekly and daily instruction, the comparisons are given in terms of the average number of hours of science instruction over the school year as reported by science teachers. At the eighth grade, results are presented first for countries teaching science as a single subject and then by science subject for countries teaching the sciences separately.

In general, students in countries with separate science subjects had more total instructional hours in the sciences. Since these students study all of the subjects offered, the total time is the sum of the hours reported by each subject area teacher. Based on these sums, instructional hours for students with separate science courses ranged from 120 hours in Latvia (where students took biology and physics only) to 284 hours in the Slovak Republic (where students took all four science subjects). Not surprisingly, the countries offering all four subjects were those with the most instructional time. All of these were from central or eastern Europe, and in addition to the Slovak Republic, included Bulgaria (245 hours), Estonia (259 hours), Hungary (235 hours), Lithuania (230 hours), Macedonia (255 hours), Romania (232 hours), and Serbia (223 hours). Among countries teaching science as a single subject, instructional time ranged from 69 hours in Italy to 202 in the Philippines, with an international average of 117 hours.

The percentage of instructional time at the eighth grade that was devoted to science ranged from 18 percent in the Philippines to 7 percent in Norway for single science countries. Among countries teaching separate science subjects, the percentage was between 6 and 7 percent for each subject. Combining these percentages gives a range from 13 percent for Latvia to 30 percent for the Slovak Republic.

At the fourth grade, countries devote less instructional time to science than at the eighth grade, in terms of both the total instructional

hours and the percentage devoted to instruction. Total instructional time for science ranged from 33 hours in the Russian Federation to 176 in the Philippines. The figure for the Philippines was almost twice that for the next highest, the Canadian province of Ontario (93 hours). The percentage of instructional time at the fourth grade that was devoted to science ranged from 3 percent in Netherlands to 16 percent in the Philippines.

Exhibit 7.4 provides teachers' reports about how instructional time in science is allocated across the five major content areas assessed by TIMSS 2003. At the eighth grade, on average, internationally, the greatest percentage of science instructional time was devoted to life science (27%). Next were physics (24%) and then chemistry (21%). Earth science was given 13 percent, environmental science 9 percent, and other topics 5 percent. At the fourth grade, with fewer content areas, the profile was different. Again, life science received the largest amount of instructional time – 41 percent, on average, internationally. Earth science was given 28 percent, physical science 24 percent, and other 8 percent.

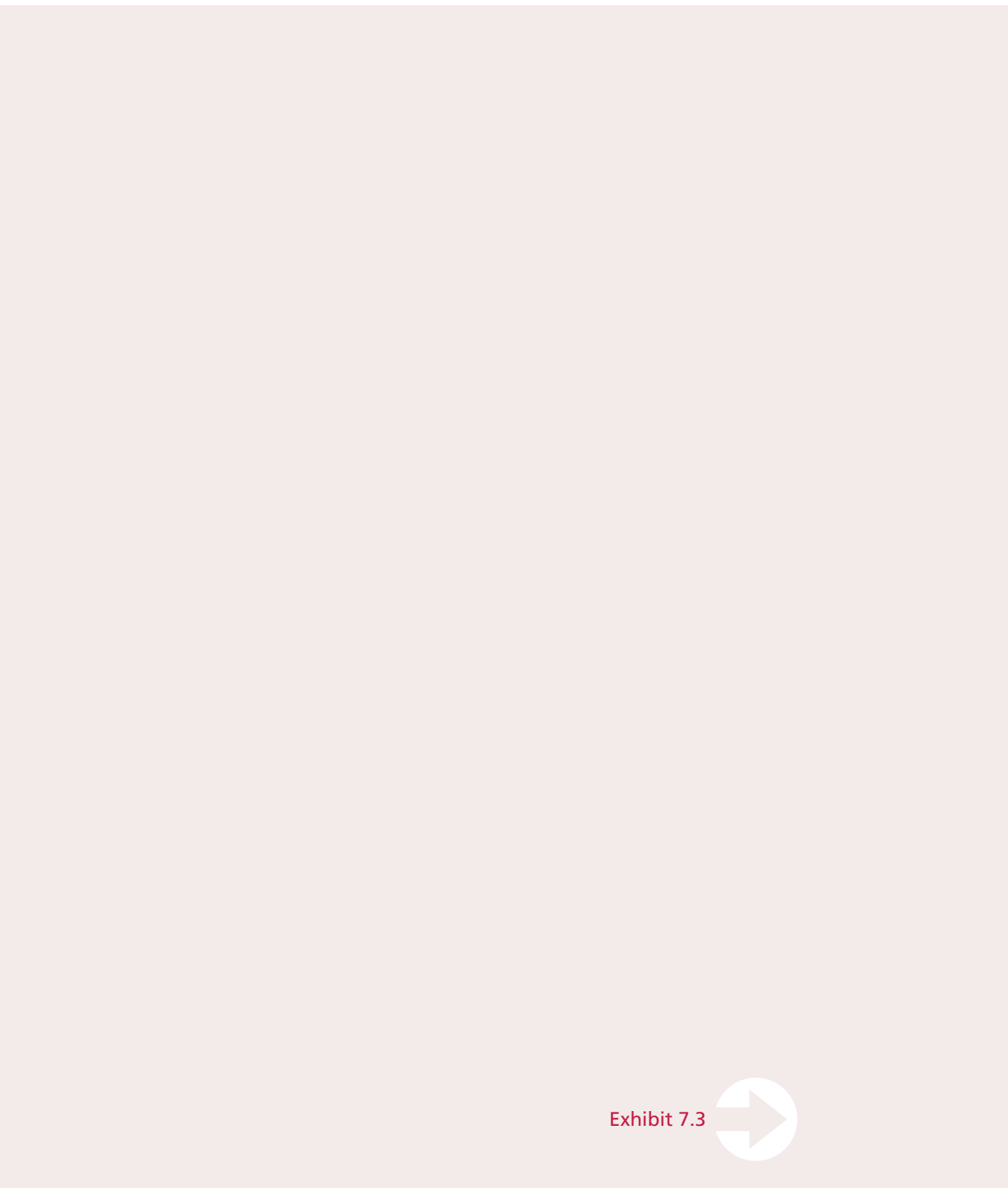
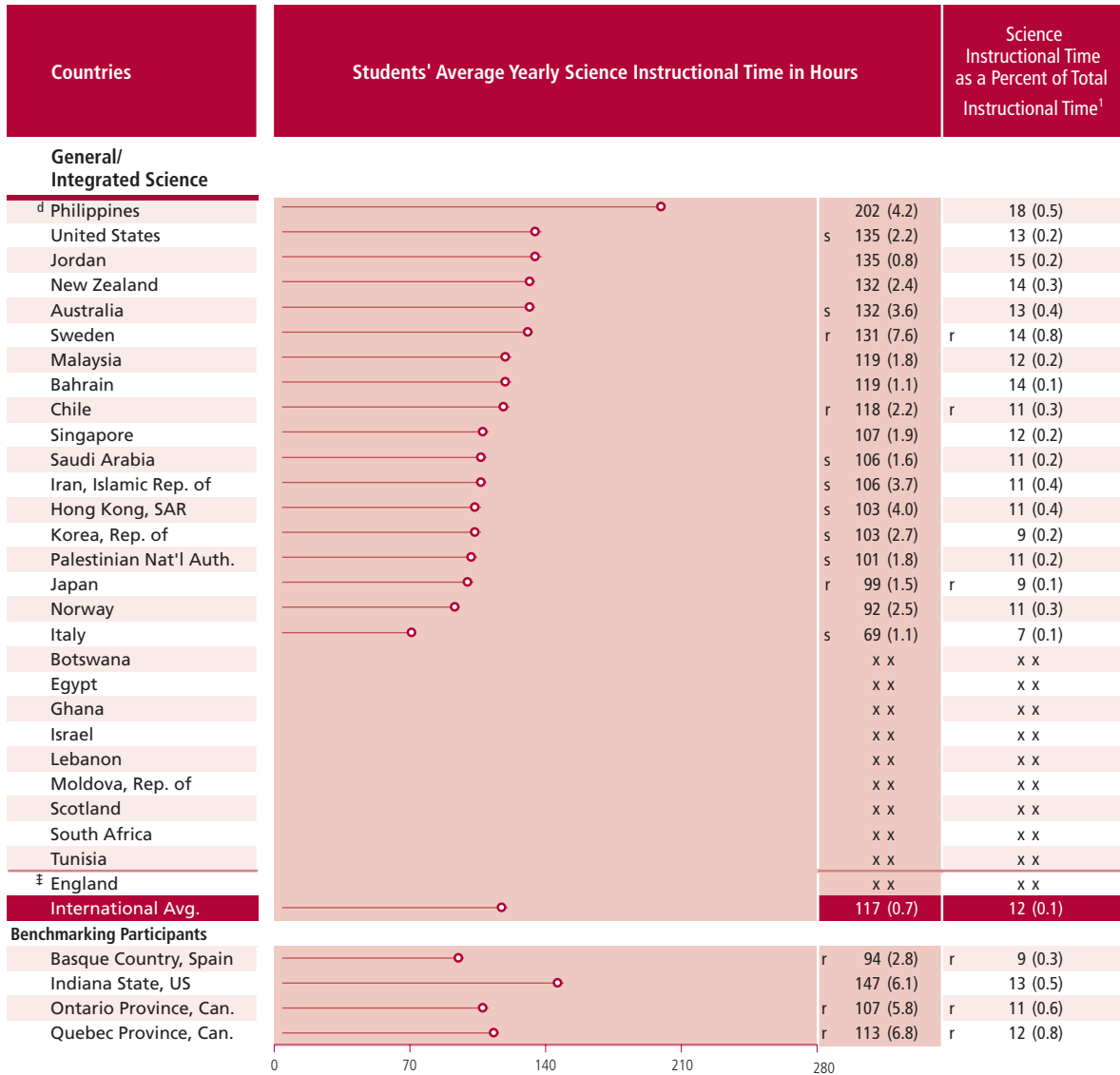


Exhibit 7.3 



Exhibit 7.3: Instructional Time in the Sciences



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Science instructional time provided by teachers, and total instructional time provided by schools.
¹ Computed as the ratio of Science instructional time to the total instructional time averaged across students (1 hour = 60 minutes).
^d Philippines: Data reported are for grade 8 biology teachers.
[‡] Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

() Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.
 An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 7.3: Instructional Time in the Sciences (Continued...)



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Science instructional time provided by teachers, and total instructional time provided by schools.

Does not include students whose teachers report that they do not teach content area.

¹ Computed as the ratio of Science instructional time to the total instructional time averaged across students (1 hour = 60 minutes).

^b Morocco: Data reported in biology panel are for grade 8 biology/earth science teachers.

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

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.



Exhibit 7.3: Instructional Time in the Sciences (...Continued)



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Science instructional time provided by teachers, and total instructional time provided by schools. Does not include students whose teachers report that they do not teach content area.

¹ Computed as the ratio of Science instructional time to the total instructional time averaged across students (1 hour = 60 minutes).

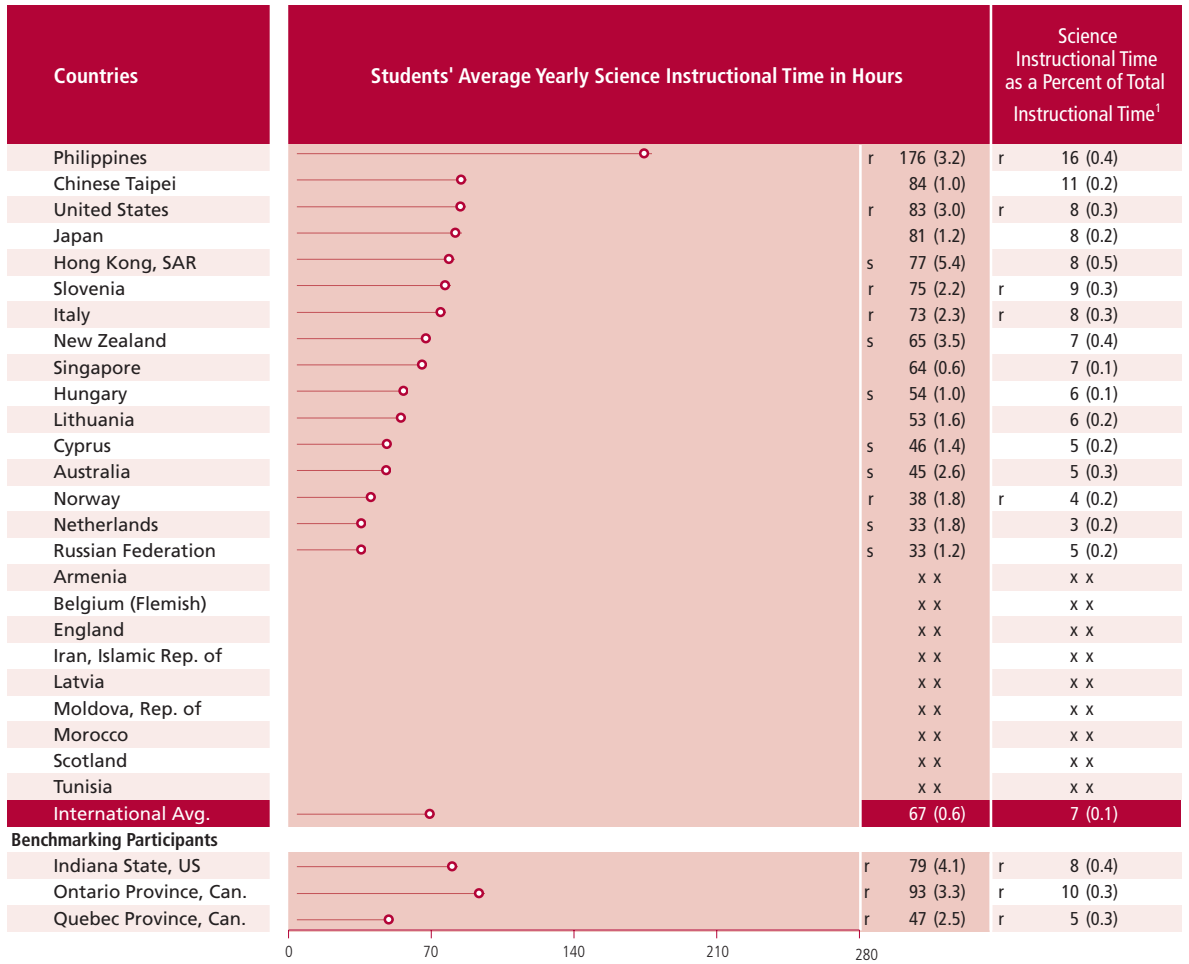
- ^a Chinese Taipei: Data reported in physics panel are for grade 8 physics/chemistry teachers.
- ^b Morocco: Data reported in physics panel are for grade 8 physics/chemistry teachers.
- ^c Netherlands: Data reported in physics panel are for grade 8 physics/chemistry teachers.

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

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 7.3: Instructional Time in the Sciences



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Science instructional time provided by teachers, and total instructional time provided by schools.

1 Computed as the ratio of Science instructional time to the total instructional time averaged across students (1 hour = 60 minutes).

