

CHAPTER 4

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There is abundant evidence that student achievement is related to home background factors, and to students' activities and attitudes. To help interpret the achievement results, Chapter 4 provides detailed information about students' home backgrounds, how they spend their time out of school, their self-concept in science, and their attitudes towards science. Also provided is information on changes in results between 1995 and 1999.





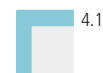
To provide an educational context for interpreting the science achievement results, TIMSS collected detailed information from students about their home backgrounds, how they spend their time out of school, and their attitudes towards science. This chapter presents eighth-grade students' responses to a subset of these questions, together with changes in results between 1995 and 1999. Specifically, one set of questions addresses home resources and support for academic achievement. Another examines how much out-of-school time students spend on their schoolwork. A third set of questions elicits information on students' self-concept in science and their feelings towards science.

In an effort to summarize this information concisely and focus attention on educationally relevant support and practice, TIMSS sometimes has combined information from individual questions to form an index that was more global and reliable than the component questions (e.g., home educational resources). According to their responses, students were placed in a "high," "medium," or "low" category. Cutoff points were established so that the high level of an index corresponds to conditions or activities generally associated with good educational practice and high academic achievement. For each index, the percentages of students in each category are presented in relation to their science achievement. The data for the component questions and more detail about some topic areas are provided in the reference section of this report (see reference section R.1).

What Educational Resources Do Students Have in Their Homes?

There is no shortage of evidence that students from homes with extensive educational resources have higher achievement in science and other subjects than those from less advantaged backgrounds. This has been documented most recently in a study of the eighth-grade results from TIMSS in 1995.¹ The international report for these data² showed that students from homes with large numbers of books, with a range of educational study aids, or with parents with university-level education also had higher science achievement. For the 1999 data presented in this report, student responses to these three variables were combined to form an index of home educational resources (HER).

Exhibit 4.1 summarizes the home educational resources index in a two-page display. The index is described on the first page. Students assigned to the high level of this index reported coming from homes with more than 100 books, with all three study aids (a computer, a study desk or table for the student's own use, and a dictionary), and where at least one



¹ Martin, M.O., Mullis, I.V.S., Gregory, K.D., Hoyle, C.D., and Shen, C. (2000), *Effective Schools in Science and Mathematics: IEA's Third International Mathematics and Science Study*, Chestnut Hill, MA: Boston College.

² Beaton, A.E., Martin, M.O., Mullis, I.V.S., Gonzalez, E.J., Smith, T.A., and Kelly, D.L. (1996), *Science Achievement in the Middle School Years: IEA's Third International Mathematics and Science Study*, Chestnut Hill, MA: Boston College.





through R1.5 in the reference section. Exhibit R1.1 shows the percentage of eighth-grade students in each country that had a dictionary, study desk or table, or computer, and shows that students reporting having all three had higher average science achievement than those without all three. The changes in these percentages presented in Exhibit R1.2 show that between 1995 and 1999 many countries had significant increases in the percentages of students having all three educational aids as well as those with computers in their homes (10 percent increase internationally, on average, for both).



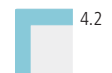
Exhibit R1.3 shows for each country the percentage of students at each of five ranges of numbers of books in the home in relation to average science achievement; changes in these results are shown in Exhibit R1.4. In most countries, the more books students reported in the home, the higher their science achievement. Interestingly, however, the trend appears to be in the direction of having fewer books in the home. Taken together with the increase in home computers, this may reflect the emerging reliance on the Internet as a source of information.



The percentages of students in each of five categories of parents' educational level are shown in Exhibit R1.5, together with their average science achievement. Although participants did their best to use educational categories that were comparable across all countries, the range of educational provision made this difficult. About half of the participating countries had to modify the response options presented to students in the questionnaire in order to conform to their national education system. Exhibit R1.6 provides details of how these modifications were aligned with the categories of parents' education used in this report. Despite the different educational approaches, structures, and organizations across the TIMSS countries, it is clear that parents' education is positively related to students' science achievement. The pattern across countries was that eighth-grade students whose parents had more education were also those who had higher achievement in science.



