Chapter 7

Teacher Preparation

Higher science achievement was related to teachers' having more teaching experience, being confident in their science teaching, and being satisfied with their careers.

The majority of fourth grade students had teachers with a bachelor's degree, and even more eighth grade students had teachers with bachelor's and postgraduate degrees. At both grades, most students had teachers that reported having at least ten years of teaching experience, being very well prepared to teach the TIMSS science topics, and feeling very confident in teaching science.

In view of the importance of a well prepared teaching force to an effective education system, TIMSS 2011 collected a range of information about teacher education. In the *TIMSS 2011 Encyclopedia*, each country chapter describes the educational route to teacher certification, including any additional requirements such as passing an examination or completing an induction year. Each encyclopedia chapter also addresses the requirements and practices for ongoing teacher professional development. Chapter 7 in this report provides information about teachers' education, experience, professional development, and satisfaction with their teaching careers.

Science Teachers' Formal Education

There is growing evidence that teacher preparation is a powerful predictor of students' achievement, perhaps even overcoming socioeconomic and language background factors (Darling-Hammond, 2000).

Exhibits 7.1 and 7.2 present teachers' reports about their highest level of formal education for the TIMSS 2011 fourth and eighth grade assessments, respectively. On average across the fourth grade countries, 23 percent of the students had science teachers with a postgraduate university degree, 57 percent had teachers with a bachelor's degree, 15 percent had teachers who had completed post-secondary education (usually a three-year teacher education program), and six percent had teachers with an upper secondary education. However, it is clear from examining the country-by-country results across the fourth grade, sixth grade, and benchmarking participants that different countries have different educational paths for becoming a primary level teacher. Similar results are shown in Exhibit 7.2 for the eighth grade students, although more students than at the fourth grade had teachers with bachelor's (63% vs. 57%) and postgraduate university degrees (27% vs. 23%).

Teachers Majoring in Education and Science

In addition to the importance of a college or university degree or advanced degree, the literature reports widespread agreement that teachers should have solid mastery of the content in the subject to be taught. For example, in a review of teacher quality research, Rice (2003) examined the relationship between teachers' advanced degrees and student achievement and found a positive relationship between subject-specific advanced degrees and student achievement in mathematics and in science.

Exhibit 7.3 shows the percentages of students in the TIMSS 2011 fourth grade assessment whose teachers had a major or specialization in primary

education and if they also had a major or specialization in science. Similar to the situation with formal education, there was a great deal of variation across countries in the degree of specialization by primary school teachers in science education. On average across the fourth grade countries, 25 percent of the students were taught science by a teacher with a major in both primary education and science, and almost half by a teacher with a major in primary education but not in science. Just 11 percent of the fourth grade students were taught science by a teacher with a major in science but not in primary education, and another 13 percent by a teacher with some other major. In several countries, one-third or more of the fourth grade and sixth grade students had science teachers without university degrees (Italy, Honduras, Morocco, Romania, Tunisia, and Yemen). However, as explained in the *TIMSS 2011 Encyclopedia*, countries have been implementing new policies that increase their teacher education requirements.

Science achievement was highest, on average, among students taught by teachers with a primary education major but not a science major (489), followed by students taught by a teacher with both majors (482), and then students taught by a teacher with some other major (479). Among the fourth grade students whose teachers had college degrees, average achievement was lowest among students taught by a teacher with a major in science but not in primary education (462).

As shown in Exhibit 7.4, the situation for science teachers of eighth grade students was somewhat different. The majority of eighth grade students were taught science by teachers who had a major in science but not in science education (51%), or who had a major in both (28%). There were only small differences in average science achievement associated with the majors of the students' teachers; students taught by teachers with a major in science and science education had somewhat higher achievement (480) than the 11 percent of students taught by teachers majoring in science education but not science (470). Almost all of the eighth grade students were taught science by teachers with college degrees (except in Morocco).

Exhibit 7.1: Science Teachers' Formal Education*

TIMSS 2011 4th Grade Science

Reported by Teachers

Country	Percent of Students by Teacher Educational Level			
	Completed Postgraduate University Degree**	Completed Bachelor's Degree or Equivalent but Not a Postgraduate Degree	Completed Post-secondary Education but Not a Bachelor's Degree	No Further than Upper-secondary Education
Armenia	79 (3.3)	3 (1.3)	18 (2.9)	1 (0.8)
Australia r	65 (3.3)	27 (2.9)	7 (2.2)	1 (1.1)
Austria	4 (1.3)	2 (0.9)	93 (1.6)	0 (0.3)
Azerbaijan	9 (2.2)	52 (4.0)	37 (3.8)	3 (1.0)
Bahrain	24 (3.7)	72 (3.8)	3 (1.5)	0 (0.0)
Belgium (Flemish)	0 (0.0)	99 (0.6)	0 (0.0)	1 (0.6)
Chile	9 (2.5)	81 (3.6)	10 (2.6)	0 (0.0)
Chinese Taipei	31 (3.6)	65 (3.9)	4 (1.4)	0 (0.0)
Croatia	1 (0.6)	30 (3.3)	69 (3.2)	1 (0.4)
Czech Republic	92 (2.3)	2 (0.9)	3 (1.6)	3 (1.3)
Denmark r	4 (1.5)	83 (2.8)	12 (2.7)	2 (1.0)
England	35 (4.1)	60 (4.2)	4 (1.5)	1 (1.2)
Finland	80 (2.6)	18 (2.4)	0 (0.0)	2 (0.9)
Georgia	74 (3.5)	21 (3.1)	5 (1.5)	0 (0.0)
Germany	2 (1.0)	82 (2.3)	10 (1.7)	6 (1.5)
Hong Kong SAR	19 (3.6)	71 (4.6)	10 (2.8)	0 (0.0)
Hungary	3 (1.0)	96 (1.3)	1 (0.0)	0 (0.0)
Iran, Islamic Rep. of	1 (0.8)	37 (3.4)	49 (3.4)	13 (2.2)
Ireland	18 (2.6)	79 (2.8)	3 (1.0)	0 (0.0)
Italy	6 (1.7)	19 (2.8)	2 (1.1)	73 (3.3)
Japan	6 (2.1)	86 (3.0)	8 (2.1)	0 (0.0)
Kazakhstan	1 (0.7)	74 (3.7)	20 (3.1)	5 (1.9)
Korea, Rep. of	24 (3.4)	69 (3.9)	7 (1.8)	0 (0.0)
Kuwait	6 (2.1)	91 (2.3)	1 (0.9)	2 (1.0)
Lithuania	15 (2.4)	77 (2.6)	7 (1.7)	0 (0.0)
Malta	8 (0.1)	73 (0.1)	13 (0.1)	6 (0.1)
Morocco	0 (0.2)	35 (4.0)	0 (0.0)	65 (4.0)
Netherlands r	1 (0.7)	98 (1.1)	0 (0.0)	1 (0.9)
New Zealand	19 (2.4)	65 (2.7)	16 (2.2)	0 (0.0)
Northern Ireland r	28 (4.1)	69 (4.3)	3 (1.5)	0 (0.0)
Norway	2 (0.9)	94 (1.5)	4 (1.2)	0 (0.0)
Oman	9 (1.5)	76 (2.1)	15 (2.0)	0 (0.2)
Poland	96 (1.4)	3 (1.2)	1 (0.7)	0 (0.0)
Portugal	3 (0.9)	91 (1.7)	6 (1.6)	0 (0.0)
Qatar	27 (3.2)	71 (3.3)	1 (0.6)	1 (0.9)
Romania	7 (2.1)	30 (3.5)	29 (4.0)	34 (3.5)
Russian Federation	80 (2.6)	0 (0.0)	20 (2.6)	0 (0.3)
Saudi Arabia	0 (0.0)	72 (3.3)	27 (3.2)	1 (0.7)
Serbia	2 (0.4)	62 (3.5)	33 (3.5)	3 (1.2)
Singapore	9 (1.7)	64 (2.5)	26 (2.2)	1 (0.5)
Slovak Republic	99 (0.5)	0 (0.3)	1 (0.4)	0 (0.0)
Slovenia	1 (0.5)	57 (3.9)	42 (3.9)	0 (0.0)
Spain	1 (0.7)	99 (0.7)	0 (0.0)	0 (0.0)
Sweden	– –	– –	– –	– –
Thailand	11 (2.9)	86 (3.0)	1 (0.7)	1 (1.0)
Tunisia	0 (0.0)	15 (2.7)	40 (3.8)	45 (3.7)
Turkey	4 (1.2)	81 (2.5)	15 (2.3)	0 (0.0)
United Arab Emirates	24 (2.2)	70 (2.3)	6 (1.0)	0 (0.0)
United States r	63 (2.0)	37 (2.0)	0 (0.0)	0 (0.0)
Yemen	0 (0.0)	33 (3.5)	36 (3.7)	32 (3.7)
International Avg.	23 (0.3)	57 (0.4)	15 (0.3)	6 (0.2)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

* Based on countries' categorizations according to UNESCO's International Standard Classification of Education (Operational Manual for ISCED-1997).

** For example, doctorate, master's, or other postgraduate degree or diploma.

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

A dash (–) indicates comparable data not available.

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

Exhibit 7.1: Science Teachers' Formal Education* (Continued)

Country		Percent of Students by Teacher Educational Level			
		Completed Postgraduate University Degree**	Completed Bachelor's Degree or Equivalent but Not a Postgraduate Degree	Completed Post-secondary Education but Not a Bachelor's Degree	No Further than Upper-secondary Education
Sixth Grade Participants					
Botswana		1 (0.0)	15 (3.0)	83 (3.1)	1 (1.0)
Honduras		0 (0.0)	45 (3.7)	21 (3.7)	34 (4.1)
Yemen		0 (0.0)	41 (4.5)	36 (4.2)	23 (3.5)
Benchmarking Participants					
Alberta, Canada	r	11 (2.5)	89 (2.5)	0 (0.0)	0 (0.0)
Ontario, Canada		15 (2.4)	84 (2.5)	1 (0.8)	0 (0.0)
Quebec, Canada		13 (3.3)	87 (3.3)	0 (0.1)	0 (0.0)
Abu Dhabi, UAE		23 (3.9)	71 (4.0)	6 (2.1)	0 (0.0)
Dubai, UAE	r	29 (4.2)	62 (4.1)	10 (1.5)	0 (0.0)
Florida, US	r	42 (5.1)	57 (5.2)	1 (0.1)	0 (0.0)
North Carolina, US		44 (6.7)	56 (6.7)	0 (0.0)	0 (0.0)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.2: Science Teachers' Formal Education*

TIMSS 2011 8th Grade Science

Reported by Teachers

Country	Percent of Students by Teacher Educational Level			
	Completed Postgraduate University Degree**	Completed Bachelor's Degree or Equivalent but Not a Postgraduate Degree	Completed Post-secondary Education but Not a Bachelor's Degree	No Further than Upper-secondary Education
Armenia	94 (1.1)	5 (1.0)	0 (0.0)	1 (0.4)
Australia s	79 (2.8)	21 (2.8)	0 (0.2)	0 (0.0)
Bahrain	27 (2.7)	71 (2.9)	2 (1.3)	0 (0.0)
Chile	9 (2.2)	87 (2.7)	4 (1.6)	0 (0.0)
Chinese Taipei	51 (3.7)	49 (3.7)	0 (0.0)	0 (0.0)
England r	45 (3.2)	54 (3.2)	1 (0.3)	0 (0.3)
Finland	89 (1.4)	10 (1.3)	0 (0.1)	1 (0.5)
Georgia	85 (1.4)	12 (1.4)	3 (0.6)	0 (0.0)
Ghana	2 (0.9)	18 (3.0)	65 (3.4)	15 (2.4)
Hong Kong SAR	39 (4.6)	57 (4.6)	4 (1.9)	0 (0.0)
Hungary	28 (2.3)	72 (2.3)	0 (0.2)	0 (0.0)
Indonesia	1 (0.6)	89 (3.2)	5 (1.3)	5 (3.0)
Iran, Islamic Rep. of	3 (1.1)	70 (2.9)	26 (2.8)	0 (0.0)
Israel	33 (3.1)	63 (3.0)	4 (1.6)	0 (0.0)
Italy	26 (3.1)	74 (3.2)	0 (0.5)	0 (0.0)
Japan	18 (3.1)	82 (3.2)	1 (0.0)	0 (0.0)
Jordan	12 (2.5)	83 (2.8)	4 (1.5)	1 (0.0)
Kazakhstan	4 (1.0)	95 (1.0)	1 (0.4)	1 (0.4)
Korea, Rep. of	34 (3.2)	66 (3.2)	0 (0.0)	0 (0.0)
Lebanon	9 (2.0)	83 (2.5)	6 (1.8)	2 (0.8)
Lithuania	35 (2.2)	60 (2.3)	5 (0.8)	0 (0.0)
Macedonia, Rep. of	2 (0.5)	43 (2.4)	54 (2.4)	0 (0.1)
Malaysia	4 (1.6)	82 (2.8)	12 (2.4)	1 (0.9)
Morocco	4 (0.9)	39 (2.4)	0 (0.0)	57 (2.5)
New Zealand	51 (4.0)	47 (4.0)	2 (0.8)	0 (0.0)
Norway	1 (1.0)	97 (1.6)	2 (1.1)	1 (0.0)
Oman	7 (1.1)	93 (1.1)	0 (0.1)	0 (0.0)
Palestinian Nat'l Auth.	11 (2.8)	83 (3.5)	6 (2.0)	0 (0.0)
Qatar	35 (3.7)	61 (2.5)	0 (0.3)	3 (2.8)
Romania	21 (1.6)	63 (2.4)	15 (1.8)	0 (0.3)
Russian Federation	99 (0.3)	0 (0.0)	0 (0.2)	0 (0.2)
Saudi Arabia	3 (1.3)	94 (2.0)	3 (1.5)	0 (0.0)
Singapore	13 (1.9)	84 (2.2)	3 (0.9)	0 (0.0)
Slovenia	2 (0.7)	55 (2.2)	42 (2.3)	0 (0.0)
Sweden	– –	– –	– –	– –
Syrian Arab Republic	1 (0.8)	65 (2.7)	32 (2.6)	2 (0.9)
Thailand	16 (3.1)	82 (3.3)	0 (0.0)	2 (1.0)
Tunisia	1 (0.9)	83 (3.0)	16 (2.9)	0 (0.0)
Turkey	5 (1.6)	86 (2.4)	9 (1.8)	0 (0.0)
Ukraine	3 (0.7)	97 (0.8)	0 (0.1)	0 (0.0)
United Arab Emirates	28 (2.1)	71 (2.1)	1 (0.4)	0 (0.0)
United States r	62 (2.8)	38 (2.8)	0 (0.0)	0 (0.0)
International Avg.	27 (0.4)	63 (0.4)	8 (0.2)	2 (0.1)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

* Based on countries' categorizations according to UNESCO's International Standard Classification of Education (Operational Manual for ISCED-1997).

** For example, doctorate, master's, or other postgraduate degree or diploma.

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

A dash (–) indicates comparable data 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 students.

Exhibit 7.2: Science Teachers' Formal Education* (Continued)

Country		Percent of Students by Teacher Educational Level			
		Completed Postgraduate University Degree**	Completed Bachelor's Degree or Equivalent but Not a Postgraduate Degree	Completed Post-secondary Education but Not a Bachelor's Degree	No Further than Upper-secondary Education
Ninth Grade Participants					
Botswana		1 (0.7)	29 (3.8)	69 (3.8)	1 (1.0)
Honduras		3 (1.8)	75 (4.1)	12 (3.0)	10 (3.0)
South Africa		20 (2.7)	33 (4.1)	45 (3.9)	2 (0.9)
Benchmarking Participants					
Alberta, Canada		11 (2.7)	87 (2.8)	1 (1.0)	0 (0.2)
Ontario, Canada		20 (3.6)	80 (3.6)	0 (0.3)	0 (0.0)
Quebec, Canada		24 (3.2)	74 (3.4)	1 (0.0)	1 (0.0)
Abu Dhabi, UAE		20 (3.4)	79 (3.5)	1 (0.7)	0 (0.0)
Dubai, UAE	r	41 (3.7)	58 (3.7)	1 (0.6)	0 (0.0)
Alabama, US	r	66 (8.5)	34 (8.5)	0 (0.0)	0 (0.0)
California, US	s	81 (3.6)	19 (3.6)	0 (0.0)	0 (0.0)
Colorado, US		79 (5.6)	21 (5.6)	0 (0.0)	0 (0.0)
Connecticut, US	r	89 (2.3)	11 (2.3)	0 (0.0)	0 (0.0)
Florida, US		x x	x x	x x	x x
Indiana, US	r	69 (6.0)	31 (6.0)	0 (0.0)	0 (0.0)
Massachusetts, US	r	88 (4.7)	12 (4.7)	0 (0.0)	0 (0.0)
Minnesota, US	r	79 (3.3)	21 (3.3)	0 (0.0)	0 (0.0)
North Carolina, US	s	43 (7.7)	57 (7.7)	0 (0.0)	0 (0.0)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.3: Teachers Majored in Education and Science