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 7.4: Percentage of Time in Science Class Devoted to TIMSS Content Areas During the School Year



Countries	Life Science	Chemistry	Physics	Earth Science	Environmental Science	Other
Armenia	x x	x x	x x	x x	x x	x x
Australia	r 26 (0.9)	r 23 (0.7)	r 21 (0.7)	r 16 (0.8)	r 11 (0.6)	r 3 (0.6)
Bahrain	30 (0.8)	26 (0.9)	36 (0.8)	3 (0.5)	3 (0.4)	2 (0.6)
Belgium (Flemish)	r 42 (1.4)	r 3 (0.4)	r 16 (1.1)	r 26 (1.2)	r 7 (0.7)	s 8 (1.1)
Botswana	r 38 (1.8)	r 20 (0.8)	r 22 (1.3)	r 5 (0.7)	r 8 (0.7)	r 7 (1.3)
Bulgaria	s 24 (1.1)	s 23 (0.9)	s 20 (1.0)	s 18 (0.9)	s 9 (0.7)	s 6 (1.0)
Chile	26 (1.1)	22 (0.9)	16 (0.6)	17 (0.7)	17 (0.7)	2 (0.4)
Chinese Taipei	3 (0.8)	48 (0.9)	43 (0.9)	2 (0.3)	3 (0.4)	0 (0.3)
Cyprus	r 3 (0.2)	r 39 (0.7)	r 29 (0.9)	r 19 (0.8)	r 6 (0.5)	s 5 (0.5)
Egypt	23 (0.6)	25 (0.5)	26 (0.9)	11 (0.4)	10 (0.5)	5 (0.4)
Estonia	r 23 (1.0)	r 24 (1.0)	r 24 (1.3)	r 15 (0.8)	r 9 (0.6)	r 7 (1.0)
Ghana	28 (0.8)	20 (0.7)	20 (0.6)	13 (0.5)	15 (0.6)	5 (0.7)
Hong Kong, SAR	29 (1.2)	26 (0.7)	31 (1.0)	5 (0.7)	7 (0.8)	1 (0.5)
Hungary	x x	x x	x x	x x	x x	x x
Indonesia	40 (1.4)	4 (0.5)	40 (1.4)	7 (0.6)	7 (0.6)	2 (0.4)
Iran, Islamic Rep. of	25 (0.5)	17 (0.4)	24 (0.8)	16 (0.4)	12 (0.6)	6 (0.6)
Israel	34 (1.7)	28 (1.3)	19 (1.1)	8 (1.0)	8 (0.7)	r 4 (0.8)
Italy	30 (1.2)	10 (0.6)	22 (1.1)	22 (0.9)	13 (0.5)	3 (0.6)
Japan	22 (0.7)	28 (1.2)	26 (0.9)	19 (1.0)	3 (0.6)	2 (0.8)
Jordan	25 (0.5)	24 (0.5)	25 (0.6)	15 (0.5)	9 (0.5)	2 (0.3)
Korea, Rep. of	r 28 (1.6)	r 21 (0.6)	r 23 (0.7)	r 22 (0.6)	r 6 (0.5)	r 1 (0.2)
Latvia	x x	x x	x x	x x	x x	x x
Lebanon	s 23 (1.4)	s 25 (1.1)	s 27 (1.3)	s 16 (0.9)	s 6 (0.6)	s 3 (0.6)
Lithuania	s 24 (1.0)	s 21 (0.9)	s 20 (1.1)	s 16 (0.9)	s 13 (0.6)	s 6 (1.0)
Macedonia, Rep. of	r 21 (1.1)	r 17 (1.0)	r 18 (1.1)	r 15 (1.0)	r 4 (0.6)	r 25 (2.4)
Malaysia	27 (1.0)	22 (0.5)	22 (0.6)	11 (0.6)	16 (0.5)	3 (0.6)
Moldova, Rep. of	x x	x x	x x	x x	x x	x x
Morocco	r 29 (2.1)	r 22 (1.5)	r 25 (1.7)	r 18 (1.7)	r 5 (0.7)	r 2 (0.6)
Netherlands	r 28 (1.1)	r 8 (0.6)	r 28 (1.3)	r 9 (0.5)	r 12 (0.6)	r 16 (0.9)
New Zealand	28 (1.5)	24 (0.7)	24 (0.8)	13 (0.8)	7 (0.6)	3 (0.7)
Norway	25 (0.7)	21 (0.5)	20 (0.6)	18 (0.7)	13 (0.5)	3 (0.6)
Palestinian Nat'l Auth.	25 (0.7)	24 (0.4)	30 (0.7)	13 (0.5)	5 (0.6)	3 (0.5)
Philippines	57 (2.4)	9 (0.9)	6 (0.9)	9 (0.9)	16 (0.9)	3 (0.8)
Romania	s 21 (0.9)	s 22 (1.0)	s 20 (1.0)	s 19 (1.1)	s 10 (0.7)	s 9 (1.3)
Russian Federation	--	--	--	--	--	--
Saudi Arabia	28 (1.2)	13 (1.4)	19 (1.1)	21 (0.8)	16 (1.1)	r 3 (0.6)
Scotland	--	--	--	--	--	--
Serbia	x x	x x	x x	x x	x x	x x
Singapore	33 (0.7)	24 (0.6)	33 (0.6)	3 (0.2)	6 (0.3)	2 (0.4)
Slovak Republic	r 8 (0.8)	r 22 (1.3)	r 24 (1.2)	r 14 (1.2)	r 13 (0.9)	r 20 (1.6)
Slovenia	r 29 (1.1)	r 28 (0.9)	r 29 (1.1)	r 3 (0.3)	r 8 (0.4)	r 5 (0.8)
South Africa	r 26 (1.1)	r 21 (0.8)	r 21 (0.9)	r 13 (0.6)	r 15 (0.6)	r 5 (0.7)
Sweden	32 (1.1)	r 27 (0.9)	r 28 (0.9)	r 2 (0.4)	r 5 (0.5)	r 7 (1.0)
Tunisia	60 (1.8)	5 (0.6)	3 (0.3)	16 (1.0)	8 (0.8)	r 10 (1.5)
United States	r 16 (1.4)	r 23 (1.3)	r 26 (1.5)	r 26 (1.9)	r 9 (0.5)	s 3 (0.5)
‡ England	--	--	--	--	--	--
International Avg.	27 (0.2)	21 (0.1)	24 (0.2)	13 (0.1)	9 (0.1)	5 (0.1)
Benchmarking Participants						
Basque Country, Spain	35 (1.6)	19 (1.0)	25 (1.3)	10 (0.8)	10 (0.9)	1 (0.5)
Indiana State, US	18 (1.5)	29 (1.7)	24 (1.7)	18 (2.4)	9 (0.7)	r 2 (0.5)
Ontario Province, Can.	24 (0.6)	18 (0.8)	25 (1.0)	16 (0.7)	14 (0.8)	r 4 (0.8)
Quebec Province, Can.	r 5 (0.8)	r 20 (1.1)	r 33 (1.8)	r 18 (1.1)	r 13 (1.5)	s 14 (2.2)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

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

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 7.4: Percentage of Time in Science Class Devoted to TIMSS Content Areas During the School Year

Countries	Life Science	Physical Science	Earth Science	Other
Armenia	x x	x x	x x	x x
Australia	r 42 (1.6)	r 21 (1.1)	r 31 (1.2)	r 7 (1.4)
Belgium (Flemish)	38 (1.1)	12 (0.9)	34 (1.0)	17 (1.6)
Chinese Taipei	30 (0.9)	34 (1.1)	33 (0.9)	3 (0.7)
Cyprus	35 (1.1)	49 (1.8)	15 (1.0)	2 (0.5)
England	--	--	--	--
Hong Kong, SAR	r 38 (1.5)	r 26 (1.4)	r 23 (1.2)	r 13 (1.9)
Hungary	42 (1.1)	9 (0.7)	38 (1.4)	r 11 (1.5)
Iran, Islamic Rep. of	35 (1.2)	21 (0.9)	27 (0.8)	17 (1.1)
Italy	56 (1.3)	18 (0.8)	22 (0.9)	5 (0.7)
Japan	36 (0.9)	41 (1.0)	21 (0.9)	2 (0.7)
Latvia	x x	x x	x x	x x
Lithuania	40 (1.4)	15 (0.7)	36 (1.2)	10 (1.0)
Moldova, Rep. of	r 42 (1.4)	r 15 (0.9)	r 30 (1.3)	r 13 (1.2)
Morocco	x x	x x	x x	x x
Netherlands	56 (1.8)	15 (1.0)	24 (1.4)	4 (0.9)
New Zealand	r 35 (1.0)	r 27 (0.8)	r 29 (0.8)	r 9 (1.0)
Norway	39 (1.4)	15 (0.6)	39 (1.2)	7 (1.5)
Philippines	r 40 (1.1)	r 24 (0.9)	r 30 (0.9)	r 6 (0.8)
Russian Federation	r 39 (1.5)	r 13 (0.9)	r 35 (1.3)	r 13 (1.2)
Scotland	--	--	--	--
Singapore	42 (1.4)	38 (1.6)	18 (1.0)	2 (0.6)
Slovenia	45 (1.5)	21 (0.9)	22 (0.9)	12 (1.5)
Tunisia	r 45 (0.9)	r 39 (1.0)	r 11 (1.0)	r 5 (0.8)
United States	r 36 (0.8)	r 24 (0.8)	r 34 (1.0)	r 6 (0.8)
International Avg.	41 (0.3)	24 (0.2)	28 (0.2)	8 (0.3)
Benchmarking Participants				
Indiana State, US	42 (1.9)	24 (1.4)	29 (1.5)	5 (2.1)
Ontario Province, Can.	31 (1.1)	32 (1.5)	29 (0.9)	7 (0.9)
Quebec Province, Can.	40 (1.6)	20 (1.7)	33 (1.8)	r 8 (1.9)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

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

A dash (-) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "x" indicates data are available for less than 50% of the students.

How Is Scientific Inquiry Emphasized in Science Lessons?

In many countries, the science curriculum places considerable emphasis on engaging the students in scientific inquiry. To examine the emphasis placed on that goal in the classroom, TIMSS asked eighth-grade students and teachers about how often students were asked to do a range of activities related to science investigations. At the eighth grade, these activities were: 1) watching the teacher demonstrate an experiment or investigation, 2) designing or planning experiments or investigations, 3) conducting experiments or investigations, 4) working in small groups on experiments or investigations, 5) writing explanations about what was observed and why it happened, and 6) relating what is being learned in science to our daily lives. Exhibits 7.5 and 7.6 present students' and teachers' reports, respectively. Results at the eighth grade are presented first for countries teaching science as a single subject and then by science subject for countries teaching the sciences separately.

In most of the integrated-science countries, students reported a moderate emphasis on doing these types of activities in science class. About two-thirds, on average, internationally, said that, in at least half their lessons, they were asked to write explanations about what was observed and why it happened (66%) or watch the teacher demonstrate an experiment or investigation (64%). More than half reported working in small groups on experiments or investigations (59%), conducting experiments or investigations (57%), or relating what is being learned in science to their daily lives (57%). Students reported the least attention to designing or planning an experiment or investigation (49%). Among countries teaching the sciences as separate subjects, students reported watching the teacher demonstrate an experiment or investigation most frequently in chemistry and physics class (63% and 58%, on average, respectively), and much less so in biology (39%) and earth science (28%). Relating what is being learned in science to their daily lives was reported by students in biology and earth science classes as the most frequent activity (51%, on average).

At fourth grade, most students reported that they watch the teacher do a science experiment and write or give an explanation for something they are studying in science once or twice a month or more (69%, on average, for each activity). More than half the students (57%) reported working with other students in small groups on a science experiment or investigation, and 50 percent reported either designing or planning a science experiment or investigation or actually doing such an activity.

On average, internationally, teachers at both grade levels reported less emphasis on students watching them demonstrate an experiment or investigation than did the students. For example, at eighth grade in integrated science countries, teachers of only 38 percent of the students reported asking their students to watch them demonstrate an experiment or investigation in at least half the lessons, whereas 64 percent of student reported this activity at this frequency. Similarly at fourth grade, teachers of only 23 percent of students reported asking them to do this activity, while 69 percent of students reported doing so.

Exhibit 7.5: Students' Reports on Doing Science Investigations



Countries	Percentage of Students Who Reported Doing the Activity About Half of the Lessons or More					
	Watch the Teacher Demonstrate an Experiment or Investigation	Design or Plan an Experiment or Investigation	Conduct an Experiment or Investigation	Work in Small Groups on an Experiment or Investigation	Write Explanations About What was Observed and Why it Happened	Relate What is Being Learned in Science to Our Daily Lives
General/Integrated Science						
Australia	54 (1.6)	49 (1.7)	60 (2.2)	68 (2.1)	75 (1.5)	42 (1.1)
Bahrain	83 (0.8)	63 (0.8)	64 (0.8)	66 (1.1)	68 (0.9)	64 (0.9)
Botswana	61 (0.9)	45 (0.8)	48 (1.0)	50 (1.1)	61 (0.9)	71 (0.8)
Chile	57 (1.3)	56 (1.4)	54 (1.5)	61 (1.4)	69 (1.0)	62 (0.7)
^a Chinese Taipei	48 (1.1)	24 (0.9)	36 (1.3)	37 (1.5)	37 (1.1)	40 (1.0)
Egypt	80 (0.7)	61 (1.0)	62 (1.0)	60 (0.8)	71 (0.7)	73 (0.7)
Ghana	73 (1.2)	54 (1.3)	55 (1.3)	54 (1.5)	64 (1.5)	75 (1.0)
Hong Kong, SAR	66 (1.2)	35 (1.0)	71 (1.5)	75 (1.2)	67 (1.2)	61 (0.8)
Iran, Islamic Rep. of	87 (1.0)	66 (1.4)	77 (1.2)	73 (1.5)	78 (1.0)	70 (1.0)
Israel	73 (1.6)	56 (1.4)	63 (1.6)	52 (1.8)	76 (1.3)	56 (1.0)
Italy	26 (1.3)	16 (0.9)	13 (0.8)	12 (0.8)	32 (1.4)	35 (1.1)
Japan	66 (1.5)	51 (1.7)	75 (1.7)	79 (1.6)	69 (1.5)	27 (1.1)
Jordan	67 (1.5)	56 (1.4)	55 (1.7)	53 (1.6)	66 (1.3)	70 (1.1)
Korea, Rep. of	31 (1.0)	14 (0.8)	20 (1.1)	39 (1.3)	44 (1.3)	36 (0.9)
Malaysia	83 (1.1)	46 (1.3)	71 (1.7)	77 (1.3)	73 (1.0)	72 (1.0)
Morocco	82 (1.2)	62 (1.3)	r 61 (1.2)	50 (1.3)	74 (1.0)	r 65 (1.2)
New Zealand	60 (2.0)	50 (2.1)	56 (2.5)	66 (2.3)	73 (1.8)	45 (1.3)
Norway	40 (1.5)	34 (1.6)	49 (2.2)	49 (2.2)	56 (1.9)	31 (0.9)
Palestinian Nat'l Auth.	70 (1.2)	56 (1.2)	57 (1.0)	54 (1.5)	66 (1.2)	69 (0.9)
^d Philippines	74 (0.9)	58 (1.2)	57 (1.0)	62 (1.1)	72 (1.0)	76 (0.8)
Saudi Arabia	68 (1.3)	50 (1.3)	51 (1.4)	43 (1.4)	60 (1.3)	67 (1.0)
Scotland	69 (1.4)	54 (1.3)	74 (1.4)	81 (1.2)	83 (1.1)	47 (1.0)
Singapore	49 (0.9)	31 (0.6)	55 (1.0)	57 (0.8)	68 (0.8)	58 (0.7)
South Africa	72 (1.1)	64 (1.2)	63 (1.1)	70 (1.1)	73 (0.7)	77 (0.7)
Tunisia	79 (0.7)	65 (1.0)	69 (1.0)	55 (1.2)	73 (0.8)	54 (0.9)
United States	57 (1.3)	48 (1.2)	55 (1.4)	65 (1.5)	65 (1.4)	51 (0.9)
[‡] England	60 (1.9)	54 (1.6)	63 (1.7)	71 (1.8)	71 (1.6)	35 (1.6)
International Avg.	64 (0.2)	49 (0.2)	57 (0.3)	59 (0.3)	66 (0.2)	57 (0.2)
Benchmarking Participants						
Basque Country, Spain	50 (2.2)	34 (1.8)	35 (2.2)	41 (2.3)	55 (1.9)	51 (1.3)
Indiana State, US	59 (1.7)	49 (2.1)	56 (2.9)	66 (2.7)	62 (2.6)	51 (1.6)
Ontario Province, Can.	53 (1.6)	45 (1.6)	49 (1.8)	56 (2.0)	67 (1.5)	52 (1.4)
Quebec Province, Can.	60 (1.5)	54 (1.6)	60 (2.0)	65 (1.9)	62 (1.5)	45 (1.3)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by students.

^a Chinese Taipei: Students were asked about natural science; data pertain to grade 8 physics/chemistry course.^d Philippines: Students study only biology at grade 8.[‡] Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

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

An "r" indicates data are available for at least 70 but less than 85% of the students.

Exhibit 7.5: Students' Reports on Doing Science Investigations (Continued...)