Students who speak a language (or languages) in the home that is different from the language spoken in school sometimes benefit from being multilingual. However, sometimes they are still developing proficiency in the language of instruction and can be at a disadvantage in learning situations. Exhibit 4.2 contains students' reports of how frequently they spoke the language of the TIMSS test at home in relation to their average science achievement. Students from homes where the language of the test is always or almost always spoken had higher average achievement than those who spoke it less frequently. On average



text continued
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† Lithuania tested the same cohort of students as other countries, but later in 1999, not the next school year. Standard error in parentheses. A dash (–) indicates that the standard error is too large to report.





Exhibit 4.2 Frequency with Which Students Speak Language of the Test at Home

	Always or Almost Always		Sometimes		Never	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Australia	89 (1.2)	547 (4.6)	10 (1.1)	506 (10.1)	1 (0.3)	~ ~
Belgium (Flemish)	86 (1.3)	542 (2.8)	8 (0.7)	504 (10.7)	6 (0.9)	496 (18.1)
Bulgaria	88 (1.9)	526 (5.6)	11 (1.7)	468 (13.1)	1 (0.3)	~ ~
Canada	91 (0.6)	537 (2.3)	8 (0.5)	494 (7.4)	2 (0.2)	~ ~
Chile ^r	94 (0.5)	423 (4.5)	6 (0.5)	368 (9.3)	1 (0.1)	~ ~
Chinese Taipei	67 (1.4)	587 (4.8)	31 (1.3)	535 (5.5)	2 (0.2)	~ ~
Cyprus	89 (1.1)	465 (3.2)	9 (1.0)	450 (8.2)	2 (0.3)	~ ~
Czech Republic	98 (0.5)	541 (4.4)	1 (0.3)	~ ~	1 (0.2)	~ ~
England	95 (0.9)	544 (4.8)	5 (0.8)	487 (13.6)	0 (0.1)	~ ~
Finland	97 (0.7)	540 (3.3)	3 (0.7)	483 (24.5)	1 (0.2)	~ ~
Hong Kong, SAR ^r	80 (2.4)	523 (4.2)	17 (1.9)	536 (8.8)	3 (0.5)	551 (11.5)
Hungary ^r	99 (0.2)	557 (4.1)	0 (0.2)	~ ~	1 (0.1)	~ ~
Indonesia	28 (2.5)	438 (8.1)	63 (2.3)	432 (4.6)	9 (0.8)	456 (9.8)
Iran, Islamic Rep.	59 (3.4)	462 (3.7)	26 (2.1)	426 (7.0)	15 (1.6)	430 (8.2)
Israel	85 (1.2)	474 (4.4)	13 (1.1)	453 (10.4)	2 (0.3)	~ ~
Italy	77 (1.1)	506 (3.9)	20 (1.0)	448 (6.1)	4 (0.5)	468 (12.9)
Japan	97 (0.3)	552 (2.2)	3 (0.3)	511 (13.5)	0 (0.1)	~ ~
Jordan	85 (0.9)	457 (3.7)	13 (0.8)	436 (6.2)	2 (0.3)	~ ~
Korea, Rep. of	96 (0.3)	551 (2.6)	4 (0.3)	504 (8.6)	0 (0.0)	~ ~
Latvia (LSS)	92 (1.2)	503 (4.9)	6 (0.8)	489 (13.2)	2 (0.6)	~ ~
Lithuania [‡]	99 (0.3)	490 (4.3)	1 (0.3)	~ ~	0 (0.1)	~ ~
Macedonia, Rep. of ^s	93 (1.5)	482 (5.3)	5 (0.9)	451 (13.1)	2 (0.8)	~ ~
Malaysia	61 (2.3)	483 (4.5)	30 (1.7)	504 (6.9)	10 (1.0)	515 (9.2)
Moldova	89 (1.2)	462 (4.6)	10 (1.1)	441 (12.9)	1 (0.3)	~ ~
Morocco	20 (1.0)	305 (8.5)	51 (1.6)	334 (6.1)	30 (1.6)	322 (7.6)
Netherlands	86 (2.4)	550 (6.9)	8 (1.2)	509 (14.8)	6 (1.8)	536 (11.7)
New Zealand	90 (0.9)	517 (4.6)	9 (0.7)	456 (9.9)	1 (0.3)	~ ~
Philippines	11 (1.6)	322 (8.9)	70 (1.5)	357 (8.6)	19 (0.9)	327 (11.3)
Romania	92 (2.4)	475 (5.9)	5 (1.5)	460 (18.6)	3 (0.9)	475 (21.4)
Russian Federation	94 (2.3)	530 (6.2)	5 (2.3)	541 (47.0)	1 (0.2)	~ ~
Singapore	27 (1.8)	612 (8.4)	63 (1.6)	553 (8.2)	10 (0.5)	548 (11.2)
Slovak Republic	87 (1.9)	540 (3.3)	9 (1.4)	504 (7.5)	3 (0.7)	493 (17.2)
Slovenia	91 (1.0)	540 (3.3)	7 (0.7)	489 (8.8)	2 (0.4)	~ ~
South Africa	23 (2.2)	368 (14.9)	53 (1.6)	222 (5.8)	24 (1.8)	177 (5.4)
Thailand	72 (2.4)	489 (4.4)	25 (2.1)	466 (5.5)	3 (0.4)	446 (10.1)
Tunisia	88 (1.5)	431 (3.6)	8 (1.0)	418 (6.1)	4 (0.7)	436 (15.1)
Turkey	92 (1.4)	438 (3.9)	7 (1.3)	394 (10.4)	1 (0.2)	~ ~
United States	90 (1.0)	524 (4.3)	9 (1.0)	456 (7.4)	1 (0.1)	~ ~
International Avg.	79 (0.3)	496 (0.8)	17 (0.2)	459 (3.0)	5 (0.1)	445 (3.8)