Reported by Teachers

Country	Major in Primary Education and Major (or Specialization) in Science		Major in Primary Education but No Major (or Specialization) in Science		Major in Science but No Major in Primary Education		All Other Majors		No Formal Education Beyond Upper-secondary*	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Armenia	31 (3.9)	414 (6.8)	45 (4.3)	419 (6.2)	4 (1.7)	405 (9.6)	19 (3.4)	424 (7.8)	1 (0.8)	~ ~
Australia r	9 (2.4)	515 (9.2)	84 (2.8)	520 (3.8)	2 (1.1)	~ ~	4 (1.2)	479 (11.3)	1 (1.1)	~ ~
Austria	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –
Azerbaijan	56 (3.8)	444 (8.8)	17 (3.0)	443 (16.6)	19 (3.2)	414 (10.9)	5 (1.5)	452 (12.9)	3 (1.0)	424 (14.4)
Bahrain	19 (3.9)	438 (10.3)	3 (1.5)	518 (26.4)	72 (4.4)	447 (4.1)	6 (1.5)	479 (17.7)	0 (0.0)	~ ~
Belgium (Flemish)	– –	– –	– –	– –	– –	– –	– –	– –	– –	– –
Chile	29 (3.7)	486 (6.7)	69 (3.9)	478 (3.4)	1 (0.9)	~ ~	2 (1.0)	~ ~	0 (0.0)	~ ~
Chinese Taipei	34 (4.0)	551 (3.8)	31 (3.7)	557 (3.5)	15 (2.9)	546 (6.3)	20 (3.0)	549 (5.0)	0 (0.0)	~ ~
Croatia	21 (2.9)	509 (4.0)	77 (3.0)	518 (2.3)	1 (0.5)	~ ~	1 (0.5)	~ ~	1 (0.4)	~ ~
Czech Republic	1 (0.7)	~ ~	75 (3.2)	540 (2.7)	6 (1.7)	508 (19.1)	14 (2.7)	535 (7.0)	3 (1.3)	512 (12.1)
Denmark	19 (3.0)	531 (4.5)	25 (2.9)	529 (5.2)	24 (2.9)	537 (4.7)	30 (3.4)	526 (5.4)	2 (0.9)	~ ~
England	25 (3.9)	534 (7.6)	50 (4.3)	526 (4.3)	7 (2.1)	555 (17.9)	17 (3.0)	520 (10.9)	1 (1.2)	~ ~
Finland	15 (2.5)	572 (5.8)	79 (2.7)	570 (2.6)	0 (0.0)	~ ~	5 (1.3)	579 (8.6)	2 (0.9)	~ ~
Georgia	52 (3.4)	453 (4.3)	21 (2.5)	447 (9.6)	17 (3.3)	469 (8.7)	10 (2.1)	448 (15.1)	0 (0.0)	~ ~
Germany	54 (3.4)	531 (3.8)	32 (3.4)	525 (4.3)	4 (1.4)	520 (14.9)	4 (1.4)	509 (18.3)	6 (1.5)	536 (9.7)
Hong Kong SAR	27 (4.2)	536 (5.2)	52 (4.7)	535 (6.2)	6 (2.2)	530 (13.8)	15 (2.9)	532 (7.4)	0 (0.0)	~ ~
Hungary	6 (1.7)	497 (21.6)	91 (1.8)	537 (4.0)	2 (1.1)	~ ~	1 (0.8)	~ ~	0 (0.0)	~ ~
Iran, Islamic Rep. of	24 (3.0)	473 (10.1)	46 (3.6)	448 (5.5)	2 (1.1)	~ ~	16 (2.8)	436 (8.5)	12 (2.2)	460 (11.8)
Ireland	11 (2.3)	526 (8.7)	81 (2.7)	514 (3.7)	1 (0.7)	~ ~	6 (1.6)	526 (9.0)	0 (0.0)	~ ~
Italy	2 (1.1)	~ ~	2 (1.0)	~ ~	2 (0.9)	~ ~	20 (3.1)	527 (4.7)	73 (3.4)	523 (3.4)
Japan	19 (3.1)	560 (4.3)	57 (3.9)	558 (2.0)	3 (1.7)	552 (22.9)	21 (3.2)	560 (4.2)	0 (0.0)	~ ~
Kazakhstan	65 (3.4)	497 (7.3)	27 (3.4)	498 (10.3)	0 (0.4)	~ ~	2 (1.2)	~ ~	5 (1.9)	447 (10.3)
Korea, Rep. of	14 (3.0)	587 (5.2)	81 (3.3)	587 (2.3)	0 (0.0)	~ ~	4 (1.7)	591 (16.6)	0 (0.0)	~ ~
Kuwait	55 (4.5)	347 (7.0)	4 (1.6)	308 (17.8)	39 (4.4)	343 (7.8)	0 (0.0)	~ ~	2 (1.2)	~ ~
Lithuania	14 (2.5)	495 (8.1)	84 (2.7)	518 (2.6)	2 (0.9)	~ ~	0 (0.3)	~ ~	0 (0.0)	~ ~
Malta	17 (0.1)	453 (3.5)	52 (0.1)	438 (2.6)	8 (0.1)	435 (4.7)	17 (0.1)	459 (3.1)	6 (0.1)	474 (5.0)
Morocco	5 (1.8)	309 (38.1)	5 (2.5)	278 (19.2)	7 (1.4)	326 (23.6)	19 (3.5)	257 (11.4)	64 (4.0)	258 (7.3)
Netherlands r	9 (2.7)	537 (4.4)	90 (2.9)	529 (2.8)	0 (0.0)	~ ~	0 (0.0)	~ ~	1 (0.9)	~ ~
New Zealand	13 (2.1)	495 (9.3)	77 (2.6)	498 (2.8)	1 (0.6)	~ ~	8 (1.5)	493 (9.2)	0 (0.0)	~ ~
Northern Ireland r	11 (2.8)	538 (7.9)	75 (3.9)	518 (3.4)	3 (1.7)	513 (22.7)	10 (3.0)	490 (19.1)	0 (0.0)	~ ~
Norway	26 (4.3)	490 (4.0)	57 (4.2)	493 (2.9)	5 (2.2)	512 (10.4)	11 (2.6)	503 (5.0)	0 (0.0)	~ ~
Oman	49 (3.1)	379 (6.5)	14 (1.9)	382 (8.2)	29 (2.6)	379 (6.4)	8 (1.7)	359 (10.5)	0 (0.2)	~ ~
Poland	20 (3.0)	505 (6.1)	79 (3.0)	505 (2.8)	0 (0.0)	~ ~	0 (0.0)	~ ~	0 (0.0)	~ ~
Portugal	21 (3.2)	510 (9.2)	75 (3.4)	525 (4.1)	0 (0.0)	~ ~	4 (1.4)	529 (6.0)	0 (0.0)	~ ~
Qatar	23 (2.7)	402 (9.8)	7 (1.7)	476 (14.9)	62 (3.8)	378 (7.2)	7 (2.4)	408 (24.3)	1 (0.9)	~ ~
Romania	21 (3.5)	480 (13.9)	28 (3.6)	517 (8.9)	1 (0.6)	~ ~	16 (2.3)	527 (10.0)	35 (3.5)	502 (8.1)
Russian Federation	55 (3.8)	553 (5.0)	42 (3.9)	551 (4.4)	2 (1.0)	~ ~	1 (0.7)	~ ~	0 (0.3)	~ ~
Saudi Arabia	31 (3.8)	417 (12.1)	9 (2.6)	454 (15.5)	53 (4.4)	426 (7.5)	7 (2.2)	469 (18.3)	1 (0.8)	~ ~
Serbia	26 (3.4)	523 (5.7)	69 (3.6)	513 (3.9)	1 (0.6)	~ ~	1 (0.8)	~ ~	3 (1.2)	509 (12.1)
Singapore	43 (2.8)	581 (5.7)	21 (2.0)	590 (6.8)	15 (2.2)	594 (8.1)	20 (2.2)	570 (7.8)	1 (0.5)	~ ~
Slovak Republic	11 (2.3)	539 (5.8)	80 (2.6)	531 (4.4)	4 (1.4)	541 (14.9)	5 (1.6)	530 (8.1)	0 (0.0)	~ ~
Slovenia	6 (1.8)	519 (8.8)	94 (1.9)	520 (2.8)	1 (0.0)	~ ~	0 (0.0)	~ ~	0 (0.0)	~ ~
Spain	29 (3.7)	503 (5.7)	55 (3.8)	506 (3.4)	8 (2.1)	516 (9.7)	8 (2.2)	493 (9.2)	0 (0.0)	~ ~
Sweden r	55 (4.3)	531 (3.7)	35 (3.9)	536 (4.2)	6 (1.7)	563 (10.3)	3 (1.2)	532 (15.8)	1 (0.9)	~ ~
Thailand	13 (2.9)	467 (13.4)	30 (4.2)	477 (12.1)	23 (4.2)	470 (11.4)	33 (4.2)	472 (7.7)	1 (1.0)	~ ~
Tunisia	15 (2.7)	334 (10.6)	7 (2.0)	333 (16.3)	11 (2.7)	344 (16.3)	21 (3.3)	325 (10.9)	46 (3.8)	360 (8.2)
Turkey	19 (2.6)	458 (8.5)	58 (3.2)	472 (6.0)	8 (1.8)	460 (14.7)	15 (2.3)	432 (17.7)	0 (0.0)	~ ~
United Arab Emirates	29 (2.1)	420 (6.0)	7 (1.0)	503 (9.4)	56 (2.5)	422 (4.5)	8 (1.2)	448 (7.8)	0 (0.0)	~ ~
United States r	10 (1.8)	550 (10.1)	75 (2.5)	547 (2.4)	2 (0.7)	~ ~	13 (1.7)	531 (6.0)	0 (0.0)	~ ~
Yemen	17 (3.3)	206 (15.4)	11 (2.8)	191 (19.7)	21 (3.9)	237 (11.8)	18 (3.3)	215 (14.7)	32 (3.8)	191 (13.0)
International Avg.	25 (0.4)	482 (1.5)	48 (0.4)	489 (1.3)	12 (0.3)	462 (2.4)	10 (0.3)	479 (1.9)	6 (0.2)	433 (2.9)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

* Countries have been increasing their certification requirements and providing professional development to teachers certified under earlier guidelines.

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

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

Exhibit 7.3: Teachers Majored in Education and Science (Continued)

Country		Major in Primary Education and Major (or Specialization) in Science		Major in Primary Education but No Major (or Specialization) in Science		Major in Science but No Major in Primary Education		All Other Majors		No Formal Education Beyond Upper-secondary*	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Sixth Grade Participants											
Botswana		31 (3.9)	384 (16.6)	39 (4.3)	360 (9.6)	15 (3.1)	361 (15.5)	13 (3.0)	381 (12.1)	2 (1.1)	~ ~
Honduras		12 (3.6)	461 (21.4)	26 (3.7)	432 (7.9)	6 (1.6)	446 (11.7)	24 (3.8)	434 (13.1)	33 (4.0)	426 (8.9)
Yemen		20 (3.8)	341 (11.3)	11 (2.5)	295 (22.2)	35 (4.6)	366 (10.9)	11 (2.7)	347 (19.6)	23 (3.5)	335 (15.8)
Benchmarking Participants											
Alberta, Canada	r	13 (3.1)	545 (5.8)	75 (4.2)	540 (3.6)	3 (1.2)	550 (6.5)	9 (2.6)	541 (5.8)	0 (0.0)	~ ~
Ontario, Canada		10 (2.2)	536 (7.7)	66 (3.5)	526 (3.7)	2 (0.9)	~ ~	21 (3.0)	528 (5.6)	0 (0.0)	~ ~
Quebec, Canada		7 (2.0)	530 (10.8)	85 (3.0)	517 (2.8)	1 (0.4)	~ ~	8 (2.4)	505 (7.0)	0 (0.0)	~ ~
Abu Dhabi, UAE		31 (4.2)	394 (9.3)	5 (2.0)	475 (22.2)	58 (4.3)	413 (7.0)	6 (2.1)	421 (15.1)	0 (0.0)	~ ~
Dubai, UAE	r	27 (3.9)	454 (12.8)	15 (1.8)	528 (11.1)	45 (4.2)	445 (9.4)	13 (1.7)	485 (7.6)	0 (0.0)	~ ~
Florida, US	r	6 (3.4)	530 (17.2)	70 (4.8)	546 (4.7)	2 (1.2)	~ ~	22 (4.1)	543 (10.2)	0 (0.0)	~ ~
North Carolina, US		3 (1.9)	543 (16.2)	90 (3.1)	536 (4.9)	0 (0.0)	~ ~	7 (2.5)	548 (17.3)	0 (0.0)	~ ~

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.4: Teachers Majored in Education and Science

TIMSS 2011 8th Grade Science

Reported by Teachers

Country	Major in Science and Science Education		Major in Science Education but No Major in Science		Major in Science but No Major in Science Education		All Other Majors		No Formal Education Beyond Upper-secondary*	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Armenia	33 (2.5)	436 (4.7)	1 (0.3)	~ ~	64 (2.5)	440 (4.0)	1 (0.4)	~ ~	1 (0.4)	~ ~
Australia s	55 (4.0)	530 (7.8)	6 (1.3)	525 (17.5)	25 (3.4)	526 (10.5)	14 (2.6)	507 (8.1)	0 (0.0)	~ ~
Bahrain	36 (3.2)	465 (6.1)	9 (1.2)	461 (6.7)	52 (3.2)	443 (3.6)	2 (0.9)	~ ~	0 (0.0)	~ ~
Chile	34 (3.8)	477 (5.5)	16 (3.1)	457 (7.1)	16 (3.2)	472 (9.8)	35 (3.9)	442 (4.8)	0 (0.0)	~ ~
Chinese Taipei	35 (4.1)	563 (4.3)	2 (1.2)	~ ~	61 (4.0)	566 (3.6)	1 (1.0)	~ ~	0 (0.0)	~ ~
England r	54 (3.1)	535 (6.8)	3 (0.9)	502 (17.0)	39 (3.1)	537 (6.7)	3 (1.1)	506 (16.1)	0 (0.3)	~ ~
Finland	11 (1.7)	557 (4.8)	0 (0.0)	~ ~	69 (2.0)	555 (2.6)	19 (1.7)	543 (3.4)	1 (0.5)	~ ~
Georgia	34 (2.5)	427 (4.1)	4 (1.0)	405 (12.2)	60 (2.5)	417 (3.8)	2 (0.6)	~ ~	0 (0.0)	~ ~
Ghana	28 (3.7)	297 (12.8)	20 (3.0)	292 (10.0)	13 (2.7)	330 (15.6)	24 (3.2)	301 (11.0)	15 (2.5)	338 (19.8)
Hong Kong SAR	39 (4.4)	538 (5.6)	14 (3.2)	527 (17.5)	35 (4.7)	529 (7.2)	13 (3.0)	548 (12.1)	0 (0.0)	~ ~
Hungary	18 (2.0)	523 (5.6)	68 (2.3)	525 (3.6)	9 (1.8)	520 (9.0)	4 (1.3)	493 (16.7)	0 (0.0)	~ ~
Indonesia	21 (3.7)	414 (9.9)	6 (2.4)	397 (19.5)	60 (4.1)	411 (4.7)	8 (2.4)	383 (8.3)	5 (3.1)	342 (18.8)
Iran, Islamic Rep. of	16 (2.1)	484 (9.5)	68 (3.1)	474 (5.2)	10 (1.9)	475 (13.9)	6 (1.6)	457 (13.4)	0 (0.0)	~ ~
Israel	60 (4.1)	513 (5.6)	7 (1.9)	527 (8.8)	31 (3.7)	519 (9.0)	2 (0.9)	~ ~	0 (0.0)	~ ~
Italy r	0 (0.0)	~ ~	0 (0.0)	~ ~	90 (2.2)	503 (2.9)	10 (2.2)	492 (8.1)	0 (0.0)	~ ~
Japan	27 (3.5)	556 (3.8)	5 (1.9)	556 (7.3)	64 (3.9)	560 (3.2)	3 (1.6)	547 (5.6)	0 (0.0)	~ ~
Jordan	8 (2.3)	445 (12.7)	19 (2.9)	446 (10.2)	69 (3.7)	448 (5.7)	3 (0.9)	473 (10.6)	1 (0.0)	~ ~
Kazakhstan	34 (3.0)	493 (6.6)	1 (0.3)	~ ~	64 (3.0)	490 (4.9)	0 (0.2)	~ ~	1 (0.4)	~ ~
Korea, Rep. of	23 (3.1)	562 (4.3)	4 (1.2)	560 (5.4)	70 (3.4)	559 (2.7)	2 (0.8)	~ ~	0 (0.0)	~ ~
Lebanon	32 (3.3)	415 (8.1)	4 (1.5)	408 (21.3)	59 (3.7)	403 (6.4)	4 (1.4)	392 (21.7)	2 (0.9)	~ ~
Lithuania	22 (1.6)	514 (3.7)	3 (0.7)	511 (10.5)	71 (1.9)	514 (2.8)	3 (0.8)	514 (8.3)	0 (0.0)	~ ~
Macedonia, Rep. of	10 (1.5)	442 (10.8)	2 (0.9)	~ ~	86 (1.6)	406 (5.8)	2 (0.5)	~ ~	0 (0.1)	~ ~
Malaysia	20 (3.2)	429 (12.0)	19 (2.8)	385 (15.3)	43 (4.2)	434 (9.2)	16 (2.9)	440 (15.5)	2 (0.9)	~ ~
Morocco	7 (1.3)	374 (7.8)	0 (0.0)	~ ~	37 (2.3)	376 (3.5)	0 (0.3)	~ ~	56 (2.4)	377 (2.8)
New Zealand	40 (4.2)	519 (7.0)	3 (1.4)	496 (12.4)	51 (4.1)	511 (6.3)	6 (1.3)	485 (23.4)	0 (0.0)	~ ~
Norway	8 (2.3)	491 (8.2)	13 (3.2)	489 (6.7)	27 (3.3)	500 (4.5)	52 (3.9)	492 (3.7)	1 (0.0)	~ ~
Oman	36 (3.5)	424 (6.2)	3 (1.3)	472 (11.9)	60 (3.7)	417 (4.5)	0 (0.0)	~ ~	0 (0.0)	~ ~
Palestinian Nat'l Auth.	11 (2.6)	427 (8.6)	20 (3.3)	403 (9.4)	65 (4.0)	429 (4.7)	4 (1.2)	399 (28.9)	0 (0.0)	~ ~
Qatar	25 (3.6)	438 (15.3)	3 (1.4)	421 (28.1)	67 (3.1)	414 (5.9)	2 (1.3)	~ ~	3 (2.8)	468 (7.4)
Romania	52 (2.8)	464 (4.1)	0 (0.0)	~ ~	45 (2.5)	467 (4.1)	3 (0.9)	426 (13.4)	0 (0.3)	~ ~
Russian Federation	53 (2.2)	544 (3.8)	0 (0.2)	~ ~	45 (2.0)	542 (3.7)	1 (0.3)	~ ~	0 (0.2)	~ ~
Saudi Arabia	27 (4.2)	443 (10.3)	11 (2.9)	462 (8.0)	61 (3.9)	428 (4.1)	1 (0.9)	~ ~	0 (0.0)	~ ~
Singapore	37 (2.8)	578 (7.7)	2 (0.8)	~ ~	57 (2.7)	597 (5.7)	4 (1.2)	602 (23.4)	0 (0.0)	~ ~
Slovenia	17 (1.7)	543 (4.5)	5 (1.2)	549 (7.3)	75 (2.0)	542 (2.8)	3 (0.6)	549 (5.8)	0 (0.0)	~ ~
Sweden r	48 (3.5)	511 (4.0)	19 (3.1)	520 (6.0)	25 (3.2)	508 (5.0)	5 (1.8)	497 (11.2)	2 (1.0)	~ ~
Syrian Arab Republic	16 (2.9)	423 (9.6)	3 (1.3)	431 (11.8)	73 (3.5)	425 (4.9)	5 (1.4)	419 (15.3)	2 (0.9)	~ ~
Thailand	13 (2.7)	455 (8.8)	29 (3.8)	456 (7.5)	35 (3.8)	454 (8.1)	21 (3.4)	445 (11.6)	2 (1.1)	~ ~
Tunisia	9 (2.2)	439 (5.9)	0 (0.0)	~ ~	90 (2.3)	437 (2.6)	2 (1.2)	~ ~	0 (0.0)	~ ~
Turkey	36 (3.5)	481 (8.2)	36 (3.3)	476 (5.7)	28 (3.0)	496 (7.2)	0 (0.3)	~ ~	0 (0.0)	~ ~
Ukraine	32 (2.9)	506 (5.6)	1 (0.3)	~ ~	60 (3.0)	500 (3.7)	7 (1.3)	484 (7.0)	0 (0.0)	~ ~
United Arab Emirates	24 (2.0)	477 (6.7)	12 (1.7)	437 (6.8)	62 (2.4)	461 (3.1)	2 (0.6)	~ ~	0 (0.0)	~ ~
United States s	32 (2.2)	530 (4.5)	13 (1.8)	526 (9.8)	30 (2.5)	520 (5.8)	24 (2.1)	530 (5.8)	0 (0.0)	~ ~
International Avg.	28 (0.5)	480 (1.2)	11 (0.3)	470 (2.2)	51 (0.5)	478 (1.0)	8 (0.3)	476 (2.7)	2 (0.1)	~ ~

* Countries have been increasing their certification requirements and providing professional development to teachers certified under earlier guidelines.

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

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

TIMSS & PIRLS International Study Center
Lynch School of Education, Boston College

Exhibit 7.4: Teachers Majored in Education and Science (Continued)

Country		Major in Science and Science Education		Major in Science Education but No Major in Science		Major in Science but No Major in Science Education		All Other Majors		No Formal Education Beyond Upper-secondary*	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Ninth Grade Participants											
Botswana		28 (4.1)	402 (8.4)	23 (3.5)	400 (7.5)	47 (4.2)	406 (5.8)	1 (0.8)	~ ~	1 (1.0)	~ ~
Honduras		42 (4.9)	371 (6.5)	6 (2.1)	363 (17.0)	35 (4.6)	373 (8.3)	7 (2.8)	361 (19.4)	10 (3.0)	360 (14.6)
South Africa		20 (3.3)	359 (13.3)	8 (1.8)	309 (21.4)	54 (4.2)	326 (6.3)	17 (2.9)	306 (11.3)	2 (0.9)	~ ~
Benchmarking Participants											
Alberta, Canada		36 (3.3)	551 (3.7)	6 (1.9)	538 (7.1)	20 (3.3)	548 (5.1)	37 (3.8)	541 (3.8)	0 (0.2)	~ ~
Ontario, Canada		18 (3.0)	523 (6.1)	6 (1.6)	543 (10.6)	20 (3.2)	529 (6.2)	56 (3.9)	517 (3.2)	0 (0.0)	~ ~
Quebec, Canada		45 (4.4)	516 (5.7)	14 (2.6)	533 (9.1)	24 (3.1)	529 (5.7)	17 (3.3)	508 (5.6)	1 (0.0)	~ ~
Abu Dhabi, UAE		22 (3.4)	464 (10.5)	13 (3.0)	435 (10.8)	63 (4.3)	463 (5.6)	3 (1.4)	467 (22.3)	0 (0.0)	~ ~
Dubai, UAE	r	34 (4.2)	507 (7.3)	7 (1.4)	413 (16.6)	54 (4.3)	475 (5.1)	5 (0.4)	443 (12.1)	0 (0.0)	~ ~
Alabama, US	r	47 (5.9)	477 (9.7)	11 (4.8)	472 (18.1)	37 (6.4)	493 (10.0)	4 (2.3)	494 (17.8)	0 (0.0)	~ ~
California, US	s	25 (4.3)	493 (8.2)	7 (2.7)	461 (16.5)	42 (5.6)	505 (10.5)	26 (5.1)	510 (11.5)	0 (0.0)	~ ~
Colorado, US		41 (6.1)	549 (7.2)	8 (4.1)	501 (30.1)	39 (5.7)	547 (8.4)	11 (4.1)	524 (19.2)	0 (0.0)	~ ~
Connecticut, US	r	24 (4.9)	538 (12.1)	22 (5.7)	547 (24.5)	35 (5.3)	529 (9.3)	20 (4.8)	516 (15.4)	0 (0.0)	~ ~
Florida, US		x x	x x	x x	x x	x x	x x	x x	x x	x x	x x
Indiana, US	r	50 (5.3)	536 (6.7)	25 (5.2)	521 (10.5)	9 (2.7)	541 (22.8)	16 (5.6)	545 (11.3)	0 (0.0)	~ ~
Massachusetts, US	s	39 (6.8)	569 (9.2)	12 (4.5)	569 (20.1)	30 (6.6)	573 (18.0)	19 (5.9)	534 (18.8)	0 (0.0)	~ ~
Minnesota, US	r	56 (6.6)	544 (8.1)	12 (4.2)	545 (11.5)	22 (5.8)	563 (9.6)	9 (4.8)	587 (12.3)	0 (0.0)	~ ~
North Carolina, US	s	37 (6.5)	527 (19.1)	12 (5.1)	560 (15.3)	37 (7.2)	512 (12.6)	14 (4.4)	539 (23.2)	0 (0.0)	~ ~

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Teachers' Years of Experience

It is difficult to examine the effects of teacher experience on student achievement, because sometimes more experienced teachers are assigned to students of higher ability and with fewer discipline problems, and other times the more experienced teachers are assigned to the lower-achieving students in need of more help. However, some research has addressed this selection bias problem; and experience can have a large positive impact primarily in the first few years of teaching, although the benefits can continue beyond the first five years of a teacher's career (Harris & Sass, 2011; Leigh, 2010).