Countries	Percentage of Students Who Reported Doing the Activity About Half of the Lessons or More					
	Watch the Teacher Demonstrate an Experiment or Investigation	Design or Plan an Experiment or Investigation	Conduct an Experiment or Investigation	Work in Small Groups on an Experiment or Investigation	Write Explanations About What was Observed and Why it Happened	Relate What is Being Learned in Science to Our Daily Lives
Biology						
Armenia	51 (1.3)	30 (1.4)	30 (1.3)	23 (1.1)	40 (1.3)	65 (1.1)
Belgium (Flemish)	59 (1.6)	19 (0.9)	15 (1.0)	9 (0.9)	58 (1.4)	47 (1.1)
Bulgaria	39 (1.6)	20 (1.2)	18 (1.0)	18 (1.0)	26 (1.2)	50 (1.4)
Cyprus	x x	x x	x x	x x	x x	x x
Estonia	17 (1.1)	7 (0.6)	8 (0.6)	12 (0.9)	20 (1.2)	48 (1.1)
Hungary	37 (1.4)	18 (1.0)	12 (0.8)	6 (0.7)	34 (1.5)	61 (1.3)
Indonesia	56 (1.1)	23 (1.0)	23 (1.0)	36 (1.1)	41 (1.2)	41 (1.0)
Latvia	19 (1.1)	13 (0.9)	11 (0.9)	20 (1.4)	33 (1.5)	42 (1.3)
^b Lebanon	67 (1.2)	52 (1.4)	53 (1.4)	45 (1.8)	69 (1.1)	69 (0.9)
Lithuania	14 (0.8)	10 (0.7)	8 (0.6)	14 (1.0)	26 (1.5)	38 (1.3)
Macedonia, Rep. of	47 (1.4)	30 (1.4)	26 (1.2)	29 (1.5)	45 (1.5)	74 (1.1)
Moldova, Rep. of	52 (1.5)	30 (1.3)	27 (1.1)	30 (1.6)	44 (1.5)	60 (1.2)
Netherlands	25 (1.4)	10 (1.0)	13 (1.3)	16 (1.3)	18 (1.3)	34 (1.4)
Romania	60 (1.5)	27 (1.3)	25 (1.2)	24 (1.4)	45 (1.3)	54 (1.4)
Russian Federation	20 (1.5)	17 (1.4)	12 (0.9)	14 (1.0)	42 (1.3)	55 (1.3)
Serbia	22 (1.1)	16 (0.8)	13 (0.9)	16 (1.1)	36 (1.1)	64 (1.2)
Slovak Republic	55 (1.7)	19 (1.2)	15 (1.0)	31 (1.6)	45 (1.7)	41 (1.3)
Slovenia	30 (1.2)	19 (1.0)	17 (1.0)	15 (1.0)	34 (1.4)	52 (1.2)
Sweden	40 (1.1)	29 (1.2)	38 (1.6)	43 (1.4)	49 (1.2)	29 (0.9)
International Avg.	39 (0.3)	22 (0.3)	20 (0.3)	22 (0.3)	39 (0.3)	51 (0.3)
Earth Science						
Armenia	44 (1.5)	28 (1.3)	28 (1.4)	22 (1.2)	38 (1.5)	57 (1.3)
Belgium (Flemish)	17 (0.8)	7 (0.5)	4 (0.4)	6 (0.8)	33 (1.0)	55 (1.3)
Bulgaria	29 (1.5)	21 (1.3)	17 (1.0)	18 (1.0)	29 (1.1)	41 (1.5)
Cyprus	45 (1.0)	36 (0.8)	31 (0.9)	25 (0.8)	69 (0.9)	57 (1.0)
Estonia	9 (0.8)	5 (0.5)	6 (0.5)	8 (0.7)	14 (0.8)	48 (1.1)
Hungary	29 (1.2)	13 (0.8)	10 (0.7)	7 (0.7)	30 (1.3)	56 (1.2)
Indonesia	--	--	--	--	--	--
Latvia	--	--	--	--	--	--
^b Lebanon	--	--	--	--	--	--
Lithuania	9 (0.6)	8 (0.5)	5 (0.4)	9 (0.6)	15 (0.8)	42 (1.1)
Macedonia, Rep. of	38 (1.5)	27 (1.4)	22 (1.1)	26 (1.3)	42 (1.5)	68 (1.1)
Moldova, Rep. of	50 (1.5)	34 (1.2)	31 (0.9)	33 (1.2)	47 (1.3)	59 (1.1)
Netherlands	10 (0.8)	6 (0.7)	5 (0.6)	7 (0.7)	12 (1.3)	37 (1.4)
Romania	64 (1.4)	32 (1.2)	28 (1.3)	25 (1.2)	49 (1.2)	54 (1.1)
Russian Federation	15 (0.9)	14 (0.7)	11 (0.7)	15 (0.8)	38 (1.2)	56 (1.2)
Serbia	14 (0.8)	10 (0.6)	10 (0.6)	13 (0.9)	32 (1.2)	55 (1.1)
Slovak Republic	33 (1.1)	14 (0.8)	11 (0.8)	15 (1.0)	26 (1.1)	46 (1.4)
Slovenia	--	--	--	--	--	--
Sweden	19 (1.0)	14 (0.9)	15 (0.8)	29 (1.0)	30 (1.3)	37 (1.2)
International Avg.	28 (0.3)	18 (0.2)	16 (0.2)	17 (0.2)	34 (0.3)	51 (0.3)

Background data provided by students.

Does not include students who report that they do not study the content area.

^b Lebanon: Data in biology panel pertain to grade 8 life and earth sciences course.⁽¹⁾ Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (–) indicates comparable data are not available.

An "x" indicates data are available for less than 50% of the students.

Exhibit 7.5: Students' Reports on Doing Science Investigations (...Continued)



SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Countries	Percentage of Students Who Reported Doing the Activity About Half of the Lessons or More					
	Watch the Teacher Demonstrate an Experiment or Investigation	Design or Plan an Experiment or Investigation	Conduct an Experiment or Investigation	Work in Small Groups on an Experiment or Investigation	Write Explanations About What was Observed and Why it Happened	Relate What is Being Learned in Science to Our Daily Lives
Chemistry						
Armenia	58 (1.7)	39 (1.4)	41 (1.6)	26 (1.4)	45 (1.4)	53 (1.3)
Belgium (Flemish)	--	--	--	--	--	--
Bulgaria	59 (2.0)	38 (1.6)	42 (1.9)	25 (1.2)	37 (1.5)	35 (1.4)
Cyprus	82 (0.8)	71 (0.8)	73 (0.9)	56 (1.0)	78 (0.8)	51 (0.9)
Estonia	58 (2.0)	24 (1.3)	28 (1.7)	23 (1.6)	41 (1.7)	44 (1.4)
Hungary	77 (1.8)	66 (1.7)	67 (2.0)	14 (1.0)	68 (1.7)	58 (1.2)
Indonesia	--	--	--	--	--	--
Latvia	43 (1.9)	32 (1.5)	27 (1.5)	22 (1.2)	43 (1.5)	40 (1.2)
Lebanon	75 (1.2)	60 (1.4)	59 (1.5)	46 (1.6)	70 (1.2)	64 (1.3)
Lithuania	39 (1.9)	27 (1.2)	26 (1.4)	16 (1.0)	33 (1.4)	34 (1.2)
Macedonia, Rep. of	64 (1.8)	46 (1.7)	46 (1.8)	36 (1.8)	52 (1.5)	60 (1.4)
Moldova, Rep. of	70 (1.3)	47 (1.2)	49 (1.5)	34 (1.3)	48 (1.5)	53 (1.2)
^c Netherlands	--	--	--	--	--	--
Romania	73 (1.3)	49 (1.5)	48 (1.6)	38 (1.6)	56 (1.5)	48 (1.3)
Russian Federation	62 (1.2)	46 (1.3)	33 (1.5)	26 (1.4)	54 (1.3)	47 (1.6)
Serbia	48 (2.2)	34 (1.7)	35 (1.9)	25 (1.5)	46 (1.5)	50 (1.2)
Slovak Republic	76 (1.4)	44 (1.7)	38 (1.7)	36 (1.6)	60 (1.6)	43 (1.3)
Slovenia	70 (1.5)	50 (1.4)	56 (1.5)	31 (1.4)	52 (1.3)	42 (1.2)
Sweden	59 (1.4)	47 (1.5)	60 (1.7)	56 (1.7)	57 (1.6)	28 (1.2)
International Avg.	63 (0.4)	45 (0.4)	45 (0.4)	32 (0.4)	52 (0.4)	47 (0.3)
Physics						
Armenia	62 (1.6)	40 (1.5)	44 (1.4)	^r 28 (1.3)	47 (1.5)	62 (1.1)
Belgium (Flemish)	x x	x x	x x	x x	x x	x x
Bulgaria	53 (1.7)	34 (1.3)	36 (1.4)	25 (1.2)	34 (1.1)	45 (1.5)
Cyprus	79 (0.7)	70 (0.8)	71 (0.9)	54 (1.2)	78 (0.7)	61 (0.8)
Estonia	45 (1.7)	23 (1.2)	27 (1.4)	24 (1.4)	39 (1.4)	53 (1.1)
Hungary	69 (1.5)	46 (1.2)	56 (1.7)	15 (0.9)	58 (1.4)	58 (1.0)
Indonesia	63 (1.1)	24 (1.0)	24 (1.2)	29 (1.1)	46 (1.0)	40 (1.1)
Latvia	37 (1.7)	25 (1.1)	24 (1.3)	20 (1.0)	39 (1.3)	50 (1.2)
Lebanon	74 (1.3)	55 (1.4)	55 (1.7)	46 (1.8)	68 (1.3)	65 (1.1)
Lithuania	40 (2.1)	25 (1.3)	26 (1.4)	17 (0.8)	30 (1.3)	39 (1.2)
Macedonia, Rep. of	56 (1.8)	39 (1.5)	39 (1.5)	38 (1.7)	49 (1.5)	63 (1.3)
Moldova, Rep. of	68 (1.4)	47 (1.3)	47 (1.4)	35 (1.4)	48 (1.2)	55 (1.0)
^c Netherlands	52 (2.0)	27 (1.5)	38 (2.1)	33 (2.0)	33 (1.8)	29 (1.3)
Romania	71 (1.5)	46 (1.6)	45 (1.7)	38 (1.6)	54 (1.5)	48 (1.3)
Russian Federation	57 (1.4)	37 (1.3)	31 (1.3)	27 (0.9)	49 (1.3)	51 (1.5)
Serbia	37 (1.5)	23 (1.0)	25 (1.2)	19 (1.0)	39 (1.1)	49 (1.2)
Slovak Republic	68 (1.6)	34 (1.5)	30 (1.3)	30 (1.4)	51 (1.6)	45 (1.2)
Slovenia	57 (1.7)	39 (1.4)	43 (1.8)	26 (1.4)	46 (1.5)	43 (1.3)
Sweden	51 (1.4)	41 (1.4)	52 (1.6)	50 (1.6)	48 (1.5)	32 (1.2)
International Avg.	58 (0.4)	38 (0.3)	40 (0.3)	31 (0.3)	47 (0.3)	49 (0.3)

Background data provided by students.

Does not include students who report that they do not study the content area.

^c Netherlands: Data in physics panel pertain to grade 8 physics/chemistry course.⁽⁾ Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

A dash (--) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students.

Exhibit 7.5: Students' Reports on Doing Science Investigations

SCIENCE
Grade 4

Countries	Percentage of Students Who Reported Doing the Activity Once or Twice a Month or More				
	Watch the Teacher Do a Science Experiment	Design or Plan a Science Experiment or Investigation	Do a Science Experiment or Investigation	Work with Other Students in a Small Group on a Science Experiment or Investigation	Write or Give an Explanation For Something I am Studying in Science
Armenia	r 67 (1.4)	s 39 (1.2)	s 37 (1.5)	s 40 (1.1)	s 61 (1.4)
Australia	59 (1.9)	44 (1.9)	48 (1.8)	60 (2.1)	64 (1.9)
Belgium (Flemish)	57 (1.8)	35 (1.5)	29 (1.4)	40 (1.7)	52 (1.6)
Chinese Taipei	92 (0.5)	49 (1.1)	61 (1.1)	76 (1.1)	77 (0.9)
Cyprus	93 (0.6)	81 (0.9)	79 (1.0)	88 (0.9)	88 (0.7)
England	78 (1.7)	73 (1.5)	79 (1.3)	83 (1.3)	84 (0.9)
Hong Kong, SAR	44 (1.8)	22 (1.0)	23 (1.1)	28 (1.5)	37 (1.0)
Hungary	85 (1.0)	37 (1.2)	23 (1.0)	29 (1.3)	81 (0.7)
Iran, Islamic Rep. of	91 (0.9)	85 (1.4)	68 (2.2)	80 (1.5)	85 (1.0)
Italy	69 (1.7)	47 (1.5)	49 (1.3)	42 (1.6)	78 (0.9)
Japan	88 (1.1)	78 (1.0)	76 (0.8)	89 (0.7)	82 (0.8)
Latvia	51 (1.5)	36 (1.2)	30 (1.1)	32 (1.5)	60 (1.4)
Lithuania	48 (1.5)	31 (1.1)	31 (1.4)	31 (1.3)	78 (0.8)
Moldova, Rep. of	46 (2.3)	r 34 (2.1)	r 33 (1.9)	r 39 (2.4)	r 65 (2.5)
Morocco	84 (2.5)	r 68 (2.5)	r 58 (2.7)	r 70 (2.6)	r 71 (2.4)
Netherlands	60 (2.3)	53 (1.8)	39 (1.9)	50 (2.1)	50 (2.0)
New Zealand	55 (1.3)	46 (1.1)	47 (1.2)	62 (1.3)	65 (1.1)
Norway	71 (0.9)	46 (1.1)	49 (1.0)	54 (1.3)	61 (1.2)
Philippines	77 (1.4)	62 (1.6)	63 (1.4)	66 (1.8)	70 (1.6)
Russian Federation	--	--	--	--	--
Scotland	60 (2.6)	47 (2.0)	50 (2.4)	61 (2.0)	65 (2.1)
Singapore	81 (1.4)	34 (1.1)	48 (1.3)	66 (1.6)	64 (1.3)
Slovenia	76 (1.7)	58 (2.0)	62 (1.7)	65 (1.8)	78 (1.4)
Tunisia	72 (1.8)	63 (2.0)	r 63 (1.9)	r 53 (1.8)	r 66 (1.6)
United States	63 (1.1)	42 (0.9)	53 (1.0)	65 (1.1)	73 (0.7)
International Avg.	69 (0.3)	50 (0.3)	50 (0.3)	57 (0.3)	69 (0.3)
Benchmarking Participants					
Indiana State, US	60 (2.4)	34 (1.5)	44 (1.9)	58 (2.3)	68 (2.0)
Ontario Province, Can.	71 (1.6)	55 (1.5)	61 (2.0)	72 (2.0)	82 (1.2)
Quebec Province, Can.	61 (1.8)	51 (1.6)	52 (1.7)	66 (1.7)	58 (1.6)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by students.

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

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 7.6: Teachers' Reports on Students Doing Science Investigations



Countries	Percentage of Students Whose Teachers Reported Students Doing the Activity About Half of the Lessons or More					
	Watch Me Demonstrate an Experiment or Investigation	Design or Plan Experiments or Investigations	Conduct Experiments or Investigations	Work Together in Small Groups on Experiments or Investigations	Write Explanations About What was Observed and Why It Happened	Relate What Students are Learning in Science to Their Daily Lives
General/Integrated Science						
Australia	r 17 (2.9)	r 19 (3.4)	r 73 (3.7)	r 71 (3.7)	r 68 (3.7)	r 63 (4.0)
Bahrain	55 (3.7)	35 (4.1)	58 (3.3)	64 (3.3)	72 (3.4)	86 (2.7)
Botswana	33 (4.6)	19 (3.4)	39 (4.3)	48 (4.7)	44 (4.5)	80 (4.1)
Chile	20 (3.4)	34 (4.0)	48 (3.9)	65 (3.0)	65 (4.2)	91 (2.1)
Egypt	66 (3.8)	41 (3.8)	48 (4.3)	57 (4.5)	67 (4.2)	94 (2.2)
Ghana	46 (4.9)	39 (4.6)	40 (4.1)	42 (4.3)	40 (4.7)	91 (2.8)
Hong Kong, SAR	20 (3.6)	13 (3.2)	77 (3.5)	75 (3.0)	70 (3.7)	62 (3.8)
Iran, Islamic Rep. of	78 (3.4)	37 (4.2)	62 (3.9)	67 (3.9)	53 (3.6)	76 (3.7)
Israel	39 (3.7)	36 (3.5)	45 (3.7)	44 (3.9)	63 (4.0)	76 (3.6)
Italy	7 (1.6)	10 (2.3)	6 (1.6)	7 (1.9)	23 (3.2)	64 (4.0)
Japan	39 (4.0)	35 (4.0)	77 (3.7)	81 (3.3)	69 (3.9)	54 (4.1)
Jordan	54 (4.3)	23 (4.0)	44 (4.3)	47 (4.1)	66 (4.1)	87 (2.8)
Korea, Rep. of	r 34 (3.7)	r 19 (3.0)	r 32 (3.4)	r 31 (3.7)	r 44 (4.0)	r 67 (4.1)
Lebanon	70 (4.5)	65 (4.8)	61 (4.4)	45 (4.6)	76 (3.1)	91 (2.7)
Malaysia	31 (4.2)	41 (4.2)	75 (3.2)	73 (3.6)	71 (4.2)	81 (3.3)
Moldova, Rep. of	85 (3.4)	61 (4.2)	60 (4.5)	81 (3.2)	81 (3.4)	96 (1.8)
New Zealand	17 (4.6)	16 (3.6)	61 (5.0)	66 (5.4)	61 (4.7)	71 (4.3)
Norway	8 (2.5)	21 (3.7)	36 (4.6)	35 (4.5)	31 (4.3)	54 (4.1)
Palestinian Nat'l Auth.	67 (4.4)	32 (4.1)	56 (4.7)	37 (4.2)	70 (3.9)	91 (2.5)
^d Philippines	18 (3.5)	48 (4.7)	59 (5.0)	66 (4.8)	70 (4.3)	86 (3.2)
Saudi Arabia	58 (6.3)	21 (4.1)	40 (5.2)	30 (3.2)	49 (5.1)	94 (1.8)
Scotland	s 24 (2.9)	s 18 (2.2)	s 82 (2.3)	s 85 (2.4)	s 83 (2.6)	s 56 (3.5)
Singapore	13 (1.5)	6 (1.4)	53 (2.7)	51 (2.7)	49 (2.6)	60 (2.8)
South Africa	r 24 (3.4)	r 40 (4.6)	r 34 (3.4)	r 55 (4.0)	r 55 (4.1)	r 77 (3.4)
Sweden	26 (2.8)	35 (4.0)	71 (3.0)	74 (3.3)	64 (3.3)	74 (3.0)
Tunisia	64 (4.5)	66 (4.0)	61 (3.8)	68 (3.9)	68 (3.7)	68 (4.0)
United States	r 21 (2.8)	r 29 (2.5)	r 49 (3.0)	r 65 (3.2)	r 56 (3.4)	r 78 (2.7)
[‡] England	s 30 (4.8)	s 14 (2.8)	s 66 (5.2)	s 68 (5.4)	s 69 (5.2)	s 64 (5.1)
International Avg.	38 (0.7)	31 (0.7)	54 (0.7)	57 (0.7)	61 (0.7)	76 (0.6)
Benchmarking Participants						
Basque Country, Spain	17 (4.3)	16 (3.8)	19 (3.7)	24 (4.6)	43 (5.1)	87 (3.5)
Indiana State, US	22 (5.7)	24 (4.9)	51 (5.6)	65 (6.1)	60 (7.2)	81 (4.7)
Ontario Province, Can.	21 (3.6)	17 (3.8)	38 (4.7)	43 (4.9)	47 (5.1)	59 (3.8)
Quebec Province, Can.	r 22 (4.3)	r 36 (4.6)	r 69 (5.1)	r 56 (4.9)	r 52 (5.3)	r 69 (4.1)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

Does not include students whose teachers report that they do not teach the topic.

[‡] Did not satisfy guidelines for sample participation rates (see Exhibit A.9).^d Philippines: Data reported are for grade 8 biology teachers.

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 7.6: Teachers' Reports on Students Doing Science Investigations (Continued...)



Countries	Percentage of Students Whose Teachers Reported Students Doing the Activity About Half of the Lessons or More					
	Watch Me Demonstrate an Experiment or Investigation	Design or Plan Experiments or Investigations	Conduct Experiments or Investigations	Work Together in Small Groups on Experiments or Investigations	Write Explanations About What was Observed and Why It Happened	Relate What Students are Learning in Science to Their Daily Lives
Biology						
Armenia	r 14 (3.5)	r 15 (3.7)	r 23 (4.3)	r 15 (3.7)	r 14 (3.5)	r 87 (3.5)
Belgium (Flemish)	51 (3.9)	19 (3.3)	33 (3.9)	23 (3.2)	38 (3.7)	80 (2.9)
Bulgaria	r 42 (4.8)	r 4 (1.8)	r 5 (2.1)	r 16 (3.3)	r 12 (3.3)	r 87 (3.1)
Chinese Taipei	--	--	--	--	--	--
Cyprus	--	--	--	--	--	--
Estonia	12 (3.5)	9 (3.4)	9 (3.4)	5 (1.8)	9 (2.8)	91 (2.6)
Hungary	12 (2.7)	4 (1.5)	4 (1.3)	6 (2.0)	16 (3.4)	88 (3.1)
Indonesia	56 (4.6)	23 (4.0)	39 (3.9)	34 (3.7)	54 (4.1)	63 (4.4)
Latvia	19 (3.5)	8 (2.4)	14 (3.1)	26 (4.3)	36 (4.5)	84 (3.5)
Lithuania	11 (2.9)	14 (3.5)	12 (2.8)	13 (2.7)	32 (4.7)	82 (3.2)
Macedonia, Rep. of	43 (3.9)	25 (3.7)	28 (3.9)	40 (4.6)	43 (4.5)	76 (3.7)
^b Morocco	99 (0.9)	85 (6.3)	91 (4.7)	85 (5.9)	98 (1.1)	99 (0.5)
Netherlands	r 1 (1.4)	r 2 (1.4)	r 7 (2.1)	r 11 (3.3)	r 5 (2.4)	r 63 (5.4)
Romania	41 (3.9)	17 (3.3)	32 (3.8)	36 (4.3)	49 (4.4)	86 (3.0)
Russian Federation	15 (2.6)	8 (2.0)	13 (2.6)	22 (3.1)	32 (3.5)	75 (3.4)
Serbia	18 (3.2)	16 (3.1)	12 (2.9)	15 (3.1)	26 (3.8)	83 (3.5)
Slovak Republic	18 (4.0)	8 (3.0)	8 (3.3)	16 (4.0)	27 (5.2)	81 (3.9)
Slovenia	15 (3.2)	7 (2.1)	3 (1.4)	8 (2.3)	16 (3.4)	93 (2.3)
International Avg.	29 (0.9)	16 (0.8)	21 (0.8)	23 (0.9)	32 (0.9)	82 (0.8)
Earth Science						
Armenia	s 11 (3.8)	s 8 (3.2)	s 13 (4.6)	s 20 (5.3)	s 21 (5.6)	s 79 (5.1)
Belgium (Flemish)	19 (2.6)	14 (2.6)	25 (3.3)	23 (3.3)	33 (3.5)	71 (3.6)
Bulgaria	r 39 (5.1)	r 8 (2.7)	r 4 (1.8)	r 13 (3.2)	r 21 (4.2)	r 80 (4.3)
Chinese Taipei	--	--	--	--	--	--
Cyprus	r 39 (2.1)	r 25 (2.3)	r 22 (2.3)	r 23 (2.3)	r 46 (2.8)	r 82 (1.8)
Estonia	4 (2.1)	5 (1.9)	3 (1.5)	3 (1.4)	12 (3.6)	87 (2.9)
Hungary	10 (2.5)	4 (1.7)	2 (1.2)	8 (2.4)	21 (3.6)	80 (3.2)
Indonesia	--	--	--	--	--	--
Latvia	--	--	--	--	--	--
Lithuania	r 5 (2.1)	r 8 (2.7)	r 8 (2.6)	r 9 (2.7)	r 19 (3.3)	r 71 (4.1)
Macedonia, Rep. of	40 (4.8)	21 (3.7)	20 (3.7)	38 (4.4)	37 (4.6)	71 (4.1)
^b Morocco	--	--	--	--	--	--
Netherlands	r 1 (0.8)	4 (1.9)	r 3 (1.8)	r 7 (2.7)	r 5 (2.3)	62 (4.9)
Romania	35 (4.5)	21 (3.7)	23 (3.6)	30 (3.6)	42 (4.4)	82 (3.3)
Russian Federation	15 (2.8)	15 (4.6)	16 (4.4)	21 (3.0)	37 (3.9)	75 (3.2)
Serbia	16 (3.4)	11 (2.8)	10 (2.6)	16 (3.4)	24 (3.9)	73 (4.4)
Slovak Republic	10 (3.2)	11 (4.4)	8 (2.7)	18 (4.2)	22 (4.6)	81 (3.7)
Slovenia	--	--	--	--	--	--
International Avg.	19 (0.9)	12 (0.9)	12 (0.8)	18 (0.9)	26 (1.1)	77 (1.1)

Background data provided by teachers.

Does not include students whose teachers report that they do not teach the content area.

^b Morocco: Data reported in biology panel are for grade 8 biology/earth science teachers.

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

A dash (–) indicates comparable data are not available. An “r” indicates data are available for at least 70 but less than 85% of the students. An “s” indicates data are available for at least 50 but less than 70% of the students.

Exhibit 7.6: Teachers' Reports on Students Doing Science Investigations (...Continued)



Countries	Percentage of Students Whose Teachers Reported Students Doing the Activity About Half of the Lessons or More					
	Watch Me Demonstrate an Experiment or Investigation	Design or Plan Experiments or Investigations	Conduct Experiments or Investigations	Work Together in Small Groups on Experiments or Investigations	Write Explanations About What was Observed and Why It Happened	Relate What Students are Learning in Science to Their Daily Lives
Chemistry						
Armenia	r 23 (4.4)	r 24 (3.8)	r 30 (4.8)	r 15 (3.6)	r 21 (4.0)	r 90 (2.5)
Belgium (Flemish)	--	--	--	--	--	--
Bulgaria	r 55 (4.6)	r 14 (3.5)	r 10 (2.8)	r 12 (3.1)	r 15 (3.4)	r 77 (4.4)
^a Chinese Taipei	--	--	--	--	--	--
Cyprus	53 (1.7)	55 (2.2)	77 (1.9)	80 (1.9)	90 (1.5)	87 (1.7)
Estonia	46 (5.1)	12 (3.6)	21 (3.6)	16 (4.1)	23 (4.6)	85 (3.9)
Hungary	77 (3.9)	13 (2.9)	19 (3.2)	13 (2.8)	45 (4.2)	89 (2.6)
Indonesia	--	--	--	--	--	--
Latvia	r 39 (4.9)	r 12 (3.5)	r 17 (3.6)	s 18 (4.1)	s 27 (4.2)	r 72 (4.8)
Lithuania	39 (4.6)	14 (3.3)	16 (3.6)	14 (3.0)	37 (4.4)	78 (3.4)
Macedonia, Rep. of	42 (4.4)	20 (3.6)	25 (3.8)	42 (4.5)	46 (4.6)	81 (3.6)
^b Morocco	--	--	--	--	--	--
^c Netherlands	--	--	--	--	--	--
Romania	63 (4.2)	13 (2.7)	47 (4.2)	42 (4.2)	58 (3.9)	89 (2.4)
Russian Federation	52 (3.7)	11 (2.4)	22 (3.2)	23 (3.6)	34 (3.4)	68 (3.2)
Serbia	37 (3.8)	19 (3.8)	17 (3.4)	14 (2.8)	34 (4.3)	77 (3.7)
Slovak Republic	53 (4.8)	8 (2.6)	7 (2.3)	6 (2.1)	26 (4.3)	84 (3.4)
Slovenia	51 (4.2)	14 (3.1)	8 (2.3)	7 (2.1)	21 (3.5)	84 (3.4)
International Avg.	48 (1.2)	18 (0.9)	24 (0.9)	23 (0.9)	37 (1.1)	82 (0.9)
Physics						
Armenia	r 29 (3.7)	r 27 (4.4)	r 38 (4.2)	r 15 (2.9)	r 23 (3.5)	r 90 (2.5)
Belgium (Flemish)	54 (5.2)	33 (4.9)	52 (4.5)	45 (4.2)	39 (5.3)	68 (5.8)
Bulgaria	r 72 (4.4)	r 9 (2.4)	r 14 (3.0)	r 9 (2.5)	r 13 (3.1)	r 93 (2.4)
^a Chinese Taipei	20 (3.0)	15 (2.8)	21 (3.6)	16 (2.9)	22 (3.5)	48 (4.0)
Cyprus	61 (2.5)	25 (2.6)	34 (3.1)	42 (2.9)	75 (2.7)	89 (2.1)
Estonia	58 (5.1)	27 (3.9)	33 (4.7)	17 (3.4)	29 (4.5)	87 (3.1)
Hungary	78 (3.1)	10 (2.3)	19 (3.0)	10 (2.2)	31 (3.7)	85 (2.9)
Indonesia	59 (4.7)	22 (3.9)	41 (4.5)	36 (4.3)	60 (4.2)	66 (4.3)
Latvia	49 (4.6)	r 12 (3.4)	r 18 (3.9)	r 13 (3.2)	21 (4.0)	r 80 (4.0)
Lithuania	56 (4.8)	24 (3.6)	19 (3.5)	15 (3.1)	39 (4.6)	87 (3.3)
Macedonia, Rep. of	41 (4.5)	22 (3.9)	36 (4.3)	50 (4.2)	51 (4.6)	75 (3.7)
^b Morocco	95 (4.6)	75 (10.5)	88 (5.8)	81 (9.1)	95 (1.4)	90 (5.5)
^c Netherlands	32 (5.1)	r 8 (3.1)	36 (5.4)	33 (4.7)	25 (4.7)	r 53 (5.3)
Romania	60 (3.9)	16 (3.2)	47 (4.1)	40 (4.4)	49 (4.6)	79 (3.1)
Russian Federation	67 (4.6)	16 (3.1)	16 (3.1)	24 (3.2)	22 (2.4)	74 (3.1)
Serbia	36 (4.2)	18 (3.0)	14 (2.8)	14 (2.6)	36 (4.2)	78 (3.4)
Slovak Republic	61 (4.9)	8 (3.5)	8 (2.4)	12 (2.3)	23 (4.0)	89 (2.7)
Slovenia	61 (4.4)	28 (3.7)	13 (2.9)	10 (2.2)	26 (3.6)	78 (3.7)
International Avg.	55 (1.0)	22 (1.0)	30 (0.9)	27 (0.9)	38 (0.9)	78 (0.9)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

Does not include students whose teachers report that they do not teach the content area.

^a Chinese Taipei: Data reported in physics panel are for grade 8 physics/chemistry teachers.^b Morocco: Data reported in physics panel are for grade 8 physics/chemistry teachers.^c Netherlands: Data reported in physics panel are for grade 8 physics/chemistry teachers.

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

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 7.6: Teachers' Reports on Students Doing Science Investigations

SCIENCE
Grade 4

Countries	Percentage of Students Whose Teachers Reported Students Doing the Activity About Half of the Lessons or More					
	Watch Me Do a Science Experiment	Design or Plan Experiments or Investigations	Do Experiments or Investigations	Work Together in Small Groups on Experiments or Investigations	Write Explanations About Something They are Studying	Relate What Students are Learning in Science to Their Daily Lives
Armenia	x x	x x	x x	x x	x x	x x
Australia	r 12 (3.0)	r 27 (4.2)	r 40 (4.4)	r 46 (4.8)	r 58 (4.8)	r 52 (4.8)
Belgium (Flemish)	12 (2.6)	3 (1.3)	7 (1.8)	16 (2.7)	42 (3.6)	46 (3.7)
Chinese Taipei	42 (4.5)	53 (4.5)	81 (3.3)	76 (3.7)	70 (4.2)	68 (4.2)
Cyprus	33 (4.2)	63 (4.7)	90 (2.8)	96 (1.4)	95 (1.4)	97 (1.3)
England	r 13 (3.4)	r 51 (4.9)	r 61 (4.8)	r 64 (4.6)	r 78 (4.3)	r 75 (3.6)
Hong Kong, SAR	5 (2.0)	3 (2.1)	r 6 (2.4)	6 (2.5)	44 (5.0)	52 (4.9)
Hungary	15 (2.8)	2 (1.1)	5 (1.8)	6 (1.9)	83 (3.1)	84 (3.0)
Iran, Islamic Rep. of	83 (3.5)	76 (3.5)	74 (4.1)	74 (3.5)	85 (3.3)	78 (3.8)
Italy	18 (2.5)	25 (2.7)	30 (3.1)	24 (2.6)	79 (3.0)	44 (3.4)
Japan	37 (4.0)	64 (3.7)	85 (3.1)	85 (2.6)	76 (3.1)	55 (4.1)
Latvia	x x	x x	x x	x x	x x	x x
Lithuania	8 (2.1)	5 (1.6)	9 (2.2)	11 (2.4)	63 (3.6)	84 (2.6)
Moldova, Rep. of	r 25 (3.9)	r 21 (3.8)	r 22 (3.8)	r 55 (4.5)	r 70 (4.4)	r 91 (2.6)
Morocco	x x	x x	x x	x x	x x	x x
Netherlands	8 (2.5)	5 (1.7)	15 (3.4)	16 (3.6)	32 (4.6)	49 (4.9)
New Zealand	r 11 (2.3)	r 36 (3.6)	r 49 (3.4)	r 69 (3.2)	r 69 (3.5)	r 64 (3.3)
Norway	3 (1.5)	5 (2.0)	7 (2.5)	9 (2.2)	27 (3.5)	39 (3.8)
Philippines	27 (4.4)	39 (4.7)	49 (5.0)	61 (5.0)	72 (4.3)	77 (4.1)
Russian Federation	15 (3.1)	8 (1.9)	12 (2.7)	20 (3.1)	54 (3.7)	93 (2.0)
Scotland	s 15 (3.4)	s 23 (3.8)	s 40 (4.8)	s 43 (4.9)	s 59 (4.9)	s 54 (4.6)
Singapore	29 (3.9)	10 (2.1)	45 (4.2)	46 (4.0)	51 (4.7)	65 (4.1)
Slovenia	8 (2.2)	16 (3.1)	33 (4.2)	25 (3.6)	52 (4.1)	66 (4.6)
Tunisia	75 (4.2)	r 56 (4.3)	r 55 (4.4)	55 (4.3)	77 (3.8)	81 (3.3)
United States	r 12 (1.9)	r 22 (2.7)	r 44 (3.2)	r 57 (2.9)	r 63 (2.5)	r 71 (2.7)
International Avg.	23 (0.7)	28 (0.7)	39 (0.8)	44 (0.8)	64 (0.8)	67 (0.8)
Benchmarking Participants						
Indiana State, US	10 (3.5)	27 (4.9)	45 (5.5)	52 (6.5)	62 (5.7)	67 (5.3)
Ontario Province, Can.	20 (3.6)	13 (3.7)	43 (5.2)	48 (4.9)	64 (4.6)	68 (4.1)
Quebec Province, Can.	23 (3.6)	18 (3.4)	32 (4.4)	31 (4.3)	24 (3.4)	49 (4.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

What Instructional Strategies Are Used in Science Classes?