Exhibit 7.5 presents teachers' reports about their years of experience for participants in the TIMSS fourth grade assessment. On average across the fourth grade countries, teachers of science had been teaching for an average of 17 years. Forty percent of the students, on average, had teachers with 20 years or more of experience, and another 30 percent had teachers with at least 10 (but less than 20) years of experience. On average across countries, science achievement was highest for students whose teachers had 20 or more years of experience (494), compared to those whose teachers had between 10 and 20 years of experience (485), between 5 and 10 years of experience (483), or less than five years of experience (482).

Exhibit 7.6 shows science teachers' reports from the eighth grade assessment about their years of experience. On average, the eighth grade teachers were somewhat less experienced than their fourth grade counterparts (15 years vs. 17 years), leading to lesser percentages of students taught by experienced teachers—62 percent were taught by teachers with at least ten years of experience, compared to 70 percent of fourth grade students. Also, the relationship between teacher experience and average student achievement was less pronounced among the eighth grade students. On average across countries, achievement was highest for students whose teachers had 20 or more years of experience or between 10 and 20 years of experience (480 in each case), compared to students whose teachers had between 5 and 10 years of experience (475), or less than five years of experience (471).

Teachers' Professional Development

Evidence from recent meta-analyses of research conducted in the United States shows that teacher professional development focused on science content has a significant positive effect on student achievement (Blank & de las Alas, 2009) and that the amount of professional development (more than 14 hours) was an important factor (Yoon, Duncan, Lee, Scarloss, & Shapley, 2007).

Exhibit 7.7 presents, for the fourth grade TIMSS assessment, teachers' reports about areas of professional development in science in which they had participated in the past two years. Although there was considerable variation across countries, the most common areas of science professional development for teachers of fourth grade students were science content (35%), science pedagogy and instruction (34%), and science curriculum (34%). On average, about one-third of students had teachers who had professional development in each of these three areas. Integrating information technology into science and science assessment were somewhat less common areas of professional development, with 28 percent and 27 percent of students, respectively, taught by teachers who had professional development in these areas in the past two years.

As shown in Exhibit 7.8, science teachers of students in the TIMSS eighth grade assessment reported somewhat higher levels of participation in science professional development than teachers of the fourth grade students. On average across the eighth grade countries, the majority of students were taught by science teachers who had participated in professional development in science pedagogy and instruction (58%), science content (55%), or science curriculum (53%) in the past two years. Slightly less than half of the students had teachers with professional development in integrating information technology into science, science assessment, and improving students' critical thinking or inquiry skills.

Exhibit 7.5: Teachers' Years of Experience

Reported by Teachers

Country	20 Years or More		At Least 10 but Less than 20 Years		At Least 5 but Less than 10 Years		Less than 5 Years		Average Years of Experience
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Armenia	73 (3.8)	417 (4.5)	21 (3.7)	415 (7.8)	3 (1.2)	421 (12.0)	3 (1.0)	404 (30.5)	26 (0.8)
Australia r	41 (4.1)	519 (5.5)	24 (3.7)	524 (6.3)	19 (2.8)	510 (10.5)	16 (3.1)	518 (8.3)	17 (0.9)
Austria	55 (2.9)	537 (3.4)	25 (2.7)	526 (4.9)	11 (1.9)	528 (7.7)	9 (1.7)	519 (7.8)	21 (0.6)
Azerbaijan r	48 (4.1)	440 (7.0)	30 (3.8)	442 (12.7)	14 (2.6)	418 (14.5)	7 (2.2)	462 (19.9)	21 (0.9)
Bahrain	11 (2.8)	444 (7.1)	52 (5.2)	446 (5.6)	25 (4.2)	454 (9.5)	13 (2.3)	461 (12.2)	12 (0.6)
Belgium (Flemish)	42 (3.4)	512 (2.9)	29 (3.4)	506 (3.3)	19 (3.2)	508 (4.2)	10 (2.3)	499 (7.9)	17 (0.7)
Chile	39 (3.7)	482 (5.1)	26 (3.9)	483 (7.3)	12 (2.6)	475 (10.1)	23 (3.5)	479 (8.9)	17 (0.9)
Chinese Taipei	43 (4.2)	555 (3.2)	37 (4.0)	546 (3.8)	13 (2.9)	550 (7.1)	7 (1.6)	562 (7.4)	17 (0.7)
Croatia	56 (3.4)	520 (2.3)	30 (2.9)	509 (3.8)	9 (2.0)	518 (4.2)	5 (1.4)	519 (6.4)	21 (0.7)
Czech Republic	49 (4.1)	536 (3.9)	26 (3.4)	533 (4.0)	11 (2.8)	546 (9.1)	14 (2.7)	538 (7.1)	19 (0.8)
Denmark	23 (3.1)	532 (5.2)	25 (3.6)	533 (6.0)	25 (3.3)	524 (5.1)	27 (3.5)	529 (5.5)	13 (0.8)
England	18 (2.8)	551 (9.0)	30 (4.2)	536 (6.1)	22 (3.7)	534 (6.2)	30 (3.8)	511 (6.4)	12 (0.7)
Finland	40 (3.1)	569 (2.9)	35 (3.2)	572 (4.0)	12 (2.0)	575 (5.0)	14 (2.1)	569 (7.0)	17 (0.7)
Georgia	58 (3.6)	452 (3.7)	30 (3.4)	454 (7.5)	7 (1.5)	467 (21.5)	4 (1.6)	464 (18.3)	23 (0.7)
Germany	44 (3.4)	529 (4.4)	25 (2.8)	527 (6.0)	13 (2.5)	529 (7.2)	18 (2.6)	529 (6.4)	18 (0.9)
Hong Kong SAR	23 (4.3)	525 (10.5)	46 (4.4)	540 (4.8)	16 (3.8)	533 (18.4)	15 (3.4)	535 (7.9)	13 (0.8)
Hungary	71 (3.0)	536 (4.1)	20 (2.5)	527 (12.6)	7 (1.8)	538 (10.4)	3 (1.2)	529 (13.0)	24 (0.6)
Iran, Islamic Rep. of	41 (3.6)	477 (6.2)	41 (3.5)	440 (6.9)	10 (1.9)	443 (16.3)	9 (1.8)	414 (14.5)	17 (0.6)
Ireland	25 (3.1)	525 (7.7)	21 (3.4)	517 (8.2)	27 (3.1)	514 (5.3)	27 (3.2)	511 (6.6)	12 (0.6)
Italy	64 (3.1)	525 (3.5)	24 (2.9)	525 (5.0)	7 (1.6)	527 (11.6)	4 (1.4)	530 (10.3)	23 (0.7)
Japan	46 (3.9)	559 (2.9)	15 (3.3)	558 (5.0)	18 (3.1)	558 (4.2)	22 (3.5)	558 (4.1)	17 (1.0)
Kazakhstan	53 (4.0)	498 (6.8)	31 (3.4)	502 (9.4)	8 (2.3)	459 (18.6)	8 (2.1)	489 (23.3)	20 (0.8)
Korea, Rep. of	37 (4.1)	585 (2.8)	30 (4.3)	589 (3.8)	18 (3.2)	589 (4.0)	15 (3.3)	582 (6.4)	16 (0.8)
Kuwait	1 (1.0)	~ ~	15 (2.6)	346 (12.5)	39 (3.8)	354 (7.0)	45 (4.0)	341 (7.4)	6 (0.4)
Lithuania	70 (2.8)	514 (3.2)	28 (2.6)	516 (4.8)	2 (1.0)	~ ~	1 (0.5)	~ ~	24 (0.5)
Malta	14 (0.1)	458 (2.9)	42 (0.1)	442 (2.5)	31 (0.1)	445 (2.9)	13 (0.1)	451 (5.7)	12 (0.0)
Morocco	55 (4.2)	261 (6.9)	33 (4.4)	255 (10.1)	7 (2.3)	258 (26.3)	5 (1.3)	353 (20.6)	21 (0.6)
Netherlands r	31 (4.8)	530 (4.4)	27 (4.3)	530 (4.1)	29 (5.0)	532 (5.9)	13 (3.0)	524 (5.8)	16 (1.2)
New Zealand	25 (2.6)	497 (5.2)	26 (2.6)	497 (5.0)	26 (2.8)	502 (5.1)	23 (2.8)	495 (5.5)	13 (0.6)
Northern Ireland r	32 (4.7)	515 (4.8)	36 (4.0)	520 (5.5)	24 (4.2)	515 (8.4)	8 (2.5)	523 (20.3)	16 (1.0)
Norway	29 (4.2)	493 (3.7)	39 (4.2)	498 (3.1)	16 (3.3)	495 (5.7)	17 (3.5)	495 (5.4)	15 (1.0)
Oman	6 (1.2)	383 (26.6)	19 (2.5)	391 (9.8)	56 (2.6)	378 (4.7)	19 (1.9)	362 (12.6)	9 (0.3)
Poland	83 (2.2)	505 (3.0)	11 (2.1)	510 (7.7)	4 (1.5)	485 (10.6)	2 (0.9)	~ ~	23 (0.4)
Portugal	36 (3.2)	537 (5.4)	46 (3.8)	509 (6.1)	14 (2.9)	514 (9.8)	4 (1.6)	550 (15.7)	17 (0.6)
Qatar	11 (2.5)	461 (20.7)	22 (2.5)	402 (14.7)	33 (4.6)	386 (11.9)	33 (3.8)	370 (11.3)	9 (0.6)
Romania	57 (3.7)	517 (5.9)	31 (3.5)	488 (11.3)	9 (2.3)	479 (21.8)	2 (1.0)	~ ~	23 (0.8)
Russian Federation	71 (2.9)	554 (3.7)	23 (2.7)	550 (8.9)	3 (1.1)	524 (19.5)	4 (1.5)	548 (13.2)	24 (0.7)
Saudi Arabia	25 (3.8)	431 (8.5)	45 (4.4)	434 (10.7)	15 (3.1)	454 (13.6)	15 (2.8)	406 (12.1)	14 (0.6)
Serbia	63 (3.3)	514 (4.2)	31 (3.2)	523 (4.7)	5 (1.3)	487 (11.8)	2 (1.0)	~ ~	22 (0.6)
Singapore	10 (1.4)	581 (10.4)	28 (2.5)	582 (6.9)	26 (2.4)	588 (7.8)	37 (2.0)	582 (5.2)	9 (0.4)
Slovak Republic	57 (2.9)	531 (5.1)	21 (2.2)	530 (4.8)	12 (2.4)	529 (11.0)	10 (2.1)	527 (9.3)	20 (0.6)
Slovenia	57 (3.8)	521 (2.8)	26 (3.2)	525 (4.7)	10 (2.2)	504 (8.1)	6 (1.6)	518 (10.4)	21 (0.7)
Spain	59 (4.2)	512 (3.3)	21 (3.9)	497 (6.5)	6 (1.5)	509 (11.0)	14 (3.2)	487 (10.0)	21 (0.9)
Sweden r	32 (4.4)	543 (4.2)	43 (4.7)	529 (4.7)	16 (2.8)	524 (6.0)	9 (2.7)	551 (8.5)	16 (1.0)
Thailand	47 (4.5)	479 (5.3)	25 (4.0)	466 (18.7)	14 (3.2)	462 (14.5)	15 (3.4)	477 (13.3)	19 (1.1)
Tunisia	57 (3.6)	359 (7.7)	23 (3.6)	336 (11.6)	10 (2.4)	354 (16.2)	11 (2.5)	310 (14.6)	19 (0.6)
Turkey	21 (2.7)	498 (7.3)	38 (3.0)	475 (5.2)	20 (2.5)	450 (11.8)	21 (2.8)	415 (11.7)	13 (0.5)
United Arab Emirates r	10 (1.8)	450 (9.3)	31 (2.4)	429 (5.7)	30 (1.8)	425 (7.1)	29 (2.5)	434 (6.2)	9 (0.4)
United States r	26 (2.6)	550 (4.2)	36 (2.8)	545 (3.6)	23 (2.4)	542 (5.0)	14 (1.8)	542 (5.8)	14 (0.6)
Yemen	9 (2.9)	206 (20.6)	58 (4.4)	196 (8.9)	17 (3.0)	258 (10.9)	16 (3.5)	219 (17.8)	12 (0.6)
International Avg.	40 (0.5)	494 (1.1)	30 (0.5)	485 (1.1)	16 (0.4)	483 (1.6)	14 (0.4)	482 (1.8)	17 (0.1)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

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

Exhibit 7.5: Teachers' Years of Experience (Continued)

Country		20 Years or More		At Least 10 but Less than 20 Years		At Least 5 but Less than 10 Years		Less than 5 Years		Average Years of Experience
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Sixth Grade Participants										
Botswana		23 (3.9)	372 (15.1)	33 (4.3)	376 (14.7)	27 (4.0)	354 (10.8)	17 (3.5)	376 (15.8)	13 (0.8)
Honduras		29 (4.2)	449 (7.1)	37 (4.6)	415 (8.3)	17 (3.7)	447 (11.1)	17 (4.0)	442 (23.8)	14 (0.9)
Yemen		12 (2.7)	367 (17.1)	59 (4.5)	339 (8.9)	14 (3.3)	365 (20.2)	14 (3.2)	344 (18.2)	13 (0.6)
Benchmarking Participants										
Alberta, Canada	r	35 (4.3)	548 (4.4)	23 (4.1)	538 (5.1)	27 (4.3)	536 (7.2)	15 (3.5)	539 (5.5)	15 (0.9)
Ontario, Canada		16 (2.3)	528 (7.1)	39 (3.4)	524 (4.4)	33 (3.3)	530 (4.4)	11 (2.5)	524 (10.0)	11 (0.4)
Quebec, Canada		28 (3.9)	516 (4.5)	38 (4.6)	518 (3.9)	23 (4.2)	514 (5.6)	11 (2.6)	520 (7.1)	14 (0.7)
Abu Dhabi, UAE	r	7 (2.2)	429 (23.4)	34 (4.6)	403 (11.3)	28 (3.8)	407 (10.8)	31 (4.1)	430 (9.7)	9 (0.6)
Dubai, UAE	r	14 (4.2)	491 (17.1)	31 (3.0)	475 (5.5)	33 (4.4)	464 (11.1)	22 (2.6)	449 (11.0)	10 (0.8)
Florida, US	r	17 (3.1)	543 (11.5)	34 (4.9)	552 (5.9)	30 (4.2)	542 (8.9)	19 (3.9)	532 (9.2)	12 (0.9)
North Carolina, US		22 (4.7)	546 (8.0)	32 (4.7)	547 (6.2)	22 (4.0)	541 (8.8)	24 (4.8)	513 (7.9)	12 (1.1)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.6: Teachers' Years of Experience

Reported by Teachers

Country	20 Years or More		At Least 10 but Less than 20 Years		At Least 5 but Less than 10 Years		Less than 5 Years		Average Years of Experience
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Armenia	51 (1.8)	439 (3.5)	33 (2.2)	437 (4.5)	8 (1.3)	431 (7.7)	8 (1.3)	445 (8.8)	21 (0.4)
Australia s	32 (3.3)	528 (8.0)	21 (2.7)	524 (9.6)	21 (3.4)	523 (10.5)	26 (2.9)	526 (8.9)	14 (0.8)
Bahrain	27 (3.5)	461 (7.8)	47 (3.5)	436 (5.2)	18 (2.2)	479 (3.9)	7 (1.0)	473 (8.5)	15 (0.5)
Chile	43 (3.9)	458 (4.7)	23 (3.4)	465 (7.8)	18 (3.4)	462 (7.7)	16 (3.1)	460 (8.3)	18 (1.0)
Chinese Taipei	28 (3.7)	570 (6.1)	28 (3.9)	571 (4.6)	26 (3.9)	556 (6.4)	18 (3.0)	555 (6.3)	13 (0.6)
England r	18 (2.9)	525 (10.0)	27 (2.7)	545 (9.5)	24 (2.7)	521 (8.4)	32 (2.9)	533 (9.3)	11 (0.7)
Finland	38 (2.5)	552 (2.5)	33 (2.5)	557 (3.6)	15 (1.5)	554 (4.3)	15 (1.7)	540 (5.1)	16 (0.5)
Georgia	61 (2.0)	417 (3.7)	21 (1.8)	427 (4.2)	9 (1.2)	425 (6.1)	8 (1.1)	423 (7.1)	24 (0.6)
Ghana	7 (1.8)	311 (20.7)	15 (3.0)	329 (15.4)	33 (4.4)	289 (9.7)	45 (4.2)	310 (8.5)	7 (0.5)
Hong Kong SAR	25 (3.9)	541 (8.9)	31 (4.0)	521 (9.2)	18 (3.8)	545 (11.9)	27 (4.5)	538 (7.8)	13 (0.8)
Hungary	62 (2.5)	524 (3.4)	25 (2.1)	522 (4.7)	7 (1.4)	521 (8.3)	6 (1.1)	512 (9.2)	22 (0.5)
Indonesia	23 (2.8)	420 (6.9)	31 (4.1)	408 (10.7)	24 (3.5)	408 (5.7)	22 (4.1)	382 (9.0)	12 (0.6)
Iran, Islamic Rep. of	32 (2.6)	495 (6.2)	46 (3.5)	476 (6.2)	14 (2.6)	441 (9.1)	7 (1.7)	433 (11.3)	16 (0.5)
Israel	38 (3.8)	532 (6.4)	33 (3.2)	520 (7.3)	13 (2.5)	479 (14.3)	16 (2.5)	504 (11.6)	16 (0.7)
Italy	59 (4.1)	505 (3.4)	22 (3.3)	490 (7.1)	11 (2.5)	508 (9.2)	8 (2.1)	499 (12.8)	22 (0.9)
Japan	49 (4.4)	557 (3.3)	16 (3.2)	573 (6.9)	13 (2.7)	556 (5.0)	22 (3.6)	549 (4.9)	17 (0.9)
Jordan	7 (1.8)	453 (12.4)	22 (3.3)	469 (6.1)	33 (3.6)	449 (9.1)	38 (3.8)	436 (8.0)	8 (0.5)
Kazakhstan	48 (1.8)	496 (5.1)	27 (1.9)	488 (5.2)	12 (1.4)	478 (7.5)	13 (1.4)	489 (8.4)	19 (0.4)
Korea, Rep. of	42 (3.6)	563 (3.5)	17 (2.7)	561 (5.1)	20 (3.1)	564 (4.6)	21 (2.8)	551 (3.5)	15 (0.7)
Lebanon	18 (2.5)	418 (10.5)	26 (2.7)	420 (9.0)	29 (2.7)	390 (7.1)	27 (3.1)	405 (9.1)	11 (0.6)
Lithuania	64 (2.4)	513 (2.6)	24 (1.9)	515 (4.2)	5 (1.1)	517 (9.8)	6 (0.9)	516 (7.5)	23 (0.6)
Macedonia, Rep. of	51 (2.1)	397 (6.5)	25 (2.0)	412 (7.9)	9 (1.2)	425 (10.8)	15 (1.5)	425 (9.3)	20 (0.5)
Malaysia	22 (2.9)	417 (15.9)	25 (3.6)	423 (11.9)	17 (3.0)	416 (14.2)	37 (3.6)	437 (11.0)	11 (0.6)
Morocco	53 (2.1)	378 (2.7)	28 (2.2)	377 (4.2)	9 (1.4)	378 (7.4)	11 (1.3)	370 (5.7)	19 (0.4)
New Zealand	29 (3.0)	510 (7.1)	27 (3.0)	518 (6.9)	25 (3.6)	511 (9.0)	20 (2.5)	506 (12.3)	14 (0.7)
Norway	32 (4.1)	495 (3.5)	23 (3.5)	492 (6.0)	16 (3.4)	494 (7.0)	29 (3.6)	494 (4.3)	15 (1.1)
Oman	5 (1.2)	416 (13.7)	26 (2.3)	432 (8.3)	34 (2.9)	416 (5.2)	36 (2.8)	419 (5.1)	7 (0.2)
Palestinian Nat'l Auth.	14 (2.8)	413 (12.6)	40 (3.9)	437 (6.2)	26 (3.4)	427 (6.6)	20 (2.8)	384 (8.2)	11 (0.6)
Qatar	17 (2.9)	422 (18.2)	31 (3.3)	427 (12.1)	32 (4.3)	417 (14.4)	20 (3.1)	397 (13.2)	11 (0.6)
Romania	48 (2.5)	475 (3.5)	30 (2.3)	462 (6.3)	13 (2.1)	447 (5.8)	9 (1.5)	450 (7.1)	19 (0.6)
Russian Federation	62 (2.2)	543 (3.6)	29 (2.0)	540 (4.2)	5 (0.7)	552 (7.8)	4 (0.8)	549 (8.0)	23 (0.4)
Saudi Arabia	9 (2.4)	446 (12.1)	53 (4.2)	443 (5.9)	20 (3.2)	427 (6.8)	19 (2.9)	424 (9.3)	12 (0.6)
Singapore	13 (1.8)	586 (12.5)	17 (1.8)	578 (14.9)	25 (2.5)	597 (7.1)	46 (2.5)	592 (6.6)	8 (0.4)
Slovenia	54 (2.5)	540 (2.9)	25 (1.8)	546 (3.8)	11 (1.4)	551 (3.8)	9 (1.5)	543 (4.5)	20 (0.5)
Sweden r	24 (2.8)	509 (5.7)	36 (3.7)	512 (4.3)	27 (3.2)	511 (5.1)	13 (2.7)	506 (6.5)	14 (0.6)
Syrian Arab Republic r	13 (2.1)	431 (8.9)	21 (3.1)	428 (8.7)	23 (3.1)	437 (7.8)	43 (3.7)	421 (5.4)	9 (0.6)
Thailand	30 (3.4)	448 (7.2)	24 (3.8)	462 (10.8)	18 (3.4)	449 (12.2)	28 (3.6)	443 (7.3)	14 (0.8)
Tunisia	30 (3.8)	453 (5.9)	38 (3.9)	437 (3.3)	28 (3.4)	425 (3.8)	3 (1.1)	415 (13.5)	15 (0.6)
Turkey	13 (2.2)	497 (11.0)	32 (3.0)	498 (7.8)	21 (2.9)	476 (6.5)	35 (3.4)	467 (5.8)	10 (0.5)
Ukraine	59 (2.4)	503 (3.7)	26 (2.1)	502 (5.4)	8 (1.4)	486 (6.8)	8 (1.1)	494 (6.5)	22 (0.5)
United Arab Emirates r	17 (1.9)	451 (6.8)	42 (2.5)	462 (4.4)	24 (2.1)	467 (4.5)	17 (1.9)	465 (6.3)	12 (0.3)
United States r	24 (2.2)	542 (7.4)	38 (2.5)	523 (5.0)	21 (1.6)	530 (5.3)	16 (1.6)	503 (5.7)	14 (0.5)
International Avg.	33 (0.4)	480 (1.3)	29 (0.5)	480 (1.2)	19 (0.4)	475 (1.3)	20 (0.4)	471 (1.3)	15 (0.1)