As shown in Exhibit 7.7, the textbook is often the foundation of science instruction at both the eighth and fourth grades. On average, internationally, more than half of the eighth- and fourth-grade students (56%) had teachers who reported using a textbook as the primary basis of their lessons. For another 39 percent of the eighth-grade students and 26 percent of the fourth-grade students, teachers reported using textbooks as a supplementary resource. Teaching science without the aid of a textbook was more common at fourth grade, particularly in Australia and New Zealand, where more than three-fourths (79% and 83%, respectively) of students were taught in this way.

Exhibit 7.8 presents a profile of the activities most commonly encountered in science classes around the world, as reported by science teachers. At the eighth grade, the three most predominant activities, accounting for 57 percent of class time, on average, internationally, were teacher lecture (24% of class time), teacher-guided student practice (19%), and students working on problems on their own (14%).

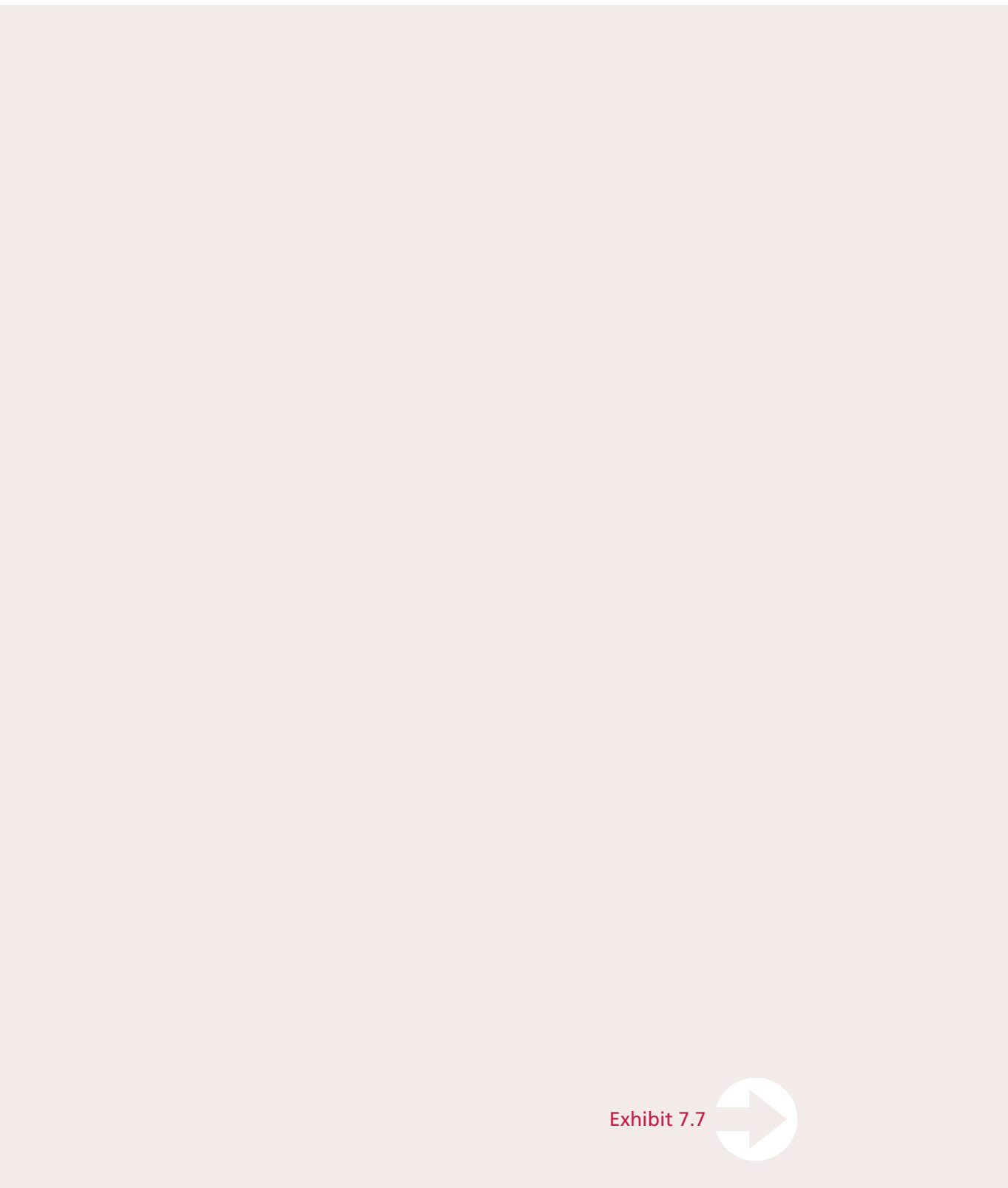


Exhibit 7.7 

Exhibit 7.7: Textbook Use in Teaching Science



Countries	Percentage of Students Taught by Teachers Reporting Textbook Use			
	Do Not Use Textbook to Teach Science	Use Textbook to Teach Science		
		As Primary Basis for Lessons	As Supplementary Resource	
Armenia	r	5 (1.1)	72 (2.6)	23 (2.5)
Australia	r	19 (3.1)	31 (4.4)	50 (3.8)
Bahrain		0 (0.0)	67 (2.6)	33 (2.6)
Belgium (Flemish)		14 (2.4)	43 (2.9)	43 (2.4)
Botswana		5 (2.0)	25 (4.0)	70 (4.2)
Bulgaria	r	2 (0.5)	75 (2.3)	23 (2.3)
Chile		6 (1.7)	21 (3.1)	74 (3.4)
Chinese Taipei		4 (1.7)	82 (3.4)	14 (3.2)
Cyprus		2 (0.5)	62 (1.1)	36 (1.0)
Egypt		1 (0.6)	67 (4.0)	33 (4.1)
Estonia		0 (0.2)	80 (2.3)	20 (2.2)
Ghana		8 (2.5)	34 (4.5)	58 (4.7)
Hong Kong, SAR		1 (0.9)	91 (2.8)	8 (2.6)
Hungary		0 (0.0)	66 (2.2)	34 (2.2)
Indonesia	s	54 (4.7)	21 (3.9)	24 (4.4)
Iran, Islamic Rep. of		8 (2.0)	81 (2.9)	12 (2.4)
Israel		5 (1.7)	45 (4.0)	50 (3.7)
Italy		1 (0.8)	63 (3.5)	36 (3.6)
Japan		2 (1.0)	62 (3.9)	37 (3.9)
Jordan		0 (0.0)	68 (3.9)	32 (3.9)
Korea, Rep. of	s	4 (1.4)	79 (2.9)	18 (2.8)
Latvia	r	1 (0.7)	43 (2.3)	56 (2.4)
Lebanon		5 (1.6)	49 (4.0)	46 (3.7)
Lithuania		0 (0.0)	100 (0.0)	0 (0.0)
Macedonia, Rep. of		5 (1.1)	63 (3.0)	32 (3.0)
Malaysia		13 (2.7)	44 (3.9)	43 (3.8)
Moldova, Rep. of	r	2 (0.8)	86 (2.0)	12 (2.0)
Morocco		0 (0.0)	12 (3.0)	88 (3.0)
Netherlands	r	1 (0.6)	92 (1.9)	7 (1.7)
New Zealand		15 (4.0)	11 (3.2)	74 (5.0)
Norway		0 (0.0)	87 (2.3)	13 (2.3)
Palestinian Nat'l Auth.		1 (0.0)	71 (3.8)	28 (3.7)
Philippines		8 (2.4)	52 (4.7)	41 (4.6)
Romania		0 (0.2)	71 (2.3)	29 (2.3)
Russian Federation		0 (0.2)	67 (3.2)	33 (3.2)
Saudi Arabia		1 (0.0)	79 (4.6)	20 (4.6)
Scotland	s	10 (2.0)	30 (4.3)	61 (4.1)
Serbia		1 (0.5)	64 (2.2)	34 (2.3)
Singapore		0 (0.0)	73 (2.4)	27 (2.4)
Slovak Republic		0 (0.3)	63 (2.6)	37 (2.7)
Slovenia		1 (0.4)	59 (3.3)	41 (3.3)
South Africa	r	8 (2.3)	36 (3.3)	56 (3.5)
Sweden		3 (1.2)	40 (3.2)	58 (3.2)
Tunisia		3 (1.4)	13 (2.8)	84 (3.1)
United States	r	7 (1.7)	39 (3.4)	54 (3.7)
‡ England	s	9 (2.7)	18 (3.9)	72 (4.3)
International Avg.		5 (0.2)	56 (0.5)	39 (0.5)
Benchmarking Participants				
Basque Country, Spain		5 (1.8)	74 (4.8)	21 (4.5)
Indiana State, US		2 (1.4)	48 (5.6)	50 (5.8)
Ontario Province, Can.		4 (2.1)	43 (4.4)	53 (4.7)
Quebec Province, Can.	r	11 (3.1)	38 (5.2)	51 (5.0)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 7.7: Textbook Use in Teaching Science

Countries	Percentage of Students Taught by Teachers Reporting Textbook Use		
	Do Not Use Textbook to Teach Science	Use Textbook to Teach Science	
		As Primary Basis for Lessons	As Supplementary Resource
Armenia	x x	x x	x x
Australia	79 (4.1)	8 (3.4)	13 (2.8)
Belgium (Flemish)	51 (4.0)	28 (3.4)	21 (3.3)
Chinese Taipei	3 (1.6)	86 (2.8)	11 (2.8)
Cyprus	0 (0.0)	77 (4.0)	23 (4.0)
England	r 37 (4.9)	6 (2.3)	58 (4.9)
Hong Kong, SAR	r 2 (1.1)	86 (3.7)	13 (3.7)
Hungary	0 (0.0)	81 (3.3)	19 (3.3)
Iran, Islamic Rep. of	5 (1.3)	67 (4.7)	28 (4.7)
Italy	7 (1.5)	32 (3.3)	61 (3.4)
Japan	1 (0.7)	76 (3.3)	23 (3.2)
Latvia	x x	x x	x x
Lithuania	0 (0.0)	100 (0.0)	0 (0.0)
Moldova, Rep. of	r 2 (1.3)	83 (4.1)	15 (4.0)
Morocco	x x	x x	x x
Netherlands	r 13 (3.0)	75 (4.3)	12 (3.3)
New Zealand	r 83 (2.6)	4 (1.5)	13 (2.1)
Norway	6 (2.2)	53 (4.7)	41 (4.5)
Philippines	r 2 (1.5)	71 (4.5)	27 (4.3)
Russian Federation	2 (1.3)	82 (3.1)	16 (2.7)
Scotland	s 26 (4.2)	40 (4.6)	35 (4.7)
Singapore	0 (0.0)	75 (4.0)	25 (4.0)
Slovenia	18 (3.4)	26 (3.5)	56 (4.2)
Tunisia	r 38 (4.2)	33 (4.3)	30 (4.1)
United States	r 24 (2.5)	46 (3.2)	30 (3.0)
International Avg.	18 (0.5)	56 (0.8)	26 (0.8)
Benchmarking Participants			
Indiana State, US	22 (5.9)	50 (6.3)	28 (5.1)
Ontario Province, Can.	23 (3.7)	33 (4.6)	44 (4.5)
Quebec Province, Can.	42 (4.7)	40 (4.4)	18 (3.5)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 7.8: Percentage of Time in Science Lessons Students Spend on Various Activities in a Typical Week



Countries		Reviewing Homework		Listening to Lecture-Style Presentations		Working Problems with Teacher's Guidance		Working Problems on Their Own Without Teacher's Guidance
Armenia	s	10 (0.4)	s	18 (0.8)	s	18 (0.5)	s	14 (0.5)
Australia	r	7 (0.4)	r	19 (1.3)	r	20 (0.7)	r	17 (0.9)
Bahrain	r	13 (0.4)	r	27 (0.9)	r	13 (0.7)	r	10 (0.8)
Belgium (Flemish)	r	5 (0.3)	r	20 (1.2)	r	21 (0.9)	r	12 (0.6)
Botswana	r	10 (0.4)	r	21 (1.3)	r	20 (1.0)	r	13 (1.0)
Bulgaria	r	8 (0.5)	r	27 (1.3)	r	16 (0.7)	r	11 (0.5)
Chile		9 (0.4)		19 (0.9)		19 (0.9)		16 (0.8)
Chinese Taipei		9 (0.6)		50 (1.3)		10 (0.5)		5 (0.5)
Cyprus		13 (0.2)		19 (0.4)		20 (0.2)		12 (0.3)
Egypt		12 (0.5)		20 (1.0)		15 (0.7)		12 (0.5)
Estonia		11 (0.3)		18 (0.6)		19 (0.5)		21 (0.5)
Ghana		10 (0.4)		17 (1.0)		18 (0.9)	r	16 (0.7)
Hong Kong, SAR		8 (0.6)		35 (1.6)		17 (0.9)		9 (0.6)
Hungary		8 (0.3)		24 (0.7)		21 (0.5)		16 (0.4)
Indonesia		12 (0.4)		27 (1.1)		19 (0.7)		11 (0.7)
Iran, Islamic Rep. of		10 (0.5)		20 (1.1)		15 (0.7)		12 (0.8)
Israel		11 (0.4)		23 (1.0)		20 (0.8)		15 (0.8)
Italy		12 (0.6)		31 (0.9)		13 (0.6)		9 (0.4)
Japan		3 (0.3)		41 (1.6)		16 (1.2)		6 (0.7)
Jordan		13 (0.7)		27 (1.1)		16 (0.6)		11 (0.6)
Korea, Rep. of	s	5 (0.4)	s	47 (1.7)	s	11 (0.6)	s	10 (0.5)
Latvia	r	8 (0.3)	r	22 (1.0)	r	18 (0.5)	r	17 (0.7)
Lebanon	s	16 (0.9)	s	17 (1.0)	s	21 (0.9)	s	8 (0.7)
Lithuania		9 (0.3)		13 (0.6)		24 (0.6)		22 (0.5)
Macedonia, Rep. of	r	7 (0.4)	r	37 (1.2)	r	19 (0.8)	r	13 (0.7)
Malaysia		13 (0.7)		25 (1.2)		19 (0.8)		11 (0.7)
Moldova, Rep. of	s	13 (0.5)	s	17 (0.7)	s	19 (0.6)	s	16 (0.6)
Morocco	r	10 (0.5)	r	24 (1.7)	r	22 (1.7)	r	11 (0.6)
Netherlands	r	16 (0.5)	r	19 (0.6)	r	16 (0.8)	r	19 (1.1)
New Zealand		8 (0.5)		17 (1.0)		20 (0.8)		14 (1.0)
Norway		7 (0.5)		24 (1.0)		21 (1.1)		20 (1.2)
Palestinian Nat'l Auth.	r	12 (0.7)	r	23 (1.2)	r	15 (0.6)	r	12 (0.6)
Philippines	r	9 (0.4)	r	22 (1.3)	r	16 (0.8)	r	13 (0.8)
Romania		9 (0.3)		28 (0.6)		19 (0.5)		13 (0.4)
Russian Federation		13 (0.3)		28 (0.7)		15 (0.4)		14 (0.3)
Saudi Arabia	r	13 (0.9)	r	21 (1.3)	r	13 (1.0)	r	8 (0.6)
Scotland	s	6 (0.3)	s	16 (0.8)	s	34 (1.3)	s	18 (1.2)
Serbia	r	6 (0.3)	r	41 (0.9)	r	18 (0.7)	r	12 (0.4)
Singapore		12 (0.4)		36 (0.8)		14 (0.4)		11 (0.5)
Slovak Republic		7 (0.3)		25 (0.7)		20 (0.7)		15 (0.3)
Slovenia		7 (0.2)		29 (0.9)		24 (0.6)		16 (0.6)
South Africa	s	11 (0.5)	s	15 (0.9)	s	21 (0.9)	s	18 (1.1)
Sweden	r	6 (0.4)	r	20 (0.8)	r	34 (1.3)	r	16 (1.0)
Tunisia	r	11 (0.9)	r	15 (1.2)	r	22 (1.2)	r	20 (1.3)
United States	r	9 (0.4)	r	20 (1.0)	r	18 (0.6)	r	17 (0.8)
‡ England	s	7 (0.4)	s	15 (0.9)	s	32 (1.3)	s	19 (1.1)
International Avg.		10 (0.1)		24 (0.2)		19 (0.1)		14 (0.1)
Benchmarking Participants								
Basque Country, Spain		15 (0.6)		24 (1.4)		16 (1.0)		16 (0.9)
Indiana State, US		11 (0.9)		20 (1.5)		19 (1.4)		16 (1.0)
Ontario Province, Can.		10 (0.5)		26 (1.6)		19 (1.0)		16 (1.0)
Quebec Province, Can.	r	7 (0.4)	r	30 (1.7)	r	17 (1.1)	r	12 (0.9)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

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

Exhibit 7.8: Percentage of Time in Science Lessons Students Spend on Various Activities in a Typical Week



Countries	Listening to Teachers Re-teach and Clarify Content/Procedures	Taking Tests and Quizzes	Participating in Classroom Management Tasks Not Related to the Lesson's Content/Purpose	Other Student Activities
Armenia	s 19 (0.6)	s 12 (0.4)	s 4 (0.2)	s 5 (0.3)
Australia	r 10 (0.4)	r 7 (0.3)	r 8 (0.5)	r 12 (1.1)
Bahrain	r 13 (0.6)	r 12 (0.5)	r 6 (0.2)	r 6 (0.3)
Belgium (Flemish)	r 26 (1.2)	r 10 (0.4)	r 5 (0.4)	r 3 (0.6)
Botswana	r 11 (0.6)	r 12 (0.8)	r 6 (0.6)	r 7 (1.0)
Bulgaria	r 23 (1.2)	r 9 (0.3)	r 3 (0.3)	r 3 (0.3)
Chile	15 (0.6)	11 (0.5)	7 (0.5)	4 (0.4)
Chinese Taipei	8 (0.4)	8 (0.4)	5 (0.5)	6 (0.6)
Cyprus	16 (0.2)	9 (0.2)	6 (0.1)	r 5 (0.2)
Egypt	14 (0.6)	13 (0.5)	7 (0.4)	8 (0.3)
Estonia	13 (0.4)	r 12 (0.4)	3 (0.2)	r 4 (0.4)
Ghana	r 13 (0.6)	13 (0.5)	7 (0.4)	7 (0.4)
Hong Kong, SAR	8 (0.5)	9 (1.1)	5 (0.4)	9 (1.1)
Hungary	10 (0.3)	11 (0.3)	4 (0.2)	7 (0.3)
Indonesia	12 (0.4)	13 (0.5)	3 (0.3)	3 (0.3)
Iran, Islamic Rep. of	16 (0.7)	13 (0.6)	7 (0.4)	7 (0.5)
Israel	12 (0.6)	8 (0.4)	6 (0.4)	r 5 (0.5)
Italy	15 (0.5)	11 (0.5)	4 (0.4)	4 (0.5)
Japan	16 (0.9)	6 (0.4)	2 (0.3)	11 (1.2)
Jordan	12 (0.5)	10 (0.4)	6 (0.3)	6 (0.4)
Korea, Rep. of	s 13 (0.8)	s 6 (0.3)	s 4 (0.3)	s 4 (0.5)
Latvia	r 12 (0.6)	r 14 (0.5)	r 3 (0.2)	r 8 (0.5)
Lebanon	s 14 (0.8)	s 14 (0.6)	s 5 (0.4)	s 5 (0.4)
Lithuania	14 (0.6)	13 (0.4)	3 (0.2)	3 (0.3)
Macedonia, Rep. of	r 8 (0.4)	r 7 (0.3)	r 4 (0.2)	r 5 (0.3)
Malaysia	12 (0.8)	10 (0.5)	5 (0.3)	5 (0.4)
Moldova, Rep. of	s 13 (0.5)	s 14 (0.4)	s 4 (0.3)	s 5 (0.5)
Morocco	r 10 (0.5)	r 13 (1.1)	r 4 (0.5)	r 7 (0.7)
Netherlands	r 9 (0.4)	r 8 (0.3)	r 6 (0.4)	r 8 (0.6)
New Zealand	10 (0.9)	7 (0.4)	8 (0.8)	16 (1.8)
Norway	10 (0.5)	6 (0.3)	4 (0.6)	9 (1.0)
Palestinian Nat'l Auth.	r 14 (0.9)	r 11 (0.5)	r 6 (0.4)	r 7 (0.7)
Philippines	r 14 (0.6)	r 13 (0.6)	r 8 (0.6)	r 5 (0.4)
Romania	11 (0.3)	10 (0.3)	4 (0.2)	5 (0.3)
Russian Federation	8 (0.2)	15 (0.4)	2 (0.1)	5 (0.3)
Saudi Arabia	r 20 (1.4)	r 11 (0.5)	r 7 (0.6)	r 7 (0.6)
Scotland	s 11 (0.4)	s 5 (0.3)	s 8 (0.5)	s 4 (0.4)
Serbia	r 9 (0.4)	r 8 (0.3)	r 3 (0.2)	r 4 (0.3)
Singapore	8 (0.4)	8 (0.3)	6 (0.5)	6 (0.5)
Slovak Republic	14 (0.4)	10 (0.3)	4 (0.2)	6 (0.3)
Slovenia	12 (0.4)	6 (0.2)	2 (0.2)	5 (0.4)
South Africa	s 12 (0.6)	s 11 (0.5)	s 8 (0.6)	s 6 (0.5)
Sweden	r 11 (0.5)	r 7 (0.3)	r 4 (0.2)	r 3 (0.4)
Tunisia	r 15 (1.2)	r 13 (0.6)	r 2 (0.3)	r 3 (0.4)
United States	r 11 (0.4)	r 8 (0.4)	r 7 (0.5)	r 10 (0.9)
‡ England	s 10 (0.5)	s 6 (0.7)	s 7 (0.6)	s 5 (0.6)
International Avg.	13 (0.1)	10 (0.1)	5 (0.1)	6 (0.1)
Benchmarking Participants				
Basque Country, Spain	10 (0.5)	9 (0.6)	5 (0.5)	5 (0.7)
Indiana State, US	12 (0.9)	8 (0.5)	7 (0.8)	7 (0.9)
Ontario Province, Can.	11 (0.7)	8 (0.4)	6 (0.5)	r 6 (0.9)
Quebec Province, Can.	r 10 (0.7)	r 8 (0.4)	r 7 (0.7)	r 10 (1.1)

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

How Are Computers Used in Science Class?

Exhibit 7.9 shows the number of countries with national policies on computer use, the percentages of students whose teachers reported that computers were not available, and the percentages of students using computers for various activities in about half of the lessons or more. Across countries, 25 participants at the eighth grade and 12 at the fourth grade reported that their science curriculum contained statements about computer use and yet access to computers remains a challenge in many countries. Teachers reported that, on average, internationally, computers were not available for 62 percent of the eighth-grade students and 54 percent of the fourth-grade students. Beyond that, using computers as often as in half the lessons was extremely rare at either grade, even in countries with relatively high availability. Korea was the only country where a substantial percentage of students used a computer regularly for doing scientific procedures or experiments (32%) or studying natural phenomena through simulations (28%).

Exhibit 7.9: Computer Use in Science Class



Countries	National Curriculum Contains Policies / Statements About the Use of Computers	Percentage of Students Whose Teachers Reported That Computers Are Not Available	Percentage of Students Whose Teachers Reported on Computer Use About Half of the Lessons or More					
			Doing Scientific Procedures or Experiments	Studying Natural Phenomena Through Simulations	Practicing Skills and Procedures	Looking Up Ideas and Information	Processing and Analyzing Data	
Armenia	○	s 77 (2.8)	s 2 (0.7)	s 2 (0.7)	s 3 (1.0)	s 5 (1.3)	s 3 (0.9)	●
Australia	●	r 26 (3.7)	r 1 (0.7)	r 0 (0.2)	r 3 (1.2)	r 6 (1.7)	r 4 (1.3)	Yes
Bahrain	●	44 (3.6)	3 (1.2)	3 (1.4)	10 (2.1)	22 (2.8)	7 (1.8)	
Belgium (Flemish)	○	66 (3.4)	1 (0.5)	0 (0.3)	1 (0.4)	1 (0.4)	1 (0.4)	○
Botswana	○	95 (2.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.3)	No
Bulgaria	○	r 85 (2.2)	r 0 (0.2)	r 0 (0.1)	r 1 (0.5)	r 2 (0.5)	r 0 (0.0)	
Chile	○	40 (3.5)	2 (0.6)	5 (2.0)	6 (1.3)	26 (2.9)	12 (2.4)	
Chinese Taipei	●	56 (4.0)	1 (0.7)	1 (0.7)	2 (0.7)	1 (1.0)	1 (1.0)	
Cyprus	●	81 (0.8)	1 (0.1)	0 (0.1)	1 (0.1)	3 (0.4)	2 (0.1)	
Egypt	●	--	--	--	--	--	--	
Estonia	●	56 (2.8)	2 (0.7)	1 (0.4)	1 (0.5)	4 (0.7)	2 (0.5)	
Ghana	●	91 (2.9)	2 (1.3)	3 (1.5)	1 (0.0)	3 (1.5)	1 (1.0)	
Hong Kong, SAR	●	44 (4.6)	5 (2.0)	3 (1.5)	4 (1.9)	5 (1.7)	3 (1.5)	
Hungary	●	59 (2.9)	1 (0.4)	1 (0.4)	1 (0.5)	2 (0.8)	1 (0.5)	
Indonesia	○	86 (2.5)	1 (0.8)	1 (0.8)	2 (1.0)	3 (1.1)	2 (1.1)	
Iran, Islamic Rep. of	○	98 (0.8)	0 (0.0)	0 (0.0)	1 (0.5)	1 (0.5)	1 (0.5)	
Israel	●	49 (4.1)	3 (1.4)	2 (1.1)	5 (1.4)	9 (1.9)	7 (1.9)	
Italy	○	65 (3.7)	0 (0.0)	1 (0.8)	1 (0.7)	6 (1.6)	4 (1.4)	
Japan	●	20 (3.4)	1 (0.9)	3 (1.3)	2 (0.6)	3 (1.4)	1 (0.9)	
Jordan	●	82 (3.5)	1 (1.0)	3 (2.2)	3 (2.2)	4 (2.0)	2 (1.1)	
Korea, Rep. of	●	r 14 (2.6)	r 32 (3.4)	r 28 (2.9)	r 11 (2.2)	r 16 (2.8)	r 12 (2.1)	
Latvia	○	r 70 (2.6)	r 1 (0.6)	r 1 (0.7)	r 1 (0.6)	r 4 (1.3)	r 2 (0.9)	
Lebanon	○	83 (2.4)	3 (1.0)	2 (0.9)	4 (1.4)	9 (1.9)	7 (1.6)	
Lithuania	●	28 (2.7)	1 (0.3)	2 (0.7)	7 (1.4)	12 (1.3)	6 (1.1)	
Macedonia, Rep. of	○	93 (1.6)	0 (0.2)	1 (0.3)	1 (0.4)	1 (0.4)	1 (0.4)	
Malaysia	○	86 (3.0)	3 (1.4)	1 (0.9)	1 (0.7)	3 (1.3)	2 (1.3)	
Moldova, Rep. of	○	s 69 (3.0)	r 8 (1.8)	r 8 (1.9)	r 13 (2.2)	r 12 (1.9)	r 12 (2.2)	
Morocco	○	86 (2.4)	0 (0.0)	0 (0.0)	1 (0.9)	2 (1.4)	1 (0.9)	
Netherlands	●	r 61 (2.9)	r 1 (0.5)	r 0 (0.0)	r 1 (0.6)	r 3 (1.1)	r 2 (0.9)	
New Zealand	●	52 (5.7)	1 (0.7)	1 (0.0)	1 (0.9)	4 (1.8)	1 (0.8)	
Norway	●	39 (3.9)	1 (1.0)	0 (0.0)	0 (0.0)	8 (2.5)	2 (1.2)	
Palestinian Nat'l Auth.	●	69 (3.9)	5 (1.4)	3 (1.5)	4 (1.8)	7 (2.1)	1 (0.9)	
Philippines	○	84 (3.2)	3 (1.6)	2 (1.3)	4 (1.8)	3 (1.7)	4 (1.9)	
Romania	○	79 (2.5)	0 (0.0)	1 (0.5)	1 (0.5)	3 (0.8)	2 (0.7)	
Russian Federation	○	89 (1.8)	0 (0.1)	0 (0.2)	0 (0.3)	1 (0.3)	1 (0.5)	
Saudi Arabia	○	80 (3.2)	3 (2.5)	6 (3.9)	6 (4.0)	9 (1.9)	4 (2.6)	
Scotland	●	s 32 (3.5)	s 1 (0.5)	s 0 (0.3)	s 2 (0.9)	s 6 (1.5)	s 1 (0.4)	
Serbia	○	88 (1.7)	2 (0.6)	2 (0.6)	2 (0.7)	2 (0.6)	2 (0.7)	
Singapore	●	21 (2.2)	2 (0.8)	1 (0.6)	1 (0.6)	11 (1.7)	4 (1.1)	
Slovak Republic	○	67 (3.2)	0 (0.2)	0 (0.2)	2 (0.8)	2 (0.7)	1 (0.4)	
Slovenia	●	50 (2.7)	1 (0.7)	1 (0.6)	1 (0.5)	4 (1.1)	3 (0.8)	
South Africa	○	r 87 (2.4)	r 2 (1.0)	r 2 (1.2)	r 3 (1.4)	r 4 (1.5)	r 3 (1.3)	
Sweden	○	36 (3.3)	1 (0.5)	0 (0.0)	1 (0.5)	9 (1.8)	5 (1.5)	
Tunisia	○	65 (4.4)	4 (1.6)	5 (1.9)	7 (2.1)	9 (2.4)	7 (2.3)	
United States	○	r 28 (2.9)	r 3 (0.9)	r 3 (1.1)	r 8 (1.7)	r 19 (2.3)	r 12 (1.5)	
‡ England	●	s 30 (3.9)	s 1 (0.3)	s 2 (1.1)	s 1 (0.3)	s 7 (3.2)	s 0 (0.3)	
International Avg.		62 (0.5)	2 (0.2)	2 (0.2)	3 (0.2)	6 (0.2)	3 (0.2)	
Benchmarking Participants								
Basque Country, Spain	●	38 (4.7)	0 (0.0)	1 (0.0)	4 (2.2)	15 (4.5)	3 (1.9)	
Indiana State, US	●	23 (5.2)	2 (2.3)	2 (2.3)	6 (3.0)	17 (5.0)	9 (3.8)	
Ontario Province, Can.	●	52 (4.6)	4 (1.8)	1 (0.8)	1 (0.9)	5 (2.1)	2 (1.3)	
Quebec Province, Can.	○	r 59 (5.1)	r 0 (0.2)	r 0 (0.2)	r 0 (0.2)	r 3 (1.5)	r 3 (2.0)	

Background data provided by National Research Coordinators and by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

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

A dash (–) indicates comparable data are not available.

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 7.9: Computer Use in Science Class



Countries	National Curriculum Contains Policies / Statements About the Use of Computers	Percentage of Students Whose Teachers Reported That Computers Are Not Available	Percentage of Students Whose Teachers Reported on Computer Use About Half of the Lessons or More				
			Doing Scientific Procedures or Experiments	Studying Natural Phenomena Through Simulations	Practicing Skills and Procedures	Looking Up Ideas and Information	
Armenia	○	x x	x x	x x	x x	x x	●
Australia	●	16 (3.0)	4 (1.8)	5 (2.4)	6 (2.5)	23 (3.8)	Yes
Belgium (Flemish)	○	37 (3.7)	2 (0.9)	1 (0.7)	4 (1.4)	12 (2.3)	○
Chinese Taipei	●	65 (4.0)	3 (1.3)	3 (1.5)	4 (1.6)	8 (2.4)	○
Cyprus	○	26 (4.3)	2 (1.1)	4 (1.5)	3 (1.6)	11 (2.2)	No
England	●	12 (2.8)	r 4 (2.0)	r 3 (1.9)	r 4 (2.0)	r 15 (2.8)	
Hong Kong, SAR	●	36 (4.8)	1 (0.8)	4 (1.9)	2 (1.4)	8 (2.2)	
Hungary	○	76 (4.0)	1 (0.8)	1 (0.8)	1 (0.9)	1 (0.9)	
Iran, Islamic Rep. of	○	96 (1.8)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.9)	
Italy	○	81 (2.7)	0 (0.0)	0 (0.0)	0 (0.0)	2 (1.1)	
Japan	●	11 (2.8)	1 (0.0)	9 (2.5)	1 (1.0)	8 (2.4)	
Latvia	○	x x	x x	x x	x x	x x	
Lithuania	●	91 (2.2)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.6)	
Moldova, Rep. of	○	78 (4.0)	0 (0.0)	0 (0.0)	4 (1.8)	4 (1.8)	
Morocco	○	x x	x x	x x	x x	x x	
Netherlands	○	62 (4.9)	1 (0.0)	0 (0.0)	2 (1.4)	4 (2.0)	
New Zealand	○	r 15 (2.6)	r 2 (1.2)	r 5 (1.4)	r 5 (1.7)	r 34 (3.3)	
Norway	●	46 (4.2)	0 (0.0)	0 (0.0)	0 (0.0)	3 (2.2)	
Philippines	○	94 (2.4)	1 (1.1)	2 (1.4)	3 (2.0)	3 (1.9)	
Russian Federation	○	97 (1.3)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.5)	
Scotland	●	s 21 (4.3)	s 1 (1.0)	s 0 (0.0)	s 4 (1.8)	s 19 (4.1)	
Singapore	●	23 (3.5)	5 (1.8)	4 (1.7)	10 (2.7)	14 (2.9)	
Slovenia	○	77 (3.9)	1 (0.9)	0 (0.0)	0 (0.0)	1 (0.5)	
Tunisia	○	85 (3.4)	4 (1.7)	4 (1.7)	5 (2.0)	8 (2.5)	
United States	○	32 (2.5)	3 (1.0)	2 (0.8)	6 (1.1)	19 (2.3)	
International Avg.		54 (0.7)	2 (0.2)	2 (0.3)	3 (0.3)	9 (0.5)	
Benchmarking Participants							
Indiana State, US	●	32 (4.7)	2 (1.4)	1 (0.0)	3 (1.1)	17 (3.9)	
Ontario Province, Can.	●	38 (4.5)	5 (3.0)	3 (1.8)	3 (1.7)	10 (2.9)	
Quebec Province, Can.	●	46 (4.5)	1 (1.3)	1 (0.6)	9 (2.6)	23 (4.2)	

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by National Research Coordinators and by teachers.