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

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.6: Teachers' Years of Experience (Continued)

Country		20 Years or More		At Least 10 but Less than 20 Years		At Least 5 but Less than 10 Years		Less than 5 Years		Average Years of Experience
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Ninth Grade Participants										
Botswana		1 (0.8)	~ ~	33 (4.4)	402 (6.4)	23 (4.0)	416 (8.3)	43 (4.2)	398 (6.0)	7 (0.4)
Honduras		11 (2.8)	364 (10.6)	27 (4.5)	373 (8.3)	28 (4.4)	363 (6.3)	34 (4.9)	373 (10.3)	9 (0.7)
South Africa		29 (3.3)	346 (9.3)	31 (3.6)	304 (7.1)	20 (3.2)	341 (9.8)	20 (2.9)	345 (15.0)	14 (0.6)
Benchmarking Participants										
Alberta, Canada		19 (2.7)	547 (4.9)	36 (3.8)	549 (3.4)	21 (2.7)	546 (4.6)	23 (3.4)	540 (6.2)	12 (0.6)
Ontario, Canada		11 (2.4)	520 (4.5)	46 (4.3)	523 (3.9)	32 (3.7)	525 (4.9)	11 (2.7)	522 (5.3)	11 (0.4)
Quebec, Canada		21 (3.2)	528 (7.0)	30 (4.2)	515 (5.4)	34 (4.0)	518 (6.5)	15 (3.4)	525 (8.9)	12 (0.6)
Abu Dhabi, UAE	r	21 (3.5)	447 (9.3)	42 (4.3)	464 (6.6)	27 (3.5)	459 (6.7)	10 (2.4)	465 (9.3)	13 (0.6)
Dubai, UAE	r	13 (2.9)	481 (10.3)	39 (4.8)	489 (7.7)	27 (4.3)	477 (9.3)	21 (2.8)	472 (9.1)	11 (0.5)
Alabama, US	r	18 (5.0)	509 (11.4)	37 (6.9)	472 (10.6)	21 (6.3)	487 (9.5)	25 (6.5)	477 (11.2)	12 (0.9)
California, US	s	29 (5.4)	514 (10.3)	36 (4.7)	491 (11.0)	18 (3.6)	494 (11.5)	17 (4.6)	500 (14.4)	13 (1.0)
Colorado, US		25 (5.7)	559 (10.4)	34 (5.5)	528 (9.7)	21 (3.9)	545 (8.7)	20 (6.1)	540 (17.4)	13 (1.3)
Connecticut, US	r	31 (6.0)	561 (10.7)	36 (6.6)	527 (15.1)	23 (4.4)	501 (12.2)	11 (3.5)	548 (23.3)	16 (1.3)
Florida, US		x x	x x	x x	x x	x x	x x	x x	x x	x x
Indiana, US	r	29 (5.7)	540 (7.8)	41 (6.2)	539 (7.8)	20 (4.3)	517 (11.2)	11 (3.6)	538 (22.8)	16 (1.3)
Massachusetts, US	r	17 (5.3)	549 (24.3)	37 (6.9)	572 (12.3)	38 (6.4)	554 (12.4)	9 (3.9)	594 (24.3)	13 (1.2)
Minnesota, US	r	29 (5.8)	551 (9.0)	28 (5.9)	548 (16.1)	25 (4.9)	554 (11.5)	18 (3.9)	551 (9.0)	13 (1.1)
North Carolina, US	s	22 (6.5)	564 (15.2)	24 (6.8)	535 (26.1)	32 (7.1)	521 (16.6)	22 (6.7)	494 (12.0)	12 (1.1)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.7: Teacher Participation in Professional Development in Science in the Past Two Years

TIMSS 2011 4th Grade Science

Reported by Teachers

Country	Percent of Students by Teacher's Area of Professional Development									
	Science Content		Science Pedagogy / Instruction		Science Curriculum		Integrating Information Technology into Science		Science Assessment	
Armenia	s	32 (4.0)	s	37 (4.6)	s	52 (4.6)	s	30 (4.7)	s	46 (4.1)
Australia	r	32 (3.2)	r	33 (3.2)	r	38 (3.8)	r	26 (2.9)	r	26 (2.8)
Austria		46 (3.6)		26 (2.9)		26 (3.0)		10 (2.0)		5 (1.4)
Azerbaijan		71 (3.5)		61 (3.7)		44 (3.7)		47 (3.9)		78 (2.9)
Bahrain		50 (5.3)		63 (5.0)		54 (5.1)		60 (4.2)		52 (5.1)
Belgium (Flemish)		39 (4.3)		30 (3.8)		47 (4.0)		30 (3.6)		7 (2.1)
Chile	r	23 (3.8)	r	18 (3.3)	r	22 (3.3)	r	23 (3.9)	r	15 (3.3)
Chinese Taipei		70 (3.4)		50 (4.0)		64 (3.8)		59 (4.7)		32 (4.1)
Croatia		59 (3.9)		48 (3.4)		52 (3.5)		17 (2.7)		38 (3.2)
Czech Republic		18 (3.0)		10 (2.4)		9 (2.5)		15 (2.9)		5 (1.5)
Denmark	r	20 (3.4)	r	17 (3.1)	r	13 (2.7)	r	10 (2.3)	r	11 (2.9)
England		29 (4.6)		43 (5.2)		28 (4.0)		23 (4.2)		42 (5.1)
Finland		10 (2.1)		10 (1.8)		3 (1.1)		5 (1.3)		4 (1.4)
Georgia		19 (3.1)		29 (3.8)		32 (4.1)		21 (3.2)		32 (4.2)
Germany		37 (3.4)		24 (3.0)		18 (2.7)		7 (1.8)		17 (2.9)
Hong Kong SAR		43 (4.5)		45 (4.5)		29 (4.0)		44 (4.4)		23 (4.0)
Hungary		16 (2.7)		26 (3.4)		6 (1.9)		20 (3.1)		7 (1.8)
Iran, Islamic Rep. of		41 (4.0)		39 (3.9)		27 (3.2)		17 (3.0)		24 (3.0)
Ireland		23 (3.4)		16 (2.9)		24 (3.5)		17 (2.8)		9 (2.1)
Italy		21 (2.8)		21 (3.3)		17 (3.0)		10 (2.0)		8 (2.0)
Japan		37 (4.5)		41 (4.2)		18 (3.4)		19 (3.3)		14 (2.8)
Kazakhstan		58 (4.3)		59 (3.8)		64 (4.1)		71 (3.8)		60 (3.9)
Korea, Rep. of		49 (4.7)		48 (4.5)		58 (3.9)		23 (3.5)		28 (4.3)
Kuwait		64 (3.4)		65 (3.6)		70 (4.0)		40 (4.1)		42 (3.8)
Lithuania		27 (2.7)		27 (3.3)		44 (3.6)		52 (3.6)		38 (2.6)
Malta		40 (0.1)		28 (0.1)		32 (0.1)		32 (0.1)		30 (0.1)
Morocco	r	7 (1.8)	r	9 (1.8)	r	9 (2.0)	r	6 (1.4)	r	5 (1.4)
Netherlands	r	4 (1.9)	r	3 (1.9)	r	3 (1.5)	r	9 (2.8)	r	3 (1.7)
New Zealand		16 (2.6)		14 (2.6)		16 (2.3)		14 (2.4)		9 (1.9)
Northern Ireland	r	26 (4.1)	r	28 (3.8)	r	29 (3.8)	r	22 (3.7)	r	5 (1.7)
Norway		10 (2.5)		9 (2.7)		6 (2.1)		5 (1.9)		3 (1.5)
Oman		36 (2.9)		44 (3.4)		30 (2.8)		21 (2.6)		37 (3.0)
Poland		34 (3.4)		19 (2.9)		26 (3.3)		25 (3.3)		11 (2.5)
Portugal		31 (3.5)		34 (3.6)		25 (3.2)		20 (3.3)		12 (2.8)
Qatar		59 (3.2)		54 (4.8)		62 (3.3)		56 (3.4)		56 (3.4)
Romania		46 (4.1)		34 (3.9)		40 (4.1)		33 (4.2)		49 (4.2)
Russian Federation		46 (4.6)		49 (4.5)		66 (4.4)		56 (3.6)		54 (4.5)
Saudi Arabia		48 (3.9)		54 (3.8)		54 (4.3)		37 (3.8)		46 (4.2)
Serbia		38 (3.9)		24 (3.1)		24 (3.6)		15 (2.9)		23 (3.5)
Singapore		75 (2.2)		78 (1.9)		66 (2.6)		59 (2.8)		70 (2.8)
Slovak Republic		16 (2.5)		18 (2.8)		41 (3.1)		43 (3.4)		17 (2.8)
Slovenia		43 (3.1)		31 (3.1)		37 (3.7)		36 (3.5)		30 (2.6)
Spain		19 (3.8)		22 (3.9)		15 (3.2)		40 (4.0)		9 (2.7)
Sweden	r	20 (3.6)	r	14 (3.1)	r	24 (3.4)	r	4 (1.4)	r	12 (2.6)
Thailand		59 (4.3)		61 (4.3)		70 (4.3)		49 (4.8)		50 (4.3)
Tunisia		23 (3.6)		48 (4.0)		25 (4.0)		15 (2.9)		40 (4.4)
Turkey		9 (1.7)		9 (1.9)		8 (2.0)		9 (1.9)		8 (1.8)
United Arab Emirates		46 (2.5)		54 (2.9)		54 (2.3)		56 (2.4)		52 (2.8)
United States	r	39 (2.7)	r	28 (2.4)	r	39 (2.6)	r	27 (2.6)	r	27 (2.1)
Yemen		21 (3.8)		37 (4.4)		24 (4.3)		10 (2.8)		20 (3.7)
International Avg.		35 (0.5)		34 (0.5)		34 (0.5)		28 (0.5)		27 (0.4)

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

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.7: Teacher Participation in Professional Development in Science in the Past Two Years (Continued)

Country	Percent of Students by Teacher's Area of Professional Development									
	Science Content		Science Pedagogy / Instruction		Science Curriculum		Integrating Information Technology into Science		Science Assessment	
Sixth Grade Participants										
Botswana	r	26 (3.3)	r	16 (3.0)	r	20 (3.4)	r	18 (3.2)	r	33 (4.3)
Honduras		30 (4.4)		26 (4.2)		21 (3.7)		16 (3.8)		28 (4.3)
Yemen		22 (4.0)		42 (4.3)		20 (4.0)		9 (2.6)		23 (3.8)
Benchmarking Participants										
Alberta, Canada	r	25 (4.1)	r	20 (4.0)	r	25 (4.1)	r	30 (4.5)	r	21 (3.1)
Ontario, Canada	r	12 (2.6)	r	10 (2.4)	r	16 (3.0)	r	11 (2.4)	r	7 (1.9)
Quebec, Canada		23 (3.9)		23 (4.1)		12 (2.1)		16 (3.6)		13 (3.3)
Abu Dhabi, UAE		48 (4.1)		63 (4.4)		57 (3.8)		63 (4.4)		54 (4.6)
Dubai, UAE	r	48 (2.5)	r	47 (4.0)	r	53 (2.4)	r	56 (2.3)	r	51 (3.1)
Florida, US	s	54 (6.0)	s	33 (5.2)	s	56 (4.9)	s	43 (5.9)	s	30 (5.0)
North Carolina, US		24 (5.6)		25 (5.0)	r	27 (5.1)	r	31 (6.5)		14 (3.6)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.8: Teacher Participation in Professional Development in Science in the Past Two Years

TIMSS 2011 8th Grade Science

Reported by Teachers

Country	Percent of Students by Teacher's Area of Professional Development											
	Science Content		Science Pedagogy / Instruction		Science Curriculum		Integrating Information Technology into Science		Improving Students' Critical Thinking or Inquiry Skills		Science Assessment	
Armenia		65 (2.1)		77 (2.0)		88 (1.5)		40 (2.6)		44 (2.9)		88 (1.4)
Australia	s	53 (3.4)	s	48 (4.1)	s	61 (3.4)	s	64 (3.5)	s	53 (3.4)	s	40 (3.9)
Bahrain		39 (2.7)		61 (2.8)		35 (3.2)		61 (3.0)		56 (3.0)		53 (3.4)
Chile		49 (4.1)		31 (3.7)		37 (4.1)		47 (4.1)		34 (3.9)		24 (3.5)
Chinese Taipei		78 (3.3)		66 (3.8)		68 (3.6)		69 (3.6)		36 (4.1)		40 (4.3)
England	r	57 (3.4)	r	75 (3.1)	r	66 (2.8)		36 (3.0)	r	39 (2.7)		55 (3.1)
Finland		25 (1.9)		23 (2.3)		6 (1.1)		29 (2.5)		6 (1.0)		6 (1.2)
Georgia		21 (2.1)		33 (2.6)		35 (2.5)		42 (2.5)		42 (2.6)		40 (2.3)
Ghana		63 (4.0)		53 (4.1)		54 (3.9)		32 (3.9)		53 (4.4)		70 (3.9)
Hong Kong SAR		72 (4.3)		64 (4.8)		61 (4.2)		40 (5.3)		47 (4.7)		51 (4.2)
Hungary		31 (2.3)		51 (2.5)		14 (1.7)		39 (2.1)		16 (1.9)		16 (1.7)
Indonesia		75 (3.8)		50 (4.1)		67 (4.2)		45 (4.2)		63 (4.0)		72 (3.7)
Iran, Islamic Rep. of		62 (3.2)		65 (3.1)		47 (3.0)		34 (3.4)		33 (3.2)		43 (3.0)
Israel		75 (3.5)		76 (3.3)		76 (3.5)		52 (4.8)		55 (3.8)		43 (3.7)
Italy		22 (3.2)		35 (4.0)		19 (3.1)		28 (3.6)		13 (2.4)		16 (3.1)
Japan		78 (3.2)		73 (3.3)		50 (4.6)		34 (4.2)		20 (3.6)		33 (3.7)
Jordan		25 (3.6)		42 (4.5)		25 (3.3)		32 (3.6)		50 (3.9)		33 (3.3)
Kazakhstan		76 (1.9)		83 (1.8)		73 (2.1)		90 (1.2)		66 (2.6)		65 (2.8)
Korea, Rep. of		65 (4.0)		69 (3.6)		59 (3.8)		30 (3.0)		45 (4.2)		44 (4.0)
Lebanon		56 (4.1)		56 (4.1)		41 (4.0)		61 (3.6)		60 (3.1)		60 (3.2)
Lithuania		69 (2.2)		51 (2.0)		82 (1.7)		64 (2.3)		36 (2.0)		59 (2.1)
Macedonia, Rep. of		89 (1.4)	r	64 (2.2)		88 (1.4)		90 (1.3)		65 (2.4)		88 (1.3)
Malaysia		44 (3.2)		39 (3.1)		43 (3.7)		44 (3.5)		38 (3.3)		48 (3.7)
Morocco		49 (2.7)		64 (2.2)		56 (2.4)		50 (2.3)		17 (1.8)		47 (2.7)
New Zealand		64 (3.3)		65 (4.3)		78 (3.9)		53 (3.6)		53 (3.4)		45 (3.6)
Norway		19 (2.9)		18 (3.1)		13 (2.6)		6 (2.1)		10 (2.6)		25 (3.9)
Oman		33 (3.1)		50 (2.9)		27 (2.7)		31 (2.5)		37 (2.9)		41 (3.0)
Palestinian Nat'l Auth.		39 (3.8)		39 (4.4)		32 (3.8)		39 (3.7)		44 (4.0)		33 (3.8)
Qatar		57 (3.4)		67 (4.2)		57 (3.5)		63 (4.3)		69 (3.6)		60 (4.2)
Romania		60 (2.7)		58 (2.7)		38 (2.9)		54 (2.4)		39 (2.6)		50 (2.5)
Russian Federation		67 (2.0)		74 (1.9)		72 (2.1)		74 (1.9)		47 (2.4)		53 (2.2)
Saudi Arabia		56 (3.6)		65 (4.0)		60 (4.3)		41 (3.8)		38 (3.6)		35 (3.6)
Singapore		71 (2.2)		88 (1.6)		67 (2.7)		70 (2.5)		74 (2.1)		65 (2.4)
Slovenia		81 (1.6)		74 (1.9)		70 (1.9)		74 (2.3)		28 (2.3)		47 (2.6)
Sweden	r	30 (3.1)	r	24 (2.8)	r	47 (3.4)	r	12 (2.4)	r	13 (2.2)	r	33 (3.6)
Syrian Arab Republic	r	25 (3.6)	r	42 (3.4)	r	36 (3.6)	r	33 (3.9)	r	56 (4.2)	r	45 (3.9)
Thailand		80 (3.9)		78 (3.0)		84 (3.1)		65 (3.2)		63 (3.8)		63 (3.8)
Tunisia		66 (3.5)		78 (3.0)		60 (3.8)		59 (3.7)		36 (3.5)		63 (3.7)
Turkey		36 (3.4)		40 (3.6)		37 (3.1)		35 (3.5)		38 (3.3)		26 (3.0)
Ukraine		75 (2.6)		80 (2.3)		78 (2.4)		79 (2.6)		66 (2.8)		76 (2.6)
United Arab Emirates		48 (2.7)		60 (2.3)		54 (2.4)		52 (2.2)		59 (2.2)		49 (2.2)
United States	r	75 (2.2)	r	67 (2.0)	r	73 (2.5)	r	70 (2.3)	s	70 (2.3)	s	57 (2.7)
International Avg.		55 (0.5)		58 (0.5)		53 (0.5)		49 (0.5)		43 (0.5)		48 (0.5)

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

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.8: Teacher Participation in Professional Development in Science in the Past Two Years (Continued)

Country	Percent of Students by Teacher's Area of Professional Development											
	Science Content		Science Pedagogy / Instruction		Science Curriculum		Integrating Information Technology into Science		Improving Students' Critical Thinking or Inquiry Skills		Science Assessment	
Ninth Grade Participants												
Botswana		24 (3.3)		34 (4.1)		30 (3.9)		20 (3.3)		29 (4.2)		29 (4.1)
Honduras		55 (4.4)		44 (4.5)		39 (4.3)		28 (4.4)		35 (5.0)		45 (4.8)
South Africa		64 (3.6)		37 (3.3)		67 (3.5)		39 (4.4)		48 (3.8)		63 (3.6)
Benchmarking Participants												
Alberta, Canada		72 (3.6)		57 (4.1)		46 (3.4)		72 (3.8)		59 (4.2)		48 (4.0)
Ontario, Canada		37 (4.4)		29 (3.9)		34 (3.8)		36 (3.9)		62 (4.2)		18 (3.3)
Quebec, Canada		50 (4.5)		49 (4.2)		40 (3.8)		39 (3.9)		11 (2.5)		43 (3.6)
Abu Dhabi, UAE	r	48 (4.3)	r	62 (4.2)	r	53 (4.7)	r	49 (4.3)	r	56 (3.4)	r	45 (4.4)
Dubai, UAE	r	53 (4.6)	r	54 (4.7)	r	60 (3.3)	r	64 (2.7)	r	64 (4.7)	r	64 (3.3)
Alabama, US	r	77 (5.0)	r	69 (6.2)	r	70 (7.2)	r	80 (6.1)	r	71 (7.2)	r	45 (8.8)
California, US	s	66 (6.3)	s	63 (5.9)	s	61 (6.2)	s	59 (5.9)	s	64 (5.0)	s	43 (6.6)
Colorado, US	r	77 (4.5)	r	65 (5.3)	r	77 (3.7)	r	69 (4.4)	r	67 (6.9)	r	46 (5.4)
Connecticut, US	r	70 (4.3)	r	63 (6.3)	r	77 (4.8)	r	69 (6.2)	r	76 (5.4)	r	65 (5.3)
Florida, US		x x		x x		x x		x x		x x		x x
Indiana, US	r	61 (6.4)	r	61 (6.9)	r	79 (4.7)	r	65 (5.8)	r	63 (5.5)	r	56 (6.2)
Massachusetts, US	r	75 (6.9)	r	73 (6.1)	r	88 (5.0)	r	68 (6.4)	r	61 (4.6)	r	53 (8.1)
Minnesota, US	r	75 (6.6)	r	70 (5.6)	r	79 (5.4)	r	67 (6.5)	r	64 (7.1)	r	57 (5.8)
North Carolina, US	s	88 (5.6)	s	74 (6.9)	s	87 (5.8)	s	84 (4.0)	s	81 (6.2)	s	59 (7.2)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Teachers' Preparation to Teach the TIMSS Science Topics

Although a sound knowledge of science would seem to be a prerequisite for effective science teaching, evidence directly linking teacher preparation in science to the achievement of their students is scarce. A meta-analysis of the effects of teachers' subject matter preparation on their students' achievement in mathematics and science found some studies showing a positive effect, but in general results were mixed (Wilson, Floden, & Ferrini-Mundi, 2002).

TIMSS 2011 gathered information from the teachers of students taking the assessment about whether they felt very well prepared, somewhat prepared, or not well prepared to teach the science content topics assessed by TIMSS. Exhibit 7.9 presents reports of teachers about their level of preparation to teach the science topics in the fourth grade assessment. The 20 science topics are shown on the second page of the exhibit, grouped by content domain (life science, physical science, and earth science). The exhibit presents for each participant the percentage of students taught by teachers who felt "very well" prepared to teach the TIMSS topics. The results are averaged across all 20 topics for a perspective on science overall, as well as separately by content domain: six topics in life science, eight topics in physical science, and six topics in earth science. On average across the fourth grade countries, 62 percent of students were taught by teachers who felt very well prepared to teach the TIMSS science topics. Across the content domains, a larger percentage of students had teachers who felt very well prepared to teach the life science topics (70%) than the physical science topics (62%) and the earth science topics (53%). However, these results varied considerably across countries; for example, in several countries larger percentages of students were taught by teachers who felt very well prepared to teach the physical science topics than the topics in the other two domains.

Exhibit 7.10 presents reports of teachers about their level of preparation to teach the science topics in the four content domains covered by the eighth grade assessment. The 20 topics are shown on the second page of the exhibit, grouped by content domain (biology, chemistry, physics, and earth science). Compared to the fourth grade, a larger percentage of eighth grade students (72%) were taught by teachers who felt very well prepared to teach the TIMSS science topics. Across the content domains, most students had teachers who felt very well prepared to teach biology topics (77%), chemistry topics (82%), and physics topics (78%); however, fewer than half of the students (47%) had teachers who felt well prepared to teach the earth science topics. While the results varied across countries, this general pattern was observed in many of the eighth grade countries, ninth grade countries, and benchmarking participants.

Teachers' Confidence in Teaching Science

Teachers with a strong sense of personal ability to organize and execute their teaching are more open to new ideas and less likely to experience emotional burnout. Research has shown that teachers' self-confidence in their teaching skills is not only associated with their professional behavior, but also with students' performance and motivation (Bandura, 1997; Henson, 2002).

To investigate teachers' confidence in teaching science, teachers of students taking the fourth and eighth grade TIMSS assessments were asked to indicate how confident they feel about doing each of the following:

- Answer students' questions about science;
- Explain science principles or concepts by doing science experiments;
- Provide challenging tasks for capable students;
- Adapt their teaching to engage students' interest; and
- Help students appreciate the value of learning science.

Exhibit 7.9: Teachers Feel "Very Well" Prepared to Teach TIMSS Science Topics

TIMSS 2011 4th Grade Science

Reported by Teachers

Country	Percent of Students Whose Teachers Feel "Very Well" Prepared to Teach TIMSS Science Topics			
	Overall Science (20 Topics)	Life Science (6 Topics)	Physical Science (8 Topics)	Earth Science (6 Topics)
Armenia	s 61 (2.5)	s 66 (3.1)	s 55 (3.9)	s 66 (3.1)
Australia	r 51 (3.2)	r 60 (4.1)	r 47 (3.7)	r 49 (3.5)
Austria	– –	– –	– –	– –
Azerbaijan	60 (2.4)	64 (2.5)	58 (2.9)	60 (2.8)
Bahrain	82 (2.0)	85 (2.5)	89 (2.3)	70 (3.1)
Belgium (Flemish)	49 (2.5)	62 (2.9)	47 (3.7)	40 (2.2)
Chile	r 74 (2.4)	r 87 (2.1)	r 62 (3.5)	r 77 (3.0)
Chinese Taipei	63 (2.0)	69 (2.7)	79 (2.3)	37 (2.7)
Croatia	67 (2.0)	86 (1.9)	66 (3.2)	50 (1.7)
Czech Republic	62 (2.5)	79 (2.5)	56 (3.5)	55 (2.5)
Denmark	r 58 (1.9)	s 68 (2.7)	s 45 (3.0)	r 67 (2.4)
England	69 (2.4)	71 (3.1)	77 (2.9)	57 (2.9)
Finland	51 (1.9)	63 (2.3)	41 (2.4)	51 (2.4)
Georgia	69 (2.4)	82 (2.3)	60 (3.6)	69 (2.8)
Germany	43 (2.0)	55 (2.8)	36 (2.6)	40 (2.0)
Hong Kong SAR	49 (2.7)	61 (3.7)	49 (3.5)	39 (2.9)
Hungary	58 (2.2)	71 (2.5)	56 (2.9)	49 (2.4)
Iran, Islamic Rep. of	68 (2.0)	68 (2.9)	78 (2.1)	53 (2.4)
Ireland	63 (2.5)	65 (2.8)	60 (2.9)	63 (2.7)
Italy	31 (2.3)	38 (2.6)	26 (2.5)	32 (2.6)
Japan	29 (2.5)	21 (2.7)	44 (3.6)	18 (2.0)
Kazakhstan	– –	– –	– –	– –
Korea, Rep. of	56 (3.0)	61 (3.8)	63 (3.5)	42 (3.7)
Kuwait	91 (1.2)	93 (1.3)	93 (1.3)	86 (1.9)
Lithuania	73 (1.7)	85 (1.6)	60 (2.5)	78 (2.0)
Malta	57 (0.1)	63 (0.1)	61 (0.1)	46 (0.1)
Morocco	r 51 (3.7)	r 65 (4.0)	r 55 (4.6)	r 33 (4.1)
Netherlands	s 45 (3.0)	s 58 (3.9)	s 37 (4.0)	s 43 (2.9)
New Zealand	42 (2.2)	47 (2.7)	35 (2.8)	47 (2.5)
Northern Ireland	r 54 (3.4)	r 62 (3.9)	r 56 (3.6)	r 44 (3.7)
Norway	37 (2.9)	42 (3.6)	28 (3.4)	42 (3.0)
Oman	73 (1.3)	91 (1.2)	86 (1.6)	40 (2.1)
Poland	82 (1.3)	94 (1.1)	80 (2.5)	74 (1.4)
Portugal	76 (2.1)	87 (2.1)	64 (3.9)	82 (1.5)
Qatar	79 (2.1)	88 (2.1)	86 (2.1)	63 (3.9)
Romania	84 (1.7)	87 (1.9)	84 (2.0)	80 (2.0)
Russian Federation	– –	– –	– –	– –
Saudi Arabia	84 (1.6)	91 (1.4)	88 (2.0)	70 (2.6)
Serbia	68 (2.6)	78 (2.6)	69 (3.2)	57 (2.7)
Singapore	58 (1.5)	67 (2.1)	75 (1.8)	25 (2.0)
Slovak Republic	75 (1.5)	88 (1.5)	68 (1.9)	71 (1.6)
Slovenia	60 (1.8)	72 (2.2)	60 (2.2)	48 (2.1)
Spain	69 (2.5)	77 (3.0)	62 (3.3)	70 (2.6)
Sweden	r 50 (3.6)	r 55 (4.3)	r 45 (4.2)	r 52 (3.8)
Thailand	38 (3.0)	45 (3.3)	40 (3.6)	28 (3.0)
Tunisia	58 (1.7)	76 (2.6)	74 (2.6)	20 (2.1)
Turkey	77 (2.0)	79 (2.6)	82 (2.0)	67 (2.3)
United Arab Emirates	82 (0.8)	91 (1.1)	91 (0.9)	63 (1.3)
United States	r 60 (1.9)	r 64 (2.2)	r 60 (2.2)	r 56 (2.0)
Yemen	67 (2.1)	76 (2.7)	78 (2.7)	43 (2.5)
International Avg.	62 (0.3)	70 (0.4)	62 (0.4)	53 (0.4)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

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

A dash (–) indicates comparable data 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: Teachers Feel "Very Well" Prepared to Teach TIMSS Science Topics (Continued)

Country	Percent of Students Whose Teachers Feel "Very Well" Prepared to Teach TIMSS Science Topics							
	Overall Science (20 Topics)		Life Science (6 Topics)		Physical Science (8 Topics)		Earth Science (6 Topics)	
Sixth Grade Participants								
Botswana	80 (1.8)	r	91 (1.4)	r	83 (2.1)	r	66 (2.8)	r
Honduras	63 (2.8)		81 (2.6)		48 (3.8)		66 (3.1)	
Yemen	71 (1.9)		84 (2.3)		83 (2.3)		44 (3.4)	
Benchmarking Participants								
Alberta, Canada	66 (2.4)	r	75 (3.4)	r	74 (2.8)	r	46 (3.2)	r
Ontario, Canada	55 (2.6)		71 (3.2)		55 (3.1)		39 (3.0)	
Quebec, Canada	41 (2.8)		45 (3.4)		35 (3.5)		44 (3.2)	
Abu Dhabi, UAE	83 (1.5)		90 (2.2)		92 (1.4)		63 (2.6)	
Dubai, UAE	81 (0.8)	r	92 (0.9)	r	88 (0.9)	r	59 (2.0)	r
Florida, US	69 (3.9)	s	68 (4.3)	s	68 (4.3)	s	72 (4.2)	s
North Carolina, US	42 (4.3)	r	52 (5.3)	r	45 (5.3)	r	27 (4.2)	r

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

TIMSS 2011 Science Topics

A. Life Science

1) Major body structures and their functions in humans and other organisms (plants and animals)
2) Life cycles and reproduction in plants and animals
3) Physical features, behavior, and survival of organisms living in different environments
4) Relationships in a given community (e.g., simple food chains, predator-prey relationships)
5) Changes in environments (effects of human activity, pollution and its prevention)
6) Human health (e.g., transmission/prevention of communicable diseases, signs of health/illness, diet, exercise)

B. Physical Science

1) States of matter (solids, liquids, gases) and differences in their physical properties (shape, volume), including changes in state of matter by heating and cooling
2) Classification of objects/materials based on physical properties (e.g., weight/mass, volume, magnetic attraction)
3) Forming and separating mixtures
4) Familiar changes in materials (e.g., decaying, burning, rusting, cooking)
5) Common energy sources/forms and their practical uses (e.g., the Sun, electricity, water, wind)
6) Light (e.g., sources, behavior)
7) Electrical circuits and properties of magnets
8) Forces that cause objects to move (e.g., gravity, push/pull forces)

C. Earth Science

1) Water on Earth (location, types, and movement) and air (composition, proof of its existence, uses)
2) Common features of Earth's landscape (e.g., mountains, plains, rivers, deserts) and relationship to human use (e.g., farming, irrigation, land development)
3) Weather conditions from day to day or over the seasons
4) Fossils of animals and plants (age, location, formation)
5) Earth's solar system (planets, Sun, moon)
6) Day, night, and shadows due to Earth's rotation and its relationship to the Sun

Exhibit 7.10: Teachers Feel "Very Well" Prepared to Teach TIMSS Science Topics

TIMSS 2011 8th Grade Science

Reported by Teachers

Country	Percent of Students Whose Teachers Feel "Very Well" Prepared to Teach TIMSS Science Topics									
	Overall Science (20 Topics)		Biology (7 Topics)		Chemistry (4 Topics)		Physics (5 Topics)		Earth Science (4 Topics)	
Armenia		84 (1.1)		87 (1.5)		90 (1.9)		95 (1.6)		56 (3.6)
Australia	s	78 (1.6)	s	84 (1.9)	s	87 (2.0)	s	79 (2.1)	s	58 (3.1)
Bahrain		78 (1.5)		82 (2.2)		88 (2.0)		78 (2.2)		60 (2.5)
Chile		71 (2.1)		81 (2.3)		69 (3.5)		62 (3.0)		65 (3.2)
Chinese Taipei		62 (2.0)		– –		86 (2.6)		82 (2.7)		14 (2.8)
England	r	84 (1.2)	r	89 (1.5)	r	91 (1.5)	r	84 (1.8)	r	70 (2.3)
Finland		81 (1.3)		84 (2.4)		86 (1.8)		86 (1.9)		62 (2.9)
Georgia		76 (2.0)		80 (2.6)		– –		86 (2.8)		57 (3.4)
Ghana		81 (1.4)		88 (1.9)		90 (1.6)		86 (1.8)		51 (3.0)
Hong Kong SAR		59 (2.5)		64 (3.8)		77 (3.7)		69 (3.8)		18 (3.0)
Hungary		70 (1.6)		71 (3.0)		86 (2.5)		79 (2.9)		44 (2.8)
Indonesia		46 (2.7)		58 (3.3)	r	46 (5.3)		58 (3.9)	r	9 (2.3)
Iran, Islamic Rep. of		75 (1.7)		77 (2.0)		80 (2.1)		77 (2.1)		66 (2.3)
Israel		71 (1.2)		86 (1.6)		90 (1.7)		77 (2.4)	r	18 (2.7)
Italy		51 (2.1)		55 (2.7)		49 (3.1)		47 (2.8)		51 (3.0)
Japan		51 (2.6)		48 (3.4)		75 (3.2)		63 (3.6)		19 (2.7)
Jordan		77 (1.7)		79 (2.5)		84 (2.3)		78 (2.5)		67 (2.4)
Kazakhstan		– –		– –		– –		– –		– –
Korea, Rep. of		60 (2.1)		62 (3.1)		75 (3.0)		68 (2.8)		33 (2.4)
Lebanon	r	87 (1.5)		83 (2.4)		94 (1.6)		88 (2.1)		– –
Lithuania		89 (0.8)		92 (1.6)		97 (0.9)		96 (1.0)		66 (2.8)
Macedonia, Rep. of	r	89 (0.9)	r	94 (1.1)	r	96 (1.5)		94 (1.3)	r	68 (3.2)
Malaysia		68 (1.7)		79 (2.3)		84 (2.1)		78 (2.7)		21 (1.9)
Morocco		75 (1.5)		82 (1.9)	r	88 (2.0)		81 (2.4)	r	45 (2.6)
New Zealand		80 (1.3)		83 (2.0)		92 (1.5)		85 (2.1)		56 (2.7)
Norway		54 (2.5)		63 (3.4)		48 (3.5)		49 (3.8)		51 (3.4)
Oman		74 (1.1)		79 (1.5)		88 (1.9)		81 (2.0)		45 (2.5)
Palestinian Nat'l Auth.		81 (1.6)		87 (2.3)		91 (2.0)		86 (2.2)		56 (3.2)
Qatar		85 (1.0)		90 (1.2)		94 (1.3)		91 (2.2)		62 (2.7)
Romania		85 (1.3)		88 (1.9)		92 (2.2)		95 (1.7)		62 (3.6)
Russian Federation		– –		– –		– –		– –		– –
Saudi Arabia		81 (1.7)		90 (1.7)		86 (2.3)		77 (3.0)		63 (3.2)
Singapore		57 (1.4)		60 (2.8)		80 (2.2)		75 (2.0)		6 (1.1)
Slovenia		80 (1.2)		77 (2.4)		91 (1.7)		87 (1.7)		63 (3.1)
Sweden	r	67 (1.7)	s	81 (2.3)	s	81 (2.5)	s	78 (2.9)	s	17 (3.4)
Syrian Arab Republic	r	68 (2.2)	r	75 (3.0)	r	79 (2.9)	r	75 (3.0)	r	36 (4.2)
Thailand		53 (2.5)		54 (3.3)		57 (3.0)		49 (3.4)		51 (3.3)
Tunisia		61 (2.0)		80 (2.5)		– –		– –		26 (2.6)
Turkey		77 (1.7)		80 (2.1)		88 (1.9)		82 (2.0)		56 (2.2)
Ukraine		56 (2.1)		52 (3.3)		68 (3.3)		66 (3.7)		39 (3.2)
United Arab Emirates		81 (1.0)	r	86 (1.3)	r	90 (1.4)	r	87 (1.4)	r	55 (1.9)
United States	r	76 (1.3)	s	83 (1.6)	s	80 (2.0)	s	77 (1.7)	r	57 (2.7)
International Avg.		72 (0.3)		77 (0.4)		82 (0.4)		78 (0.4)		47 (0.5)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

( ) Standard errors appear in parentheses. Because of rounding some results may appear inconsistent.
A dash (–) indicates comparable data 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 students.