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

What Are the Roles of Homework and Assessment?

The amount of time students spend on homework assignments is an important consideration in examining their opportunity to learn science. Exhibit 7.10 presents the index of teachers' emphasis on science homework. Students in the high category had teachers who reported giving relatively long homework assignments (more than 30 minutes) on a relatively frequent basis (in about half the lessons or more). Those in the low category had teachers who gave short assignments (less than 30 minutes) relatively infrequently (in about half the lessons or less). The medium level includes all other possible combinations of responses.

The results show considerable variation across countries in the emphasis placed on homework. At the eighth grade, more than 40 percent of the students in Italy and Malaysia were in the high category. For the majority of countries, most students were in the medium (41%, on average) and low (44%, on average) categories. Seventy percent or more of the students were in the low category in Serbia, Tunisia, Bulgaria, Slovenia, Korea, Scotland, Japan, Belgium (Flemish), and the Slovak Republic. It can be noted, however, that students in Japan and perhaps Korea may be more likely to spend extra time in tutoring and special schools than doing homework.¹ At the fourth grade, teachers reported giving science homework much less frequently than at eighth grade. On average, internationally, only 6 percent of the fourth-grade students were in the high category. About one-fourth were in the medium category and almost 70 percent were in the low category. Students in the high category at both grade levels had the lowest science achievement, on average, suggesting that homework often was being used for remedial purposes.

Exhibit 7.11 presents eighth-grade teachers' reports about how they usually use homework in their science instruction. Internationally, the eighth-grade science teachers reported always or almost always monitoring whether homework was completed (for 76 percent of the students, on average). For more than half (62%) of the eighth-grade

1 Robitaille, D.F., (1997), *National Contexts for Mathematics and Science Education: An Encyclopedia of the Education Systems Participating in TIMSS*, Vancouver, BC: Pacific Educational Press.

students, on average, teachers reported always or almost always correcting assignments and giving feedback to students, but for about one-fourth, on average, the students corrected their own homework in class. One-fourth of the students, on average, had teachers that reported using homework as basis for class discussion and almost one-third to contribute toward grades or marks (31%).

As shown in Exhibit 7.12, eighth-grade teachers reported substantial variation across countries in the frequency of testing in science class. On average, internationally, about one-third of the students (32%) reported having a science test or examination every two weeks or more and another 43 percent reported such testing about once a month. Testing every two weeks or more for most students (80% or more) was reported by eighth-grade teachers in Bahrain, Chinese Taipei, Egypt, and the Philippines. Even though the international average was relatively low (25%) for infrequent testing, there were countries where teachers reported testing only a few times a year or more for half or more of the eighth-grade students, including Bulgaria, Hong Kong SAR, Israel, Japan, Norway, Serbia, Slovenia, and Sweden.

Exhibit 7.13 presents eighth-grade teachers' reports about the types of test formats they use for science tests in relation to average science achievement. On average, internationally, more than half the eighth-grade students (60%) had teachers who used constructed-response and multiple-choice formats for their tests or examinations in about equal proportions. More than one-fourth (28%) had teachers who used only or mostly constructed-response science tests. Very few students (13%, on average) had teachers who reported using only or mostly multiple-choice testing. These students had lower science achievement, on average, than did students whose teachers used some constructed-response and multiple-choice items or only constructed-response items.

Exhibit 7.10: Index of Teachers' Emphasis on Science Homework (ESH)

Index of Teachers' Emphasis on Science Homework	Countries	High ESH		Medium ESH		Low ESH	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
	Italy	44 (4.1)	483 (4.7)	35 (3.8)	500 (5.6)	21 (3.0)	494 (6.3)
	Malaysia	40 (4.0)	518 (5.3)	34 (3.9)	509 (7.3)	26 (3.8)	504 (6.8)
	Ghana	29 (4.5)	233 (12.2)	41 (4.8)	255 (9.6)	29 (3.5)	267 (11.4)
	Singapore	29 (2.6)	603 (6.5)	32 (2.5)	573 (8.4)	38 (2.2)	565 (7.6)
	Moldova, Rep. of r	29 (2.5)	466 (4.5)	59 (3.0)	474 (4.5)	12 (2.1)	460 (10.8)
	Egypt	28 (3.3)	428 (7.3)	53 (4.1)	418 (6.0)	19 (3.6)	418 (10.9)
	Russian Federation	28 (2.0)	514 (5.2)	69 (2.3)	513 (3.4)	2 (0.9)	~ ~
	Iran, Islamic Rep. of	27 (3.8)	461 (5.2)	27 (3.6)	448 (5.6)	46 (4.4)	452 (4.3)
	Indonesia	27 (3.3)	422 (7.4)	41 (3.1)	415 (5.1)	32 (2.9)	435 (7.1)
	Lebanon	26 (3.2)	380 (7.7)	54 (3.8)	397 (6.9)	20 (3.1)	402 (10.7)
	Armenia r	26 (2.0)	468 (7.9)	52 (2.9)	464 (3.9)	22 (2.1)	454 (5.1)
	Chinese Taipei	24 (3.6)	586 (6.9)	29 (3.8)	564 (6.5)	48 (4.3)	565 (4.6)
	Morocco	21 (3.1)	398 (5.4)	50 (4.7)	402 (4.2)	29 (5.1)	394 (6.1)
	Jordan	20 (3.5)	480 (9.2)	35 (4.1)	473 (4.7)	45 (4.4)	473 (6.6)
	Philippines	19 (3.6)	367 (14.4)	62 (4.1)	379 (7.8)	18 (3.4)	389 (12.7)
	Israel	18 (3.1)	495 (8.3)	50 (3.7)	490 (4.1)	33 (3.5)	484 (6.8)
	Botswana	17 (2.3)	371 (5.5)	39 (4.5)	365 (7.0)	44 (4.7)	358 (4.7)
	Chile	17 (3.0)	421 (8.9)	35 (3.3)	406 (4.7)	48 (3.9)	413 (4.1)
	South Africa r	17 (2.8)	210 (8.3)	40 (4.2)	238 (14.9)	43 (4.5)	266 (13.5)
	Palestinian Nat'l Auth.	15 (3.1)	439 (7.1)	55 (4.2)	435 (5.1)	30 (4.1)	433 (5.9)
	Norway	15 (2.9)	490 (5.4)	51 (4.5)	493 (3.5)	35 (4.4)	496 (3.9)
	Hong Kong, SAR	12 (3.0)	560 (8.6)	40 (4.3)	565 (5.4)	48 (5.0)	548 (5.9)
	Sweden	10 (2.3)	521 (9.0)	33 (2.8)	526 (4.0)	56 (2.9)	526 (3.2)
	Romania	9 (1.6)	476 (13.1)	31 (1.8)	469 (6.4)	59 (2.0)	470 (4.7)
	Lithuania	9 (1.3)	516 (4.6)	57 (2.3)	519 (2.6)	34 (2.6)	517 (2.7)
	United States r	8 (1.4)	510 (8.9)	34 (2.8)	532 (4.9)	58 (3.0)	533 (4.5)
	Macedonia, Rep. of	7 (1.3)	423 (9.6)	28 (2.1)	453 (5.0)	65 (2.2)	451 (4.3)
	Serbia	7 (1.2)	463 (5.9)	16 (1.7)	464 (5.2)	77 (2.0)	468 (2.7)
	Cyprus	7 (0.9)	444 (5.1)	76 (1.1)	440 (2.2)	17 (0.7)	438 (3.2)
	Latvia r	7 (1.4)	504 (6.3)	58 (3.0)	516 (3.5)	35 (2.7)	511 (3.8)
	Estonia	7 (1.0)	549 (5.8)	68 (2.4)	552 (3.0)	26 (2.5)	555 (3.6)
	Tunisia	6 (2.0)	407 (8.3)	19 (3.7)	405 (6.0)	74 (3.9)	401 (2.4)
	Netherlands r	6 (1.7)	543 (10.2)	65 (2.9)	544 (3.5)	29 (3.0)	520 (5.4)
	Bulgaria r	6 (1.2)	480 (9.0)	24 (2.4)	479 (7.2)	70 (2.6)	478 (5.4)
	Bahrain	5 (0.7)	449 (8.0)	72 (2.4)	439 (2.2)	23 (2.3)	431 (3.6)
	Saudi Arabia	4 (1.7)	375 (13.7)	66 (3.8)	403 (5.1)	30 (3.6)	385 (6.1)
	Slovenia	4 (1.0)	518 (3.8)	20 (1.6)	523 (3.4)	76 (1.8)	521 (2.0)
	Korea, Rep. of s	3 (1.2)	565 (6.8)	27 (3.5)	554 (3.8)	70 (3.5)	561 (2.3)
	Hungary	3 (0.7)	530 (8.1)	45 (2.2)	546 (3.9)	52 (2.4)	538 (3.3)
	Scotland s	2 (1.2)	~ ~	14 (2.5)	507 (8.2)	84 (2.7)	517 (4.7)
	Australia r	2 (1.0)	~ ~	32 (3.6)	529 (6.8)	66 (3.5)	525 (5.2)
	Japan	2 (1.2)	~ ~	18 (3.2)	554 (3.5)	80 (3.2)	552 (2.1)
	Belgium (Flemish)	2 (0.9)	~ ~	15 (2.3)	524 (7.3)	83 (2.5)	516 (2.7)
	New Zealand	1 (0.8)	~ ~	41 (4.9)	535 (6.9)	58 (4.9)	510 (5.4)
	Slovak Republic	0 (0.2)	~ ~	17 (2.0)	521 (4.9)	83 (2.0)	516 (3.6)
	‡ England s	28 (4.2)	562 (9.8)	20 (2.9)	581 (11.4)	52 (4.0)	534 (7.5)
	International Avg.	15 (0.4)	466 (1.4)	41 (0.5)	476 (0.9)	44 (0.5)	472 (1.0)
	Benchmarking Participants						
	Basque Country, Spain	7 (2.8)	481 (8.6)	47 (5.1)	493 (4.2)	46 (5.0)	487 (4.3)
	Indiana State, US	11 (4.5)	540 (12.4)	35 (5.0)	539 (7.6)	54 (4.9)	524 (6.8)
	Ontario Province, Can.	11 (2.9)	525 (7.5)	34 (4.6)	538 (4.0)	55 (5.0)	531 (4.1)
	Quebec Province, Can. r	5 (1.6)	518 (16.2)	26 (4.3)	541 (9.1)	69 (4.6)	532 (3.1)

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

() 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 "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 7.10: Index of Teachers' Emphasis on Science Homework (ESH)



Countries		High ESH		Medium ESH		Low ESH	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Moldova, Rep. of	r	27 (4.2)	494 (9.5)	67 (4.3)	499 (5.8)	6 (2.0)	481 (13.4)
Italy		24 (3.1)	517 (7.8)	34 (2.9)	508 (6.7)	42 (3.7)	521 (5.1)
Russian Federation		16 (3.0)	539 (10.0)	80 (3.4)	524 (4.9)	4 (1.3)	482 (14.0)
Singapore		13 (2.9)	564 (9.4)	25 (3.3)	566 (9.6)	62 (4.2)	565 (7.6)
Iran, Islamic Rep. of		13 (3.2)	424 (10.3)	31 (4.8)	415 (9.0)	56 (5.0)	411 (5.3)
Philippines	r	12 (3.2)	317 (22.1)	60 (4.4)	312 (9.9)	28 (3.9)	339 (17.0)
Tunisia		11 (2.8)	320 (18.8)	30 (4.0)	321 (13.6)	59 (4.6)	304 (7.8)
Chinese Taipei		8 (2.4)	545 (9.0)	19 (3.2)	558 (4.2)	73 (3.4)	551 (2.0)
Slovenia		3 (1.6)	495 (5.2)	10 (2.8)	487 (5.8)	86 (3.2)	491 (3.0)
Norway		3 (1.4)	446 (11.0)	3 (1.4)	461 (19.1)	94 (2.0)	467 (2.7)
England	r	2 (1.4)	~ ~	13 (3.8)	531 (13.9)	85 (4.0)	541 (4.4)
Lithuania		2 (0.8)	~ ~	18 (2.3)	520 (4.2)	80 (2.6)	509 (2.8)
New Zealand	r	1 (0.6)	~ ~	3 (1.0)	535 (22.5)	95 (1.1)	522 (2.9)
Belgium (Flemish)		1 (0.9)	~ ~	4 (1.7)	523 (10.1)	95 (1.9)	518 (1.9)
United States	r	1 (0.7)	~ ~	12 (2.1)	542 (7.5)	86 (2.2)	536 (3.1)
Hong Kong, SAR	r	1 (0.9)	~ ~	35 (4.6)	538 (5.8)	64 (4.7)	544 (3.7)
Hungary		1 (0.7)	~ ~	63 (4.5)	530 (4.4)	36 (4.4)	523 (5.8)
Netherlands		0 (0.4)	~ ~	8 (2.9)	531 (10.8)	92 (2.9)	525 (2.1)
Australia	r	0 (0.4)	~ ~	5 (1.4)	525 (12.6)	95 (1.4)	524 (3.7)
Cyprus		0 (0.0)	~ ~	15 (2.9)	479 (4.7)	85 (2.9)	481 (2.5)
Japan		0 (0.0)	~ ~	8 (2.4)	546 (6.3)	92 (2.4)	543 (1.5)
Scotland	s	0 (0.0)	~ ~	4 (1.8)	494 (16.9)	96 (1.8)	508 (3.5)
Armenia		x x	x x	x x	x x	x x	x x
Latvia		x x	x x	x x	x x	x x	x x
Morocco		x x	x x	x x	x x	x x	x x
International Avg.		6 (0.4)	466 (4.0)	25 (0.7)	497 (2.4)	69 (0.7)	495 (1.5)
Benchmarking Participants							
Indiana State, US		1 (0.7)	~ ~	13 (4.3)	542 (9.0)	86 (4.4)	554 (4.0)
Ontario Province, Can.		3 (1.8)	515 (10.1)	12 (3.6)	556 (25.4)	85 (4.0)	539 (3.3)
Quebec Province, Can.		2 (1.2)	~ ~	7 (2.4)	504 (5.6)	91 (2.7)	501 (2.9)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

() 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 "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 7.11: Use of Science Homework