Exhibit 7.10: Teachers Feel "Very Well" Prepared to Teach TIMSS Science Topics (Continued)

Country	Percent of Students Whose Teachers Feel "Very Well" Prepared to Teach TIMSS Science Topics									
	Overall Science (20 Topics)		Biology (7 Topics)		Chemistry (4 Topics)		Physics (5 Topics)		Earth Science (4 Topics)	
Ninth Grade Participants										
Botswana		76 (1.7)		87 (1.9)		88 (2.4)		83 (2.5)		37 (3.2)
Honduras		75 (1.7)		85 (2.5)		81 (2.1)		68 (2.6)		60 (3.5)
South Africa		76 (1.5)		84 (2.0)		79 (2.0)		76 (2.3)		57 (3.1)
Benchmarking Participants										
Alberta, Canada		72 (2.5)		80 (2.7)		78 (2.9)		75 (2.9)		49 (3.6)
Ontario, Canada		61 (2.5)		72 (3.0)		50 (4.1)		63 (3.3)		48 (3.0)
Quebec, Canada		71 (2.2)		74 (2.9)		77 (2.6)		70 (2.9)		63 (3.7)
Abu Dhabi, UAE	r	83 (1.6)	r	88 (2.1)	r	92 (2.3)	r	90 (2.3)	r	55 (3.9)
Dubai, UAE	r	83 (1.1)	s	88 (1.9)	s	93 (1.4)	s	90 (1.2)	s	55 (3.1)
Alabama, US	r	74 (4.0)	s	88 (5.3)	r	87 (5.0)	r	82 (4.1)	r	24 (5.9)
California, US	s	67 (2.2)		x x	s	84 (3.1)	s	81 (2.8)	s	34 (4.2)
Colorado, US	r	78 (2.3)	r	84 (4.6)	r	91 (2.2)	r	85 (2.6)	r	47 (6.4)
Connecticut, US	r	76 (3.1)	r	85 (4.4)	r	80 (4.5)	r	76 (4.6)	r	57 (5.2)
Florida, US		x x		x x		x x		x x		x x
Indiana, US	r	81 (1.7)	r	86 (3.3)	r	86 (3.2)	r	84 (2.0)	r	62 (5.1)
Massachusetts, US	r	71 (2.7)	s	74 (5.2)	r	81 (4.3)	s	76 (3.3)	r	50 (5.6)
Minnesota, US	r	77 (4.4)	s	75 (7.6)	r	71 (5.7)	r	74 (5.2)	r	90 (3.5)
North Carolina, US	s	72 (4.0)	s	84 (4.2)	s	80 (4.7)	s	61 (6.6)	s	58 (6.8)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

TIMSS 2011 Science Topics

A. Biology

1) Major organs and organ systems in humans and other organisms (structure/function, life processes that maintain stable bodily conditions)
2) Cells and their functions, including respiration and photosynthesis as cellular processes
3) Reproduction (sexual and asexual) and heredity (passing on of traits, inherited versus acquired/learned characteristics)
4) Role of variation and adaptation in survival/extinction of species in a changing environment
5) Interdependence of populations of organisms in an ecosystem (e.g., energy flow, food webs, competition, predation) and the impact of changes in the physical environment on populations (e.g., climate, water supply)
6) Reasons for increase in world's human population (e.g., advances in medicine, sanitation), and the effects of population growth on the environment
7) Human health (causes of infectious diseases, methods of infection, prevention, immunity) and the importance of diet and exercise in maintaining health

B. Chemistry

1) Classification, composition, and particulate structure of matter (elements, compounds, mixtures, molecules, atoms, protons, neutrons, electrons)
2) Solutions (solvent, solute, concentration/dilution, effect of temperature on solubility)
3) Properties and uses of common acids and bases
4) Chemical change (transformation of reactants, evidence of chemical change, conservation of matter, common oxidation reactions - combustion, rusting, tarnishing)

C. Physics

1) Physical states and changes in matter (explanations of properties in terms of movement and distance between particles; phase change, thermal expansion, and changes in volume and/or pressure)
2) Energy forms, transformations, heat, and temperature
3) Basic properties/behaviors of light (reflection, refraction, light and color, simple ray diagrams) and sound (transmission through media, loudness, pitch, amplitude, frequency, relative speed of light and sound)
4) Electric circuits (flow of current; types of circuits - parallel/series; current/voltage relationship) and properties and uses of permanent magnets and electromagnets
5) Forces and motion (types of forces, basic description of motion, effects of density and pressure)

D. Earth Science

1) Earth's structure and physical features (Earth's crust, mantle and core; composition and relative distribution of water, and composition of air)
2) Earth's processes, cycles, and history (rock cycle; water cycle; weather patterns; major geological events; formation of fossils and fossil fuels)
3) Earth's resources, their use, and conservation (e.g., renewable/nonrenewable resources, human use of land/soil, water resources)
4) Earth in the solar system and the universe (phenomena on Earth - day/night, tides, phases of moon, eclipses, seasons; physical features of Earth compared to other bodies; the Sun as a star)

Exhibit 7.11 shows the fourth grade TIMSS assessment results for the Confidence in Teaching Science scale. Students were scored according to their teachers' responses, with **Very Confident** teachers being "very confident" in using three of the five instructional strategies and "somewhat confident" in using the other two, on average. All other teachers were considered to be **Somewhat Confident**. On average across countries, the majority of fourth grade students (59%) had teachers who were **Very Confident** in teaching science to the class; however, there was no significant difference between the average science achievement of these students (487) and that of the 41 percent of students whose teachers were only **Somewhat Confident** (485). There was considerable variation across countries, with the percentage of students having teachers who were **Very Confident** ranging from 14 to 95 percent.

Exhibit 7.12 provides further information about the components of the Confidence in Teaching Science scale by showing the percentage of students whose teachers reported feeling "very confident" in using each of the five instructional strategies. On average across the fourth grade countries, teachers were most often very confident about helping students appreciate the value of learning science (68% of students taught by such teachers), adapting their teaching to engage student interests (63%), and answering student questions about science (62%). Teachers were less often very confident about explaining science concepts or principles by doing science experiments (51% of students) and providing challenging tasks for capable students (43%).

Exhibit 7.13 shows results for the Confidence in Teaching Science scale for the eighth grade TIMSS assessment. On average across countries, a larger percentage of students had teachers who were **Very Confident** (73%) than at fourth grade, and unlike fourth grade, students who had teachers who were **Very Confident** had higher achievement (479) than did students who had teachers who were **Somewhat Confident** (467). Again, there was considerable variation among countries, with the percentage of students with **Very Confident** teachers ranging from 33 to 99 percent.

Exhibit 7.14 provides information about the components of the Confidence in Teaching Science scale for the eighth grade assessment. Patterns of teacher confidence differed from those at fourth grade—on average across countries, teachers were most often very confident about answering student questions about science (81% of students taught by such teachers), explaining science concepts or principles by doing science experiments (72%), and helping students appreciate the value of science (70%). Teachers were less often very confident about adapting their teaching to engage student interests (65% of students) and providing challenging tasks for capable students (57%).

Exhibit 7.11: Confidence in Teaching Science

TIMSS 2011 4th Grade Science

Reported by Teachers

Students were scored according to their teachers' responses to how confident they felt in using five instructional strategies on the *Confidence in Teaching Science* scale. Students with **Very Confident** teachers had a score on the scale of at least 9.9, which corresponds to their teachers being "very confident" in using three of the five instructional strategies and "somewhat confident" in using the other two, on average. All other students had **Somewhat Confident** teachers.

Country		Very Confident		Somewhat Confident		Average Scale Score
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Romania		95 (1.4)	502 (6.2)	5 (1.4)	543 (11.2)	11.9 (0.07)
Russian Federation		92 (2.0)	552 (3.4)	8 (2.0)	547 (12.2)	11.5 (0.07)
Kazakhstan		91 (2.4)	495 (5.3)	9 (2.4)	493 (14.2)	11.6 (0.11)
United Arab Emirates		90 (1.3)	430 (2.7)	10 (1.3)	426 (13.0)	11.4 (0.06)
Chile	r	87 (2.9)	483 (3.4)	13 (2.9)	472 (10.0)	11.3 (0.13)
Qatar		84 (2.5)	397 (5.3)	16 (2.5)	373 (13.5)	11.1 (0.10)
Azerbaijan		84 (2.8)	442 (6.8)	16 (2.8)	425 (11.0)	10.9 (0.11)
Georgia		84 (2.8)	454 (4.2)	16 (2.8)	462 (6.7)	11.0 (0.10)
Croatia		82 (2.6)	516 (2.4)	18 (2.6)	517 (3.9)	11.1 (0.11)
Kuwait		81 (3.4)	347 (5.3)	19 (3.4)	343 (10.3)	10.9 (0.13)
Oman		78 (2.7)	379 (4.0)	22 (2.7)	373 (11.0)	10.7 (0.10)
Poland		78 (3.0)	506 (2.9)	22 (3.0)	502 (4.6)	10.7 (0.10)
Serbia		77 (3.4)	516 (3.8)	23 (3.4)	516 (4.9)	10.9 (0.13)
Bahrain		76 (3.2)	452 (4.1)	24 (3.2)	439 (8.6)	10.7 (0.15)
Iran, Islamic Rep. of		75 (3.5)	454 (4.5)	25 (3.5)	448 (8.4)	10.6 (0.11)
Lithuania		73 (2.9)	515 (2.8)	27 (2.9)	514 (5.3)	10.6 (0.11)
Saudi Arabia		73 (3.5)	436 (5.5)	27 (3.5)	411 (11.4)	10.5 (0.13)
Portugal		71 (4.7)	524 (5.5)	29 (4.7)	517 (4.6)	10.6 (0.18)
Hungary		69 (3.7)	530 (4.5)	31 (3.7)	541 (7.3)	10.4 (0.14)
Turkey		66 (3.1)	466 (5.6)	34 (3.1)	455 (8.4)	10.1 (0.11)
Armenia	r	66 (3.7)	417 (4.9)	34 (3.7)	414 (7.0)	10.3 (0.11)
Spain		65 (4.0)	508 (3.6)	35 (4.0)	502 (4.6)	10.2 (0.15)
Yemen		64 (4.5)	204 (9.1)	36 (4.5)	213 (9.9)	10.2 (0.14)
Tunisia		64 (4.0)	344 (6.8)	36 (4.0)	350 (8.3)	10.1 (0.12)
England		63 (4.6)	532 (5.0)	37 (4.6)	521 (6.0)	10.1 (0.20)
Slovak Republic		63 (2.9)	532 (4.3)	37 (2.9)	530 (5.4)	10.1 (0.10)
Chinese Taipei		58 (3.7)	555 (2.9)	42 (3.7)	546 (3.8)	10.1 (0.15)
United States	r	57 (2.2)	545 (3.0)	43 (2.2)	543 (3.1)	9.9 (0.11)
Singapore		56 (2.6)	580 (4.7)	44 (2.6)	587 (5.6)	9.9 (0.11)
Malta		54 (0.1)	447 (2.5)	46 (0.1)	445 (1.8)	9.8 (0.00)
Norway		50 (5.1)	492 (3.2)	50 (5.1)	494 (3.6)	9.4 (0.16)
Slovenia		49 (3.7)	521 (3.5)	51 (3.7)	519 (3.6)	9.6 (0.14)
Denmark	s	47 (4.2)	533 (3.6)	53 (4.2)	527 (5.1)	9.5 (0.16)
Sweden	r	45 (4.6)	534 (4.4)	55 (4.6)	535 (3.7)	9.4 (0.19)
Morocco	r	44 (4.8)	272 (8.6)	56 (4.8)	254 (6.0)	9.5 (0.20)
Australia	r	43 (3.9)	524 (4.6)	57 (3.9)	516 (5.2)	9.3 (0.17)
Korea, Rep. of		42 (4.0)	588 (2.8)	58 (4.0)	586 (2.7)	9.4 (0.17)
Ireland		41 (4.2)	526 (4.7)	59 (4.2)	510 (4.4)	9.2 (0.18)
Northern Ireland	r	40 (4.1)	515 (4.9)	60 (4.1)	519 (3.9)	9.1 (0.21)
Belgium (Flemish)		39 (3.3)	507 (3.4)	61 (3.3)	510 (2.9)	9.3 (0.13)
Netherlands	r	39 (4.1)	531 (4.3)	61 (4.1)	529 (3.0)	8.9 (0.14)
Thailand		39 (4.2)	475 (8.1)	61 (4.2)	471 (7.7)	9.0 (0.17)
Czech Republic		34 (3.3)	535 (3.8)	66 (3.3)	537 (3.0)	8.9 (0.13)
Finland		32 (3.0)	574 (4.0)	68 (3.0)	570 (2.7)	9.0 (0.12)
Austria		30 (3.0)	530 (4.3)	70 (3.0)	532 (3.4)	8.7 (0.11)
Germany		27 (3.3)	523 (5.4)	73 (3.3)	532 (2.9)	8.6 (0.12)
Italy		27 (3.7)	527 (5.4)	73 (3.7)	526 (3.3)	8.5 (0.14)
Hong Kong SAR		26 (4.0)	523 (9.0)	74 (4.0)	540 (4.8)	8.5 (0.17)
New Zealand		26 (2.4)	503 (5.6)	74 (2.4)	496 (2.6)	8.4 (0.11)
Japan		14 (2.9)	560 (5.0)	86 (2.9)	558 (2.0)	7.8 (0.13)
International Avg.		59 (0.5)	487 (0.7)	41 (0.5)	485 (1.0)	

Centerpoint of scale set at 10.

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

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.11: Confidence in Teaching Science (Continued)

Country	Very Confident		Somewhat Confident		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Sixth Grade Participants					
Honduras	86 (3.0)	432 (6.9)	14 (3.0)	424 (14.4)	11.2 (0.14)
Botswana	81 (3.3)	379 (6.4)	19 (3.3)	351 (16.4)	11.0 (0.14)
Yemen	64 (4.4)	349 (9.5)	36 (4.4)	334 (9.8)	10.1 (0.15)
Benchmarking Participants					
Abu Dhabi, UAE	90 (2.7)	415 (5.0)	10 (2.7)	403 (29.1)	11.5 (0.13)
Dubai, UAE r	90 (1.3)	461 (3.7)	10 (1.3)	497 (9.0)	11.6 (0.06)
Alberta, Canada r	66 (4.2)	545 (3.5)	34 (4.2)	535 (5.8)	10.2 (0.20)
Florida, US s	53 (5.5)	542 (5.8)	47 (5.5)	543 (6.3)	9.8 (0.25)
Ontario, Canada	49 (3.8)	529 (4.0)	51 (3.8)	524 (4.2)	9.5 (0.16)
North Carolina, US	42 (5.8)	541 (5.9)	58 (5.8)	534 (6.8)	9.3 (0.24)
Quebec, Canada	28 (4.1)	515 (4.8)	72 (4.1)	517 (3.0)	8.4 (0.15)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

In teaching science to this class, how confident do you feel to do the following?

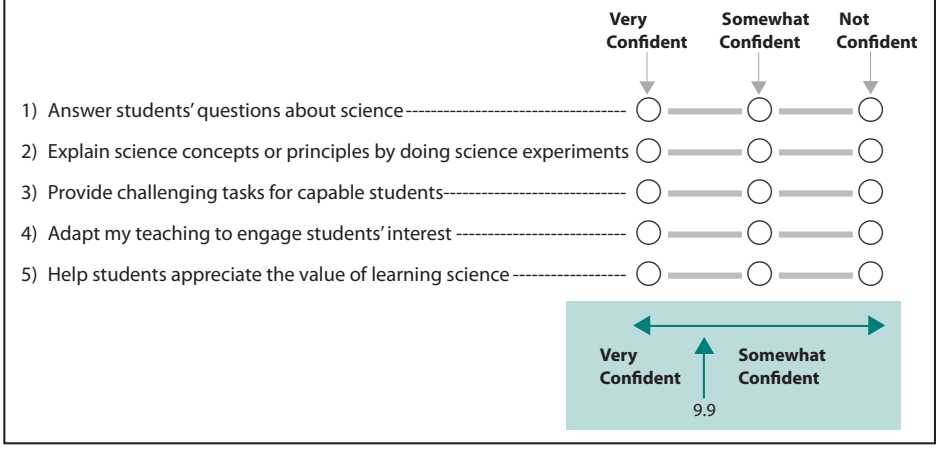

Exhibit 7.12: Components of Confidence in Teaching Science Scale

TIMSS 2011 4th Grade Science

Reported by Teachers

Country	Percent of Students Whose Teachers Feel Very Confident to									
	Answer Student Questions About Science		Explain Science Concepts or Principles by Doing Science Experiments		Provide Challenging Tasks for Capable Students		Adapt Teaching to Engage Student Interests		Help Students Appreciate the Value of Learning Science	
Armenia	r	77 (3.4)	r	47 (4.1)	r	36 (3.7)	r	71 (3.4)	r	84 (3.1)
Australia	r	42 (4.1)	r	40 (4.0)	r	38 (3.9)	r	53 (3.8)	r	48 (4.0)
Austria		38 (3.1)		17 (2.9)		17 (2.5)		54 (3.0)		45 (3.2)
Azerbaijan		91 (2.2)		75 (3.2)		68 (3.4)		56 (3.7)		89 (2.5)
Bahrain		82 (2.6)		69 (4.8)		51 (5.3)		71 (4.0)		78 (3.3)
Belgium (Flemish)		45 (4.1)		31 (3.6)		21 (3.1)		60 (3.3)		68 (3.3)
Chile	r	90 (2.5)	r	68 (3.6)	r	76 (3.7)	r	80 (3.6)	r	91 (2.4)
Chinese Taipei		58 (4.1)		73 (3.6)		42 (3.9)		65 (3.4)		57 (3.9)
Croatia		83 (2.5)		65 (3.3)		68 (3.2)		83 (2.5)		92 (1.9)
Czech Republic		29 (3.5)		25 (3.1)		23 (3.2)		53 (3.9)		58 (4.0)
Denmark	s	52 (4.1)	s	46 (4.5)	s	32 (4.4)	s	60 (4.1)	s	54 (4.1)
England		62 (4.6)		59 (5.0)	r	41 (5.0)		70 (4.3)		65 (4.3)
Finland		43 (3.2)		29 (3.2)		19 (2.8)		39 (3.3)		65 (3.4)
Georgia		84 (2.9)		62 (3.3)		57 (3.7)		82 (3.2)		94 (1.5)
Germany		32 (3.2)		20 (2.9)		18 (2.6)		49 (3.5)		40 (3.5)
Hong Kong SAR		36 (4.6)		29 (4.3)		20 (3.3)		36 (4.2)		26 (4.0)
Hungary		60 (3.1)		52 (3.8)		59 (3.8)		77 (3.2)		80 (3.2)
Iran, Islamic Rep. of		77 (3.7)		77 (2.7)		44 (3.7)		67 (3.7)		82 (2.7)
Ireland		39 (3.8)		44 (4.0)		28 (3.5)		44 (3.9)		54 (4.0)
Italy		27 (3.5)		21 (3.1)		19 (3.1)		40 (3.7)		48 (3.9)
Japan		19 (3.5)		20 (3.4)		8 (2.3)		16 (3.0)		22 (3.4)
Kazakhstan		91 (2.7)		84 (3.3)		83 (3.1)		81 (3.2)		91 (2.4)
Korea, Rep. of		45 (4.3)		51 (3.8)		27 (3.8)		52 (4.5)		54 (4.2)
Kuwait		80 (3.1)		79 (3.2)		56 (4.5)		77 (3.4)		78 (3.3)
Lithuania		70 (2.8)		54 (3.4)		61 (3.4)		78 (2.8)		86 (1.9)
Malta		53 (0.1)		48 (0.1)		43 (0.1)		58 (0.1)		66 (0.1)
Morocco	r	50 (4.9)	r	43 (5.0)	r	29 (4.4)	r	55 (4.6)	r	64 (4.5)
Netherlands	r	46 (4.3)	r	21 (3.4)	s	16 (3.2)	r	53 (4.2)	r	51 (4.7)
New Zealand		23 (2.3)		23 (2.3)		21 (2.2)		40 (3.1)		36 (3.1)
Northern Ireland	r	42 (4.4)	r	36 (4.3)	r	31 (4.4)	r	50 (4.4)	r	44 (4.6)
Norway		65 (4.9)		37 (4.4)		20 (3.2)		51 (4.8)		61 (4.8)
Oman		76 (2.3)		78 (2.8)		56 (3.2)		72 (3.0)		77 (3.0)
Poland		90 (2.1)		50 (4.0)		49 (3.5)		75 (3.3)		92 (2.1)
Portugal		71 (4.5)		52 (5.1)		52 (4.9)		83 (3.2)		85 (2.9)
Qatar		86 (2.4)		82 (2.6)		63 (3.5)		81 (2.8)		84 (2.8)
Romania		91 (1.7)		81 (2.8)		95 (1.7)		97 (1.1)		97 (1.1)
Russian Federation		91 (1.6)		84 (2.7)		78 (2.5)		78 (3.1)		96 (1.4)
Saudi Arabia		79 (3.3)		66 (4.0)		46 (4.1)		69 (3.3)		78 (4.1)
Serbia		80 (3.3)		60 (4.3)		59 (4.0)		81 (2.9)		88 (2.4)
Singapore		57 (2.3)		66 (2.6)		42 (2.8)		53 (2.5)		56 (2.7)
Slovak Republic		62 (3.2)		45 (2.7)		47 (3.1)		73 (3.0)		74 (3.0)
Slovenia		56 (3.5)		35 (3.7)		27 (3.1)		64 (3.8)		64 (3.5)
Spain		75 (3.5)		36 (4.6)		50 (4.3)		72 (3.7)		79 (3.7)
Sweden	r	57 (5.0)	r	41 (4.7)	r	25 (4.0)	r	51 (4.7)	r	55 (4.0)
Thailand		47 (4.9)		35 (3.4)		34 (4.1)		42 (4.4)		39 (4.2)
Tunisia		61 (3.9)		64 (3.2)		43 (4.0)		61 (4.2)		71 (3.9)
Turkey		69 (3.2)		44 (3.2)		46 (3.2)		75 (2.7)		68 (3.1)
United Arab Emirates		88 (1.2)		84 (1.6)		69 (2.1)		88 (1.5)		90 (1.4)
United States	r	54 (2.5)	r	52 (2.5)	r	39 (2.4)	r	63 (2.1)	r	67 (2.4)
Yemen		82 (3.4)		53 (4.7)		41 (4.5)		63 (4.1)		70 (4.0)
International Avg.		62 (0.5)		51 (0.5)		43 (0.5)		63 (0.5)		68 (0.5)

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

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.12: Components of Confidence in Teaching Science Scale (Continued)

Country	Percent of Students Whose Teachers Feel Very Confident to									
	Answer Student Questions About Science		Explain Science Concepts or Principles by Doing Science Experiments		Provide Challenging Tasks for Capable Students		Adapt Teaching to Engage Student Interests		Help Students Appreciate the Value of Learning Science	
Sixth Grade Participants										
Botswana		84 (3.1)		67 (4.4)		64 (4.0)		79 (3.4)		87 (2.8)
Honduras		87 (2.8)		59 (4.8)		75 (3.9)		88 (3.3)		94 (2.1)
Yemen		81 (3.5)		46 (4.6)		44 (4.9)		59 (4.4)		69 (3.9)
Benchmarking Participants										
Alberta, Canada	r	60 (4.3)	r	69 (4.2)	r	44 (4.7)	r	69 (5.0)	r	67 (4.3)
Ontario, Canada		50 (4.0)		44 (3.9)		36 (3.5)		59 (3.8)		55 (3.5)
Quebec, Canada		22 (3.9)		20 (3.5)		28 (3.6)		37 (3.8)		39 (4.1)
Abu Dhabi, UAE		89 (2.5)		86 (3.0)		72 (3.5)		88 (2.9)		88 (3.0)
Dubai, UAE	r	89 (1.3)	r	86 (1.4)	r	78 (1.6)	r	87 (1.4)	r	90 (1.6)
Florida, US	s	54 (5.6)	s	48 (5.9)	s	42 (5.0)	s	62 (5.5)	s	62 (5.1)
North Carolina, US		45 (5.8)		42 (5.2)		29 (5.5)		54 (5.8)		53 (6.4)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.13: Confidence in Teaching Science

Reported by Teachers

Students were scored according to their teachers' responses to how confident they felt in using five instructional strategies on the *Confidence in Teaching Science* scale. Students with **Very Confident** teachers had a score on the scale of at least 9.3, which corresponds to their teachers being "very confident" in using three of the five instructional strategies and "somewhat confident" in using the other two, on average. All other students had **Somewhat Confident** teachers.

Country	Very Confident		Somewhat Confident		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Kazakhstan	99 (0.4)	491 (4.3)	1 (0.4)	~ ~	11.7 (0.05)
Russian Federation	98 (0.5)	543 (3.2)	2 (0.5)	~ ~	11.5 (0.04)
Ukraine	98 (0.9)	502 (3.5)	2 (0.9)	~ ~	11.5 (0.06)
Macedonia, Rep. of s	96 (0.8)	430 (6.3)	4 (0.8)	370 (21.7)	11.3 (0.06)
Ghana	95 (1.9)	307 (5.6)	5 (1.9)	290 (32.0)	11.1 (0.10)
Romania	95 (1.3)	465 (3.7)	5 (1.3)	452 (9.9)	11.3 (0.07)
Lithuania	94 (1.1)	516 (2.6)	6 (1.1)	495 (7.0)	11.1 (0.06)
Indonesia	91 (2.1)	405 (4.8)	9 (2.1)	410 (11.4)	10.7 (0.11)
United Arab Emirates	87 (1.6)	464 (2.6)	13 (1.6)	449 (5.5)	10.6 (0.07)
Qatar	86 (2.7)	426 (4.9)	14 (2.7)	372 (16.8)	10.8 (0.12)
England r	84 (2.0)	532 (5.9)	16 (2.0)	531 (8.5)	10.7 (0.10)
Chile	84 (2.6)	463 (3.0)	16 (2.6)	447 (7.3)	10.6 (0.13)
Israel	84 (2.9)	520 (4.8)	16 (2.9)	509 (10.9)	10.6 (0.15)
United States s	84 (2.0)	532 (3.5)	16 (2.0)	519 (9.4)	10.5 (0.10)
Lebanon	83 (2.3)	411 (5.2)	17 (2.3)	378 (7.9)	10.5 (0.12)
Oman	83 (2.1)	420 (3.4)	17 (2.1)	417 (8.8)	10.3 (0.09)
New Zealand	80 (2.9)	515 (5.0)	20 (2.9)	499 (13.6)	10.3 (0.13)
Slovenia	78 (1.7)	543 (2.8)	22 (1.7)	543 (3.0)	10.2 (0.08)
Georgia	78 (1.9)	421 (3.1)	22 (1.9)	418 (5.1)	10.2 (0.08)
Australia s	77 (3.7)	529 (7.3)	23 (3.7)	518 (8.6)	10.3 (0.15)
Saudi Arabia	76 (3.1)	439 (4.6)	24 (3.1)	429 (7.7)	9.9 (0.13)
Hungary	74 (1.9)	522 (3.4)	26 (1.9)	521 (4.2)	10.0 (0.09)
Tunisia	74 (3.8)	440 (2.9)	26 (3.8)	434 (4.7)	10.0 (0.13)
Malaysia	74 (3.5)	426 (6.2)	26 (3.5)	424 (13.5)	10.0 (0.18)
Armenia	71 (2.6)	442 (3.8)	29 (2.6)	428 (5.7)	9.8 (0.10)
Bahrain	71 (3.2)	458 (3.4)	29 (3.2)	442 (3.6)	9.9 (0.11)
Palestinian Nat'l Auth.	68 (3.6)	421 (3.8)	32 (3.6)	419 (7.4)	9.6 (0.15)
Norway	67 (3.8)	493 (3.5)	33 (3.8)	496 (3.6)	9.6 (0.15)
Turkey	66 (3.5)	484 (4.6)	34 (3.5)	480 (6.7)	9.5 (0.13)
Syrian Arab Republic	65 (4.0)	421 (4.3)	35 (4.0)	435 (7.9)	9.3 (0.13)
Sweden r	63 (3.1)	513 (3.6)	37 (3.1)	508 (3.8)	9.5 (0.13)
Jordan	63 (3.7)	451 (6.1)	37 (3.7)	446 (6.8)	9.5 (0.15)
Chinese Taipei	62 (4.0)	565 (3.1)	38 (4.0)	561 (4.9)	9.5 (0.17)
Morocco	60 (2.6)	379 (2.9)	40 (2.6)	372 (3.1)	9.5 (0.11)
Singapore	60 (2.5)	595 (5.6)	40 (2.5)	583 (7.8)	9.4 (0.11)
Finland	56 (2.5)	554 (3.1)	44 (2.5)	549 (2.7)	9.1 (0.11)
Iran, Islamic Rep. of	49 (3.6)	482 (5.4)	51 (3.6)	467 (5.6)	8.9 (0.13)
Hong Kong SAR	48 (4.4)	540 (5.8)	52 (4.4)	531 (6.1)	8.9 (0.19)
Thailand	42 (4.4)	454 (6.7)	58 (4.4)	449 (5.4)	8.4 (0.18)
Korea, Rep. of	40 (3.6)	559 (3.1)	60 (3.6)	561 (2.5)	8.4 (0.15)
Italy	33 (3.3)	504 (5.1)	67 (3.3)	500 (3.4)	8.0 (0.15)
Japan	33 (3.6)	556 (3.0)	67 (3.6)	559 (3.3)	7.9 (0.16)
International Avg.	73 (0.4)	479 (0.7)	27 (0.4)	467 (1.5)	

Centerpoint of scale set at 10.

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

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.13: Confidence in Teaching Science (Continued)

Country		Very Confident		Somewhat Confident		Average Scale Score
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Ninth Grade Participants						
Honduras		93 (2.5)	370 (4.7)	7 (2.5)	349 (13.3)	11.0 (0.15)
Botswana		86 (2.9)	405 (4.0)	14 (2.9)	396 (9.1)	10.6 (0.12)
South Africa		81 (3.1)	332 (4.7)	19 (3.1)	317 (12.3)	10.2 (0.15)
Benchmarking Participants						
Dubai, UAE	r	92 (0.8)	487 (2.8)	8 (0.8)	405 (10.3)	11.0 (0.09)
Indiana, US	s	91 (3.2)	530 (5.2)	9 (3.2)	548 (15.5)	10.8 (0.18)
Minnesota, US	r	89 (4.5)	555 (7.2)	11 (4.5)	537 (11.3)	10.7 (0.21)
Connecticut, US	s	89 (3.4)	537 (7.6)	11 (3.4)	529 (20.1)	10.9 (0.14)
Massachusetts, US	s	89 (3.7)	565 (7.7)	11 (3.7)	564 (15.2)	10.7 (0.20)
California, US	s	87 (3.4)	509 (7.6)	13 (3.4)	476 (13.3)	10.6 (0.21)
Abu Dhabi, UAE		86 (2.6)	462 (5.0)	14 (2.6)	458 (7.8)	10.5 (0.13)
Quebec, Canada		83 (3.6)	521 (3.1)	17 (3.6)	519 (6.8)	10.6 (0.15)
Colorado, US	s	82 (4.6)	541 (7.1)	18 (4.6)	553 (14.3)	10.6 (0.23)
Alabama, US	s	82 (4.7)	484 (8.6)	18 (4.7)	489 (10.1)	10.6 (0.21)
North Carolina, US	s	78 (7.1)	517 (11.6)	22 (7.1)	563 (19.4)	10.3 (0.36)
Alberta, Canada		73 (3.5)	547 (3.0)	27 (3.5)	542 (3.9)	10.0 (0.17)
Ontario, Canada	r	59 (4.2)	524 (4.1)	41 (4.2)	516 (4.0)	9.5 (0.18)
Florida, US		x x	x x	x x	x x	x x

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

In teaching science to this class, how confident do you feel to do the following?

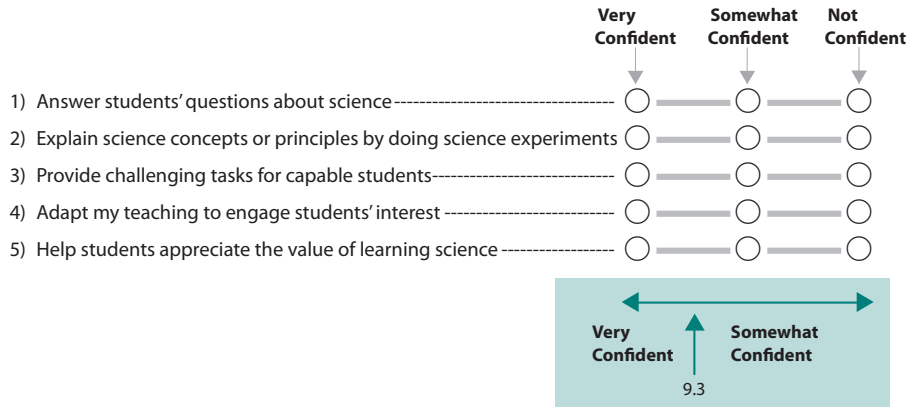

Exhibit 7.14: Components of Confidence in Teaching Science Scale

TIMSS 2011 8th Grade Science

Reported by Teachers

Country	Percent of Students Whose Teachers Feel Very Confident to									
	Answer Student Questions About Science		Explain Science Concepts or Principles by Doing Science Experiments		Provide Challenging Tasks for Capable Students		Adapt Teaching to Engage Student Interests		Help Students Appreciate the Value of Learning Science	
Armenia		88 (1.8)		53 (2.9)		61 (2.8)		56 (2.5)		73 (2.6)
Australia	s	88 (2.4)	s	86 (2.3)	s	59 (3.8)	s	65 (4.3)	s	68 (3.7)
Bahrain		87 (2.6)		68 (3.4)		51 (2.8)		62 (3.3)		69 (3.6)
Chile		86 (2.8)		68 (4.1)		74 (3.3)		84 (3.0)		85 (2.6)
Chinese Taipei		71 (4.0)		73 (3.6)		60 (4.0)		50 (4.1)		44 (3.6)
England	r	96 (1.0)	r	93 (1.5)	r	75 (2.9)	r	70 (2.6)	r	65 (3.1)
Finland		70 (2.3)		66 (2.2)		47 (2.9)		40 (2.5)		51 (2.3)
Georgia		83 (1.7)		53 (2.5)		64 (2.7)		74 (2.2)		86 (1.6)
Ghana		97 (1.3)		82 (3.2)		66 (3.7)		92 (2.2)		96 (1.4)
Hong Kong SAR		72 (4.1)		73 (4.1)		37 (4.6)		37 (4.5)		33 (4.2)
Hungary		81 (2.0)		72 (1.9)		64 (2.4)		61 (2.1)		67 (2.2)
Indonesia		93 (2.0)		82 (3.2)		61 (4.4)		78 (3.3)		92 (1.8)
Iran, Islamic Rep. of		63 (3.7)		43 (3.9)		28 (3.1)		54 (3.6)		62 (3.3)
Israel		92 (2.3)		88 (2.8)		63 (4.2)		77 (3.4)		74 (3.3)
Italy		45 (3.5)		24 (3.1)		24 (3.0)		35 (3.4)		52 (3.9)
Japan		49 (4.3)		55 (3.9)		24 (3.4)		27 (3.9)		21 (3.6)
Jordan		69 (3.8)		55 (4.1)		48 (3.9)		63 (3.7)		69 (3.3)
Kazakhstan		98 (0.5)		97 (0.7)		92 (1.6)		92 (1.3)		97 (0.9)
Korea, Rep. of		57 (3.5)		56 (3.8)		24 (3.2)		38 (3.7)		37 (3.8)
Lebanon		87 (2.1)		75 (2.7)		64 (3.2)		81 (2.5)		79 (2.4)
Lithuania		97 (0.8)		86 (1.6)		89 (1.4)		78 (1.8)		85 (1.6)
Macedonia, Rep. of	s	94 (1.1)	s	82 (2.3)	s	82 (2.3)	s	96 (1.0)	s	92 (1.3)
Malaysia		76 (3.5)		78 (3.4)		50 (3.8)		61 (3.8)		77 (3.4)
Morocco		67 (2.3)		64 (2.4)		43 (2.5)		59 (2.7)		64 (2.2)
New Zealand		90 (2.1)		88 (2.0)		63 (3.5)		59 (3.8)		67 (3.5)
Norway		85 (2.6)		61 (3.4)		49 (4.2)		47 (4.3)		69 (4.1)
Oman		90 (2.1)		85 (2.4)		56 (2.9)		62 (3.2)		78 (2.7)
Palestinian Nat'l Auth.		72 (3.3)		68 (3.6)		43 (4.2)		65 (3.6)		64 (3.8)
Qatar		88 (2.5)		86 (2.6)		72 (3.0)		77 (3.4)		81 (3.0)
Romania		95 (1.3)		83 (2.0)		89 (1.5)		93 (1.4)		90 (1.4)
Russian Federation		98 (0.4)		97 (0.8)		85 (1.3)		87 (1.5)		97 (0.6)
Saudi Arabia		85 (3.3)		59 (3.6)		53 (4.2)		71 (3.4)		75 (3.5)
Singapore		80 (2.2)		69 (2.2)		49 (2.5)		47 (2.9)		51 (2.5)
Slovenia		84 (1.5)		69 (1.9)		61 (2.1)		70 (1.8)		75 (2.1)
Sweden	r	84 (2.8)	r	77 (3.1)	r	47 (3.7)	r	47 (3.4)	r	51 (3.3)
Syrian Arab Republic		67 (3.0)		45 (4.0)		42 (3.9)		70 (3.5)		69 (4.0)
Thailand		58 (4.1)		52 (4.4)		36 (4.4)		36 (4.3)		33 (4.1)
Tunisia		82 (2.7)		87 (2.3)		40 (3.7)		63 (3.8)		72 (3.6)
Turkey		70 (3.5)		61 (3.6)		49 (3.4)		63 (3.1)		63 (3.7)
Ukraine		99 (0.6)		85 (2.5)		92 (1.6)		86 (2.0)		98 (0.6)
United Arab Emirates		88 (1.6)		84 (2.0)		59 (2.2)		80 (1.9)		82 (1.8)
United States	s	90 (1.6)	s	85 (2.1)	s	67 (2.6)	s	72 (2.5)	s	72 (2.5)
International Avg.		81 (0.4)		72 (0.5)		57 (0.5)		65 (0.5)		70 (0.5)

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

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.14: Components of Confidence in Teaching Science Scale (Continued)

Country	Percent of Students Whose Teachers Feel Very Confident to									
	Answer Student Questions About Science		Explain Science Concepts or Principles by Doing Science Experiments		Provide Challenging Tasks for Capable Students		Adapt Teaching to Engage Student Interests		Help Students Appreciate the Value of Learning Science	
Ninth Grade Participants										
Botswana		94 (2.1)		85 (3.3)		60 (4.0)		68 (4.3)		90 (2.5)
Honduras		93 (2.6)		80 (4.2)		67 (4.7)		91 (2.3)		92 (2.2)
South Africa		87 (2.3)		61 (3.5)		61 (4.0)		73 (3.7)		82 (2.6)
Benchmarking Participants										
Alberta, Canada		81 (3.7)		77 (3.7)		51 (4.1)		66 (3.6)		66 (3.8)
Ontario, Canada	r	61 (3.9)	r	63 (4.4)	r	56 (4.0)	r	59 (4.1)	r	61 (4.4)
Quebec, Canada		89 (2.7)		85 (2.5)		74 (3.8)		72 (3.9)		72 (4.1)
Abu Dhabi, UAE	r	88 (2.7)		81 (3.6)	r	53 (4.4)	r	77 (3.8)	r	84 (3.2)
Dubai, UAE	r	93 (1.0)	r	90 (1.5)	r	75 (1.9)	r	86 (1.5)	r	79 (4.0)
Alabama, US	s	92 (2.5)	s	85 (4.7)	s	65 (6.4)	s	70 (5.6)	s	79 (5.3)
California, US	s	95 (2.2)	s	87 (3.3)	s	68 (5.8)	s	76 (5.5)	s	70 (5.9)
Colorado, US	s	93 (2.8)	s	87 (4.2)	s	64 (5.7)	s	68 (7.0)	s	74 (6.2)
Connecticut, US	s	93 (3.4)	s	94 (2.3)	s	78 (4.6)	s	74 (4.4)	s	78 (3.9)
Florida, US		x x		x x		x x		x x		x x
Indiana, US	s	97 (2.7)	s	90 (3.0)	s	69 (5.3)	s	76 (5.5)	s	80 (4.7)
Massachusetts, US	s	95 (3.2)	s	86 (4.8)	s	65 (6.7)	s	81 (4.3)	s	76 (5.4)
Minnesota, US	r	94 (2.8)	r	92 (3.1)	r	76 (5.7)	r	67 (7.0)	r	71 (6.4)
North Carolina, US	s	90 (4.7)	s	74 (7.1)	s	72 (7.4)	s	62 (9.3)	s	70 (8.4)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Teachers' Career Satisfaction

Teachers who are satisfied with their profession and the working conditions at their school are more motivated to teach and prepare their instruction. Further, having teachers that can provide leadership is a dimension of teacher quality. However, developing master teachers requires retention in the profession. Teachers need to be committed to the profession and like it enough to continue teaching. It may be that some subject areas and locales would benefit from policies to reduce teacher attrition in order to improve student achievement (Boyd, Grossman, Lankford, Loeb, & Wyckoff, 2009).

Exhibit 7.15 shows the fourth grade TIMSS assessment results for the TIMSS 2011 Teacher Career Satisfaction scale, based on how much teachers agreed with each of the following six statements:

- I am content with my profession as a teacher;
- I am satisfied with being a teacher at this school;
- I had more enthusiasm when I began teaching than I have now (reverse coded);
- I do important work as a teacher;
- I plan to continue as a teacher for as long as I can; and,
- I am frustrated as a teacher (reverse coded).

Students were scored according to their teachers responses, with **Satisfied** teachers "agreeing a lot" with three of the six statements and "agreeing a little" with the other three, on average. Internationally, on average, the majority of fourth grade students (54%) had teachers **Satisfied** with their careers. Another 41 percent of the students, on average, had teachers that reported being **Somewhat Satisfied** (mostly agreed "a little" instead of "a lot"). Despite the fact that satisfaction could be relative, and dependent on the teaching situation, very few fourth grade students had science teachers that expressed any dissatisfaction except in a small number of countries.

On average across countries, at the fourth grade, science achievement was higher for students of **Satisfied** teachers (490) than for students of **Somewhat Satisfied** (483) or **Less Than Satisfied Teachers** (483), though this varied considerably from country to country. In particular, it is noteworthy that several of the highest-performing countries in science at the fourth grade—Singapore, Japan, and Korea—had among the lowest percentages of students taught by **Satisfied** teachers.

As shown in Exhibit 7.16, on average across countries, the eighth grade science teachers reported somewhat lower levels of career satisfaction than the fourth grade teachers, with 47 percent of students taught by **Satisfied** teachers (compared to 54% at the fourth grade). However, taken together, almost all of the eighth grade students (92%) were taught science by teachers who were **Satisfied** or **Somewhat Satisfied** with their careers. Similar to the fourth grade results, on average across countries, the eighth grade students taught by **Satisfied** teachers had higher science achievement (481) than those taught by **Somewhat Satisfied** (474) or **Less Than Satisfied** teachers (473).

Exhibit 7.15: Teacher Career Satisfaction

Reported by Teachers

Students were scored according to their teachers' degree of agreement with six statements on the *Teacher Career Satisfaction* scale. Students with **Satisfied** teachers had a score on the scale of at least 10.1, which corresponds to their teachers "agreeing a lot" with three of the six statements and "agreeing a little" with the other three, on average. Students with **Less Than Satisfied** teachers had a score no higher than 6.6, which corresponds to their teachers "disagreeing a little" with three of the six statements and "agreeing a little" with the other three, on average. All other students had **Somewhat Satisfied** teachers.