Countries	Percentage of Students Whose Teachers Always or Almost Always									
	Monitor Whether or Not the Homework Was Completed	Correct Assignments and Then Give Feedback to Students	Have Students Correct Their Own Homework in Class	Use the Homework as a Basis for Class Discussion	Use the Homework to Contribute Toward Students' Grades/Marks					
Armenia	r	92 (1.2)	r	87 (1.7)	r	44 (2.2)	r	33 (2.6)	r	27 (2.2)
Australia	r	72 (3.4)	r	61 (3.9)	r	12 (2.8)	r	14 (2.7)	r	30 (3.9)
Bahrain		85 (3.1)		89 (2.7)		26 (2.7)		26 (3.2)		75 (3.1)
Belgium (Flemish)		62 (2.9)		56 (3.1)		15 (2.5)		12 (1.8)		31 (2.7)
Botswana		92 (2.7)		88 (3.2)		19 (3.4)		21 (3.5)		9 (2.6)
Bulgaria	r	85 (2.0)	r	61 (2.5)	r	9 (1.5)	r	17 (2.1)	r	7 (1.4)
Chile		85 (2.6)		83 (2.8)		57 (3.7)		50 (4.0)		35 (4.0)
Chinese Taipei		59 (4.1)		42 (4.4)		29 (3.6)		30 (3.9)		51 (4.5)
Cyprus		85 (0.8)		73 (1.2)		17 (0.7)		32 (1.2)		48 (1.3)
Egypt		87 (2.7)		85 (3.3)		24 (3.5)		48 (4.6)		27 (3.8)
Estonia		71 (2.2)		35 (2.2)		10 (1.5)		24 (2.3)		30 (2.6)
Ghana		95 (1.8)		93 (2.3)		35 (4.7)		36 (4.4)		63 (4.9)
Hong Kong, SAR		72 (4.1)		58 (4.2)		22 (3.9)		12 (2.7)		20 (3.2)
Hungary		88 (1.7)		40 (2.3)		54 (2.6)		8 (1.5)		8 (1.2)
Indonesia		93 (1.9)		87 (2.0)		16 (2.6)		22 (2.8)		49 (3.3)
Iran, Islamic Rep. of		52 (4.2)		35 (4.1)		32 (3.6)		18 (2.7)		41 (3.7)
Israel		78 (2.9)		67 (3.4)		58 (4.1)		38 (4.0)		60 (3.2)
Italy		77 (3.1)		35 (3.6)		37 (3.6)		42 (3.4)		13 (2.7)
Japan		48 (3.9)		22 (3.5)		22 (3.5)		9 (2.3)		28 (3.6)
Jordan		90 (2.5)		79 (3.8)		55 (4.2)		42 (4.6)		41 (4.2)
Korea, Rep. of	s	52 (4.0)	s	14 (2.7)	s	13 (2.3)	s	7 (1.9)	s	26 (2.8)
Latvia	r	71 (2.4)	r	53 (3.2)	r	13 (1.6)	r	11 (1.9)	r	14 (1.9)
Lebanon		80 (3.2)		87 (2.6)		52 (3.7)		40 (3.1)		13 (2.5)
Lithuania		64 (2.3)		57 (2.4)		14 (1.6)		8 (1.2)		15 (1.8)
Macedonia, Rep. of		65 (2.6)		59 (2.6)		24 (2.6)		19 (1.8)		25 (2.3)
Malaysia		92 (2.2)		87 (2.6)		5 (1.9)		29 (3.7)		6 (2.2)
Moldova, Rep. of	r	79 (2.8)	r	48 (3.2)	r	40 (3.1)	r	44 (2.6)	r	45 (2.7)
Morocco		61 (4.6)		75 (4.1)		58 (5.0)		22 (3.8)		42 (4.7)
Netherlands	r	41 (3.2)	r	42 (3.1)	r	55 (2.9)	r	7 (1.5)	r	11 (2.2)
New Zealand		80 (4.5)		60 (4.4)		15 (3.3)		9 (1.9)		19 (3.8)
Norway		22 (3.5)		7 (2.2)		7 (2.5)		18 (3.5)		27 (4.1)
Palestinian Nat'l Auth.		92 (2.3)		87 (3.0)		56 (4.7)		44 (4.4)		48 (4.2)
Philippines		87 (3.3)		81 (4.1)		26 (4.4)		52 (4.0)		57 (4.4)
Romania		81 (1.8)		60 (2.1)		15 (1.6)		26 (1.8)		10 (1.7)
Russian Federation		91 (1.1)		66 (2.3)		23 (1.5)		10 (0.9)		48 (1.9)
Saudi Arabia		91 (2.9)		85 (3.9)		45 (5.1)		24 (5.8)		72 (4.8)
Scotland	s	94 (1.5)	s	85 (2.1)	s	2 (0.9)	s	13 (2.0)	s	12 (2.3)
Serbia		60 (2.6)		45 (2.6)		19 (1.9)		20 (2.0)		10 (1.4)
Singapore		87 (1.8)		75 (2.0)		17 (1.9)		39 (2.6)		12 (1.5)
Slovak Republic		76 (2.2)		57 (2.5)		7 (1.5)		15 (1.8)		14 (1.6)
Slovenia		63 (2.6)		26 (2.7)		28 (2.3)		15 (2.0)		5 (1.3)
South Africa		88 (2.6)		83 (2.5)	r	26 (2.9)		32 (3.9)	r	33 (3.3)
Sweden		52 (3.1)		38 (3.0)		4 (1.4)		22 (2.6)		20 (2.7)
Tunisia		68 (3.7)		52 (3.7)		46 (3.7)		22 (3.4)		10 (2.4)
United States	r	87 (2.0)	r	59 (3.1)	r	22 (2.6)	r	39 (3.3)	r	72 (2.9)
‡ England	s	92 (2.5)	s	85 (2.4)	s	3 (1.6)	s	11 (2.8)	s	43 (4.7)
International Avg.		76 (0.4)		62 (0.4)		27 (0.4)		25 (0.4)		31 (0.5)
Benchmarking Participants										
Basque Country, Spain		86 (3.8)		60 (5.2)		72 (5.2)		26 (4.9)		70 (5.1)
Indiana State, US		90 (3.9)		63 (6.6)		20 (5.4)		36 (5.9)		75 (5.1)
Ontario Province, Can.		82 (3.8)		62 (4.7)		22 (3.9)		31 (4.0)		49 (4.9)
Quebec Province, Can.	r	64 (4.7)	r	67 (4.2)	r	41 (5.3)	r	16 (3.5)	r	12 (2.5)

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students.

Exhibit 7.12: Frequency of Science Tests



Countries	Percentage of Students Whose Teachers Give a Science Test or Examination			
	Every Two Weeks or More	About Once a Month	A Few Times a Year or Less	
Armenia	r	13 (1.4)	48 (2.4)	40 (2.4)
Australia	r	7 (1.9)	64 (3.6)	28 (3.1)
Bahrain		83 (2.2)	17 (2.2)	0 (0.0)
Belgium (Flemish)		43 (3.7)	49 (3.5)	8 (1.8)
Botswana		11 (2.8)	88 (3.0)	1 (0.0)
Bulgaria	r	8 (1.6)	40 (3.0)	51 (3.2)
Chile		45 (4.0)	47 (4.1)	7 (2.1)
Chinese Taipei		97 (1.4)	3 (1.4)	0 (0.0)
Cyprus		3 (0.6)	48 (1.3)	49 (1.4)
Egypt		89 (2.5)	11 (2.5)	0 (0.0)
Estonia		50 (2.6)	46 (2.4)	4 (0.9)
Ghana		74 (3.7)	24 (3.8)	2 (1.2)
Hong Kong, SAR		20 (3.1)	28 (4.0)	52 (3.8)
Hungary		38 (2.8)	51 (2.7)	11 (1.6)
Indonesia		36 (3.2)	52 (3.6)	12 (2.4)
Iran, Islamic Rep. of		48 (4.1)	45 (4.0)	7 (2.2)
Israel		9 (2.0)	27 (3.2)	64 (3.2)
Italy		17 (2.9)	52 (3.7)	30 (3.1)
Japan		11 (2.7)	35 (3.7)	54 (4.1)
Jordan		33 (4.3)	51 (4.5)	16 (3.8)
Korea, Rep. of	s	49 (4.3)	34 (4.1)	17 (3.3)
Latvia	r	43 (3.2)	54 (2.9)	3 (1.0)
Lebanon		x x	x x	x x
Lithuania		23 (2.0)	66 (2.2)	11 (1.6)
Macedonia, Rep. of		29 (2.2)	27 (2.4)	44 (2.8)
Malaysia		7 (2.0)	44 (4.1)	49 (3.9)
Moldova, Rep. of	r	43 (3.6)	43 (3.4)	14 (1.9)
Morocco		34 (5.1)	61 (5.7)	5 (2.1)
Netherlands	r	25 (2.6)	69 (2.7)	6 (1.5)
New Zealand		10 (2.9)	79 (4.5)	11 (3.7)
Norway		2 (1.4)	42 (4.8)	56 (4.9)
Palestinian Nat'l Auth.	r	29 (4.3)	33 (3.6)	38 (4.6)
Philippines		92 (2.6)	5 (2.1)	3 (1.5)
Romania		44 (2.5)	50 (2.5)	6 (1.1)
Russian Federation		60 (2.4)	30 (2.3)	9 (1.3)
Saudi Arabia		39 (5.1)	42 (5.6)	19 (3.4)
Scotland	s	3 (1.2)	58 (3.9)	38 (3.9)
Serbia		3 (0.7)	18 (1.5)	79 (1.8)
Singapore		25 (2.1)	61 (2.8)	15 (2.0)
Slovak Republic		24 (2.5)	38 (2.3)	38 (2.8)
Slovenia		0 (0.0)	7 (1.5)	93 (1.5)
South Africa	r	23 (3.6)	65 (4.2)	12 (2.2)
Sweden		2 (1.1)	36 (3.2)	62 (3.3)
Tunisia		9 (2.1)	73 (3.3)	18 (3.1)
United States	r	67 (3.4)	27 (3.3)	6 (1.5)
‡ England	s	15 (3.7)	57 (4.7)	28 (4.5)
International Avg.		32 (0.4)	43 (0.5)	25 (0.4)
Benchmarking Participants				
Basque Country, Spain		33 (4.8)	58 (4.8)	9 (2.8)
Indiana State, US		72 (4.7)	26 (4.9)	1 (1.0)
Ontario Province, Can.		32 (4.6)	53 (5.1)	15 (3.3)
Quebec Province, Can.	r	57 (5.4)	38 (5.2)	5 (1.7)

SOURCE: IEA's Trends in International Mathematics and Science Study (TIMSS) 2003

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

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

An "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.

Exhibit 7.13: Item Formats Used by Teachers in Science Tests or Examinations



Countries	Only or Mostly Constructed-Response		About Half Constructed-Response and Half Multiple-Choice		Only or Mostly Multiple-Choice		
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Armenia	r	45 (2.3)	465 (4.9)	47 (2.4)	460 (4.4)	8 (1.4)	467 (8.3)
Australia	r	22 (3.1)	520 (9.9)	74 (3.4)	531 (4.4)	5 (1.9)	501 (15.0)
Bahrain		5 (1.7)	448 (8.4)	84 (2.3)	438 (2.0)	11 (1.7)	434 (6.4)
Belgium (Flemish)		34 (3.1)	520 (5.5)	42 (3.1)	513 (5.0)	24 (2.6)	521 (5.4)
Botswana		14 (3.4)	368 (11.0)	74 (4.4)	363 (4.2)	12 (3.0)	362 (5.4)
Bulgaria	r	16 (2.1)	467 (9.4)	70 (2.1)	483 (4.5)	14 (1.8)	466 (5.9)
Chile		13 (3.1)	409 (11.9)	71 (3.7)	409 (3.2)	16 (2.7)	433 (10.3)
Chinese Taipei		9 (2.4)	558 (10.3)	68 (4.0)	571 (4.5)	24 (3.5)	572 (6.0)
Cyprus		12 (0.6)	438 (3.2)	60 (1.2)	442 (2.2)	28 (1.1)	437 (3.6)
Egypt		2 (1.1)	~ ~	70 (4.2)	426 (5.1)	29 (4.1)	414 (7.8)
Estonia		14 (1.9)	556 (4.3)	65 (2.5)	554 (2.7)	20 (1.8)	548 (3.8)
Ghana		26 (3.8)	234 (10.1)	70 (4.3)	261 (7.4)	4 (1.9)	254 (14.8)
Hong Kong, SAR		39 (4.8)	556 (6.3)	60 (4.7)	558 (4.1)	1 (0.0)	~ ~
Hungary		47 (2.5)	545 (3.5)	50 (2.6)	537 (3.4)	3 (0.9)	562 (18.8)
Indonesia		36 (4.0)	416 (7.7)	56 (3.9)	428 (4.9)	8 (1.8)	425 (14.7)
Iran, Islamic Rep. of		24 (3.2)	455 (5.6)	72 (3.5)	455 (3.1)	4 (1.8)	443 (8.8)
Israel		7 (1.8)	477 (11.2)	69 (3.3)	488 (4.1)	24 (3.5)	497 (6.1)
Italy		33 (4.0)	498 (5.4)	61 (4.1)	488 (4.1)	6 (1.9)	488 (16.6)
Japan		26 (3.6)	552 (3.5)	67 (4.2)	550 (2.7)	7 (2.3)	562 (14.5)
Jordan		30 (3.7)	467 (7.0)	67 (3.7)	479 (4.9)	3 (1.3)	477 (21.7)
Korea, Rep. of	r	10 (2.3)	565 (5.6)	20 (3.2)	557 (2.3)	71 (3.6)	559 (2.3)
Latvia	r	37 (3.2)	514 (3.4)	57 (3.4)	512 (3.4)	6 (1.4)	518 (5.7)
Lebanon		19 (3.6)	412 (9.6)	65 (4.2)	386 (6.0)	15 (2.9)	399 (11.7)
Lithuania		29 (2.0)	518 (3.1)	65 (2.1)	519 (2.2)	6 (1.0)	512 (6.7)
Macedonia, Rep. of		35 (2.5)	430 (6.8)	58 (2.6)	461 (4.4)	7 (1.3)	450 (10.1)
Malaysia		1 (1.0)	~ ~	61 (4.4)	506 (4.8)	37 (4.4)	515 (6.1)
Moldova, Rep. of	r	20 (2.3)	466 (6.1)	67 (3.0)	471 (4.4)	13 (1.9)	468 (6.7)
Morocco		16 (3.8)	396 (10.7)	62 (4.7)	403 (4.3)	22 (3.8)	393 (6.0)
Netherlands	r	32 (3.0)	549 (5.6)	57 (3.4)	532 (3.7)	11 (2.1)	527 (10.2)
New Zealand		49 (4.3)	508 (5.2)	45 (4.2)	538 (7.1)	5 (1.8)	506 (11.0)
Norway		86 (3.1)	494 (2.5)	13 (3.0)	491 (7.2)	1 (0.9)	~ ~
Palestinian Nat'l Auth.		4 (1.7)	457 (9.6)	79 (3.8)	435 (4.6)	17 (3.5)	438 (8.4)
Philippines		8 (2.3)	364 (13.6)	84 (3.0)	374 (7.0)	8 (2.5)	386 (18.9)
Romania		11 (1.6)	482 (8.1)	77 (2.2)	469 (5.2)	13 (1.6)	467 (9.7)
Russian Federation		35 (2.8)	516 (4.3)	57 (3.5)	512 (3.5)	7 (1.1)	509 (5.9)
Saudi Arabia		4 (2.2)	406 (6.3)	63 (5.5)	395 (5.3)	33 (5.5)	397 (9.4)
Scotland	s	48 (4.4)	518 (6.0)	45 (4.3)	513 (6.9)	6 (2.4)	525 (18.2)
Serbia		41 (2.5)	464 (3.4)	45 (2.6)	468 (3.4)	14 (1.8)	475 (5.0)
Singapore		30 (2.4)	592 (8.6)	68 (2.4)	573 (5.3)	2 (0.5)	~ ~
Slovak Republic	r	62 (2.9)	515 (3.8)	32 (2.8)	521 (5.8)	6 (1.3)	513 (6.7)
Slovenia		28 (2.5)	524 (2.5)	71 (2.4)	520 (2.0)	1 (0.5)	~ ~
South Africa	r	16 (3.0)	219 (16.5)	72 (3.6)	254 (11.1)	11 (2.8)	221 (16.6)
Sweden		92 (1.9)	526 (2.8)	7 (1.9)	517 (9.1)	1 (0.6)	~ ~
Tunisia	r	23 (4.0)	402 (3.8)	73 (4.3)	406 (3.0)	4 (1.8)	368 (5.7)
United States	r	10 (2.1)	535 (8.7)	74 (3.0)	530 (4.2)	16 (2.2)	531 (7.2)
‡ England	s	72 (4.0)	560 (6.1)	27 (4.0)	534 (13.3)	2 (1.2)	~ ~
International Avg.		28 (0.4)	475 (1.1)	60 (0.5)	475 (0.9)	13 (0.3)	463 (1.7)
Benchmarking Participants							
Basque Country, Spain		32 (5.0)	491 (5.5)	51 (5.4)	490 (3.8)	17 (3.9)	485 (7.4)
Indiana State, US		11 (4.2)	503 (17.1)	69 (6.4)	537 (5.7)	20 (4.6)	526 (7.2)
Ontario Province, Can.	r	21 (4.1)	541 (4.5)	76 (4.2)	533 (3.7)	3 (1.6)	537 (12.1)
Quebec Province, Can.		x x	x x	x x	x x	x x	x x

Background data provided by teachers.

‡ Did not satisfy guidelines for sample participation rates (see Exhibit A.9).

() 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 "r" indicates data are available for at least 70 but less than 85% of the students. An "s" indicates data are available for at least 50 but less than 70% of the students. An "x" indicates data are available for less than 50% of the students.