Country	Satisfied		Somewhat Satisfied		Less Than Satisfied		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Croatia	83 (2.7)	515 (2.4)	16 (2.5)	522 (3.9)	1 (0.9)	~ ~	11.1 (0.11)
Chile	79 (2.9)	482 (3.4)	18 (2.6)	473 (7.5)	3 (1.2)	484 (8.4)	11.2 (0.14)
Georgia	77 (3.6)	454 (4.6)	21 (3.1)	458 (7.0)	2 (1.3)	~ ~	11.3 (0.15)
Armenia	77 (3.0)	415 (4.2)	21 (2.9)	418 (7.7)	1 (0.7)	~ ~	11.1 (0.13)
Thailand	69 (3.6)	470 (5.3)	31 (3.6)	477 (13.8)	0 (0.0)	~ ~	10.1 (0.11)
Spain	69 (4.0)	514 (3.4)	27 (3.7)	488 (4.9)	4 (1.6)	485 (9.6)	11.0 (0.19)
Ireland	68 (3.4)	516 (3.9)	29 (3.4)	518 (7.8)	2 (0.8)	~ ~	10.9 (0.12)
Denmark	68 (3.8)	530 (2.9)	29 (3.8)	532 (6.1)	3 (1.3)	511 (22.7)	10.5 (0.16)
Malta	66 (0.1)	452 (2.2)	32 (0.1)	437 (2.6)	2 (0.0)	~ ~	10.9 (0.00)
Iran, Islamic Rep. of	66 (3.3)	457 (5.0)	31 (3.5)	444 (6.8)	3 (1.1)	457 (25.6)	10.4 (0.11)
United Arab Emirates	65 (2.0)	435 (3.9)	29 (2.0)	425 (4.8)	6 (1.2)	400 (8.6)	10.5 (0.09)
Poland	64 (3.0)	503 (3.0)	36 (3.0)	509 (4.2)	1 (0.5)	~ ~	10.6 (0.11)
Qatar	62 (3.9)	399 (7.1)	32 (3.9)	390 (11.0)	6 (2.0)	360 (16.0)	10.1 (0.16)
Turkey	62 (3.4)	475 (5.1)	34 (3.4)	445 (8.3)	4 (1.5)	429 (11.3)	10.4 (0.14)
Belgium (Flemish)	62 (3.6)	510 (2.3)	34 (3.3)	507 (3.3)	4 (1.2)	505 (13.9)	10.3 (0.14)
Austria	61 (3.5)	534 (3.5)	34 (3.5)	529 (4.4)	5 (1.4)	524 (17.4)	10.5 (0.13)
Kazakhstan	60 (3.4)	505 (7.0)	39 (3.3)	479 (9.2)	1 (0.4)	~ ~	10.2 (0.10)
Russian Federation	60 (3.0)	552 (4.2)	37 (2.9)	552 (4.4)	4 (1.3)	546 (4.1)	10.2 (0.13)
Azerbaijan	60 (3.5)	440 (7.7)	40 (3.5)	434 (7.1)	1 (0.5)	~ ~	10.2 (0.11)
Serbia	59 (4.3)	517 (3.7)	38 (4.2)	512 (5.3)	3 (1.4)	525 (18.2)	10.2 (0.15)
Romania	57 (4.2)	512 (8.1)	42 (4.3)	494 (8.4)	1 (0.6)	~ ~	10.5 (0.14)
Lithuania	57 (3.8)	517 (3.4)	40 (3.7)	512 (4.7)	3 (1.0)	493 (18.1)	10.2 (0.13)
Northern Ireland r	55 (4.3)	520 (3.8)	40 (4.6)	513 (5.7)	5 (1.9)	512 (12.5)	10.2 (0.18)
Saudi Arabia	55 (4.2)	434 (8.4)	42 (4.1)	427 (7.5)	3 (1.2)	374 (20.0)	10.0 (0.17)
Hungary	54 (3.6)	544 (4.6)	42 (3.5)	522 (5.4)	3 (0.9)	506 (15.9)	10.0 (0.13)
Slovak Republic	54 (3.4)	533 (5.4)	41 (3.3)	529 (4.2)	5 (1.4)	541 (18.1)	9.9 (0.13)
Tunisia	54 (4.4)	354 (6.1)	41 (4.3)	340 (9.1)	6 (1.9)	305 (24.5)	9.9 (0.15)
Australia r	53 (3.8)	526 (4.1)	41 (3.7)	512 (5.4)	6 (1.7)	505 (10.3)	10.0 (0.16)
England	52 (3.9)	534 (4.3)	37 (3.8)	531 (7.1)	11 (2.7)	507 (8.9)	9.9 (0.18)
Yemen	52 (4.7)	207 (9.1)	46 (4.8)	213 (10.8)	2 (1.1)	~ ~	10.0 (0.17)
Norway	52 (4.2)	495 (2.9)	38 (3.8)	492 (4.2)	10 (2.8)	492 (6.4)	9.6 (0.17)
Bahrain	50 (4.1)	455 (5.0)	36 (4.2)	450 (7.5)	14 (2.7)	429 (13.3)	9.7 (0.17)
Kuwait	49 (4.1)	351 (7.1)	44 (4.1)	346 (7.6)	7 (2.1)	327 (12.6)	9.7 (0.16)
Germany	49 (3.3)	528 (4.2)	46 (3.3)	529 (3.5)	5 (1.6)	525 (8.1)	10.0 (0.12)
New Zealand	49 (3.0)	499 (3.9)	45 (3.0)	498 (3.8)	6 (1.3)	479 (10.3)	10.0 (0.13)
Czech Republic	48 (3.7)	542 (3.8)	45 (4.0)	532 (3.7)	7 (2.2)	526 (7.5)	9.7 (0.15)
United States r	48 (2.4)	546 (3.0)	46 (2.3)	546 (3.3)	7 (1.3)	522 (9.1)	9.8 (0.11)
Hong Kong SAR	46 (4.3)	537 (4.3)	49 (4.3)	534 (7.4)	5 (2.0)	519 (15.9)	9.5 (0.16)
Slovenia	44 (3.0)	521 (3.5)	53 (3.1)	520 (3.9)	3 (0.7)	517 (11.6)	9.7 (0.08)
Oman	43 (3.1)	390 (4.2)	47 (3.4)	371 (7.0)	11 (2.1)	353 (11.1)	9.5 (0.11)
Finland	40 (3.2)	575 (3.7)	52 (3.5)	568 (3.1)	8 (2.2)	564 (6.0)	9.4 (0.13)
Netherlands r	40 (4.5)	530 (4.8)	53 (4.6)	531 (2.8)	7 (2.6)	524 (12.2)	9.4 (0.18)
Chinese Taipei	36 (3.1)	556 (4.2)	55 (3.7)	550 (2.7)	9 (2.4)	540 (6.7)	9.0 (0.14)
Morocco	36 (3.9)	280 (9.6)	50 (4.1)	250 (6.0)	15 (3.0)	272 (13.8)	8.9 (0.20)
Portugal	36 (4.0)	527 (5.9)	59 (4.3)	520 (4.8)	5 (1.8)	511 (11.5)	9.5 (0.19)
Italy	35 (3.4)	528 (4.8)	57 (3.7)	523 (4.0)	8 (2.0)	521 (10.9)	9.3 (0.12)
Singapore	32 (2.6)	592 (6.3)	56 (2.7)	580 (4.4)	12 (1.7)	572 (10.7)	8.9 (0.10)
Sweden r	29 (3.6)	531 (5.7)	60 (4.0)	536 (3.4)	11 (2.8)	536 (9.2)	8.9 (0.17)
Japan	26 (3.6)	559 (3.6)	60 (4.1)	559 (2.4)	15 (3.0)	555 (5.2)	8.6 (0.14)
Korea, Rep. of	21 (3.3)	586 (3.4)	68 (4.0)	588 (2.5)	10 (2.8)	578 (6.0)	8.4 (0.13)
International Avg.	54 (0.5)	490 (0.7)	41 (0.5)	483 (0.9)	5 (0.2)	483 (2.1)	

Centerpoint of scale set at 10.

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

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.15: Teacher Career Satisfaction (Continued)

Country	Satisfied		Somewhat Satisfied		Less Than Satisfied		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Sixth Grade Participants							
Honduras	95 (1.8)	433 (6.4)	5 (1.8)	419 (23.1)	0 (0.0)	~ ~	12.2 (0.13)
Yemen	51 (4.5)	349 (9.5)	45 (4.5)	342 (10.5)	4 (1.6)	363 (15.8)	9.9 (0.14)
Botswana	25 (3.5)	381 (12.8)	62 (4.1)	368 (8.1)	13 (2.8)	362 (19.2)	8.6 (0.14)
Benchmarking Participants							
Dubai, UAE	72 (1.8)	472 (3.3)	23 (1.8)	455 (7.6)	5 (1.0)	431 (23.4)	10.6 (0.11)
Abu Dhabi, UAE	68 (3.8)	416 (7.1)	27 (3.6)	414 (9.1)	5 (1.8)	380 (12.6)	10.6 (0.15)
Ontario, Canada	60 (3.6)	528 (3.6)	37 (3.4)	526 (4.7)	4 (1.4)	526 (9.0)	10.2 (0.13)
Alberta, Canada r	60 (4.4)	547 (3.8)	40 (4.3)	535 (3.6)	1 (0.7)	~ ~	10.2 (0.15)
Quebec, Canada	45 (4.0)	522 (4.0)	48 (4.2)	511 (3.4)	7 (2.4)	520 (9.3)	9.6 (0.15)
Florida, US r	42 (5.5)	547 (7.2)	52 (5.6)	541 (6.2)	6 (2.6)	551 (19.7)	9.8 (0.21)
North Carolina, US	33 (5.7)	543 (6.5)	58 (5.2)	537 (6.4)	10 (3.5)	522 (10.9)	9.1 (0.24)

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

How much do you agree with the following statements?

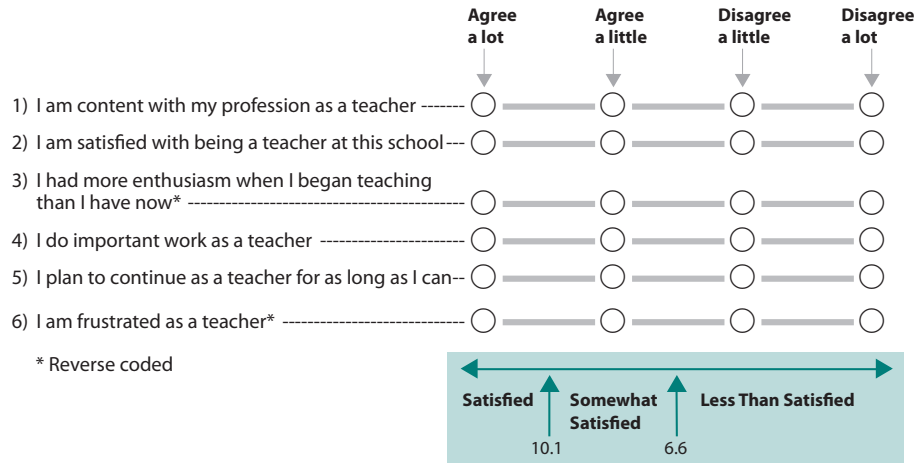

Exhibit 7.16: Teacher Career Satisfaction

Reported by Teachers

Students were scored according to their teachers' degree of agreement with six statements on the *Teacher Career Satisfaction* scale. Students with **Satisfied** teachers had a score on the scale of at least 10.4, which corresponds to their teachers "agreeing a lot" with three of the six statements and "agreeing a little" with the other three, on average. Students with **Less Than Satisfied** teachers had a score no higher than 7.0, which corresponds to their teachers "disagreeing a little" with three of the six statements and "agreeing a little" with the other three, on average. All other students had **Somewhat Satisfied** teachers.

Country	Satisfied		Somewhat Satisfied		Less Than Satisfied		Average Scale Score
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Thailand	71 (3.7)	451 (5.4)	27 (3.4)	446 (6.1)	2 (1.2)	~ ~	10.5 (0.11)
Chile	68 (3.8)	465 (3.9)	28 (3.5)	452 (5.9)	4 (2.2)	452 (17.2)	10.9 (0.17)
Georgia	67 (2.3)	421 (3.6)	31 (2.2)	417 (4.4)	2 (0.5)	~ ~	10.9 (0.09)
Malaysia	66 (3.6)	429 (6.5)	34 (3.6)	419 (10.6)	0 (0.0)	~ ~	10.4 (0.09)
Indonesia	63 (3.8)	405 (6.1)	36 (3.9)	405 (6.8)	1 (0.8)	~ ~	10.7 (0.12)
Syrian Arab Republic	62 (3.3)	426 (4.7)	35 (3.3)	427 (6.2)	4 (1.4)	414 (13.3)	10.7 (0.15)
Israel	61 (3.8)	528 (5.1)	37 (3.7)	496 (7.0)	2 (0.9)	~ ~	10.7 (0.15)
Ukraine	61 (2.9)	506 (4.2)	38 (2.9)	493 (4.5)	2 (0.6)	~ ~	10.4 (0.10)
Armenia	59 (2.7)	437 (4.0)	38 (2.7)	441 (4.2)	3 (0.7)	435 (16.6)	10.6 (0.10)
Turkey	58 (3.3)	493 (5.5)	35 (3.1)	472 (5.6)	7 (1.9)	456 (11.6)	10.4 (0.14)
Qatar	57 (3.4)	429 (8.4)	38 (3.2)	403 (7.5)	5 (1.6)	421 (27.4)	10.5 (0.13)
Saudi Arabia	56 (3.9)	442 (4.4)	39 (3.8)	427 (6.8)	6 (2.0)	442 (20.8)	10.5 (0.16)
United Arab Emirates	56 (2.4)	465 (3.3)	38 (2.4)	457 (4.1)	7 (1.3)	459 (10.5)	10.5 (0.11)
Norway	56 (3.6)	496 (3.2)	41 (3.3)	491 (4.3)	4 (1.7)	490 (23.8)	10.4 (0.16)
Iran, Islamic Rep. of	53 (3.2)	480 (5.4)	42 (3.3)	472 (6.8)	5 (1.3)	442 (22.2)	10.2 (0.11)
Kazakhstan	53 (2.5)	493 (4.7)	46 (2.6)	487 (5.5)	1 (0.4)	~ ~	10.4 (0.07)
Bahrain	52 (3.0)	469 (4.0)	30 (2.8)	442 (5.1)	18 (2.4)	424 (6.8)	10.0 (0.14)
Macedonia, Rep. of	51 (1.8)	432 (6.5)	47 (1.8)	384 (6.4)	2 (0.6)	~ ~	10.5 (0.07)
Palestinian Nat'l Auth.	50 (3.9)	423 (4.6)	41 (4.1)	418 (6.7)	9 (2.3)	417 (14.1)	10.0 (0.15)
Romania	49 (2.4)	466 (4.0)	45 (2.7)	464 (4.6)	5 (1.1)	458 (7.3)	10.2 (0.09)
Tunisia	49 (4.2)	438 (3.9)	46 (4.0)	441 (4.1)	5 (1.6)	420 (7.7)	10.2 (0.14)
Russian Federation	44 (2.0)	551 (3.6)	50 (2.2)	538 (3.8)	6 (1.0)	522 (8.5)	9.9 (0.08)
Lebanon	43 (3.2)	416 (6.9)	50 (3.2)	405 (6.5)	7 (2.0)	350 (11.6)	9.9 (0.12)
Lithuania	42 (2.2)	519 (3.0)	49 (2.1)	511 (3.0)	9 (1.2)	504 (5.9)	9.7 (0.10)
Italy	42 (3.9)	499 (4.6)	49 (3.9)	504 (4.2)	9 (2.2)	507 (13.5)	9.7 (0.14)
Finland	42 (2.4)	553 (3.2)	49 (2.2)	551 (2.5)	10 (1.4)	552 (5.8)	9.7 (0.11)
New Zealand	41 (3.7)	514 (7.7)	48 (4.3)	509 (6.7)	11 (2.9)	511 (14.0)	9.9 (0.19)
Hungary	40 (2.6)	526 (4.0)	48 (2.5)	523 (4.0)	12 (1.8)	512 (8.4)	9.7 (0.13)
United States r	40 (2.6)	533 (4.9)	51 (2.9)	527 (4.5)	10 (1.4)	500 (8.3)	9.7 (0.10)
Morocco	39 (2.5)	380 (3.3)	49 (2.3)	374 (2.9)	12 (1.6)	377 (5.8)	9.6 (0.12)
England	39 (2.8)	526 (8.6)	46 (3.1)	533 (6.7)	15 (2.4)	542 (8.4)	9.5 (0.13)
Australia s	38 (3.9)	525 (7.8)	52 (4.3)	526 (6.1)	10 (2.3)	522 (13.5)	9.7 (0.18)
Hong Kong SAR	38 (4.4)	542 (6.9)	53 (4.3)	534 (4.9)	9 (2.7)	508 (23.5)	9.6 (0.17)
Oman	37 (2.9)	423 (5.9)	50 (3.3)	421 (4.8)	14 (2.0)	408 (10.3)	9.5 (0.10)
Ghana	35 (4.2)	307 (10.1)	55 (4.0)	307 (8.1)	10 (2.5)	299 (17.2)	9.6 (0.19)
Chinese Taipei	32 (3.6)	565 (4.7)	62 (3.8)	564 (3.2)	5 (1.8)	555 (9.4)	9.6 (0.13)
Slovenia	31 (2.3)	543 (3.3)	63 (2.5)	542 (3.1)	6 (1.1)	550 (5.7)	9.5 (0.08)
Jordan	28 (3.2)	463 (5.4)	51 (3.3)	451 (5.8)	21 (2.4)	425 (10.8)	8.9 (0.13)
Singapore	28 (2.3)	592 (8.6)	59 (2.7)	592 (5.4)	13 (1.8)	576 (11.5)	9.2 (0.09)
Sweden r	24 (3.3)	519 (4.8)	60 (3.5)	509 (3.8)	16 (2.5)	505 (6.8)	9.0 (0.13)
Japan	22 (3.4)	559 (5.0)	65 (4.1)	557 (3.3)	13 (2.9)	557 (4.9)	9.0 (0.14)
Korea, Rep. of	13 (2.0)	567 (5.2)	63 (3.6)	559 (2.3)	24 (3.6)	558 (4.2)	8.3 (0.10)
International Avg.	47 (0.5)	481 (0.8)	45 (0.5)	474 (0.8)	8 (0.3)	473 (2.3)	

Centerpoint of scale set at 10.

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

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011

Exhibit 7.16: Teacher Career Satisfaction (Continued)

Country		Satisfied		Somewhat Satisfied		Less Than Satisfied		Average Scale Score
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Ninth Grade Participants								
Honduras		87 (3.0)	365 (3.7)	13 (3.0)	399 (15.6)	0 (0.0)	~ ~	12.2 (0.16)
South Africa		38 (3.8)	323 (9.3)	54 (3.7)	331 (6.2)	8 (1.7)	345 (17.5)	9.5 (0.12)
Botswana		13 (2.9)	422 (9.3)	64 (3.9)	401 (4.6)	23 (3.6)	399 (9.3)	8.4 (0.17)
Benchmarking Participants								
Ontario, Canada		62 (4.5)	525 (3.5)	37 (4.4)	516 (4.0)	1 (0.8)	~ ~	10.7 (0.15)
Abu Dhabi, UAE		61 (4.4)	460 (5.9)	33 (4.5)	456 (5.6)	7 (2.2)	485 (12.2)	10.6 (0.18)
Dubai, UAE	r	58 (4.4)	487 (5.9)	36 (4.4)	476 (7.2)	6 (1.3)	419 (18.6)	10.7 (0.19)
Alberta, Canada		53 (4.1)	550 (3.5)	38 (3.8)	544 (3.5)	9 (2.1)	532 (6.6)	10.2 (0.16)
Massachusetts, US	r	51 (7.3)	568 (9.6)	47 (7.5)	559 (13.3)	2 (1.7)	~ ~	10.2 (0.29)
Colorado, US	r	50 (6.5)	541 (7.0)	42 (6.3)	539 (10.4)	8 (3.5)	558 (11.7)	10.1 (0.27)
Indiana, US	r	48 (6.8)	539 (6.1)	46 (6.8)	529 (7.3)	6 (2.5)	537 (10.1)	10.1 (0.25)
Connecticut, US	r	47 (6.2)	535 (9.7)	44 (6.6)	533 (10.1)	8 (3.4)	522 (29.3)	9.9 (0.27)
Quebec, Canada		45 (4.1)	528 (4.2)	46 (4.2)	517 (4.2)	9 (2.4)	501 (11.7)	9.9 (0.15)
California, US	s	39 (5.2)	497 (6.5)	52 (5.2)	503 (9.3)	9 (3.1)	492 (16.2)	9.9 (0.23)
Minnesota, US	r	35 (5.8)	550 (14.2)	52 (6.8)	557 (6.3)	12 (4.8)	541 (10.3)	9.7 (0.27)
Alabama, US	r	33 (6.3)	487 (10.5)	59 (6.7)	481 (8.6)	8 (4.1)	485 (17.6)	9.5 (0.30)
North Carolina, US	s	30 (7.0)	531 (15.0)	43 (8.1)	539 (15.4)	27 (7.2)	501 (15.2)	8.9 (0.35)
Florida, US		x x	x x	x x	x x	x x	x x	x x

SOURCE: IEA's Trends in International Mathematics and Science Study – TIMSS 2011