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

Background data provided by students.

An "r" indicates a 70-84% student response rate. An "s" indicates a 50-69% student response rate.

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

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

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

Exhibit 4.4

Students' Expectations for Finishing School*

	Finish University ¹		Some Vocational/ Technical Education or University Only ²		Finish Secondary School Only ³		Some Secondary School Only		Do Not Know	
	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
Australia	55 (1.8)	568 (4.6)	14 (0.7)	539 (5.5)	17 (1.0)	497 (6.9)	5 (0.5)	483 (11.2)	9 (0.7)	516 (9.3)
Belgium (Flemish)	26 (1.1)	569 (4.1)	30 (0.9)	542 (4.1)	16 (0.9)	501 (4.5)	0 (0.0)	~ ~	29 (1.0)	520 (3.5)
Bulgaria	60 (2.9)	544 (6.3)	8 (0.6)	493 (8.6)	22 (2.2)	477 (5.8)	1 (0.2)	~ ~	9 (0.9)	480 (9.2)
Canada	76 (0.9)	541 (2.0)	13 (0.6)	521 (5.7)	4 (0.3)	493 (10.8)	1 (0.1)	~ ~	7 (0.6)	498 (7.1)
Chile	54 (1.6)	454 (4.9)	18 (0.8)	399 (4.3)	19 (1.0)	372 (4.9)	2 (0.2)	~ ~	7 (0.5)	390 (11.8)
Chinese Taipei	62 (1.4)	601 (3.9)	24 (1.0)	523 (4.2)	2 (0.3)	~ ~	0 (0.1)	~ ~	11 (0.6)	528 (6.8)
Cyprus	51 (1.0)	498 (2.6)	14 (0.7)	444 (4.7)	13 (0.6)	417 (6.2)	6 (0.5)	366 (12.0)	16 (0.9)	433 (7.4)
Czech Republic	38 (1.8)	580 (4.2)	5 (0.6)	557 (10.0)	39 (1.5)	517 (4.8)	8 (1.0)	475 (9.0)	10 (0.8)	518 (6.7)
England	--	--	--	--	--	--	--	--	--	--
Finland	10 (0.8)	587 (8.3)	22 (1.0)	558 (6.4)	41 (1.2)	518 (3.8)	3 (0.4)	491 (9.9)	24 (0.8)	530 (4.9)
Hong Kong, SAR	63 (1.7)	547 (3.3)	20 (0.9)	512 (6.1)	10 (0.8)	479 (8.1)	1 (0.2)	~ ~	6 (0.4)	511 (9.3)
Hungary	56 (1.8)	590 (3.3)	0 (0.0)	~ ~	39 (1.7)	508 (5.0)	1 (0.2)	~ ~	4 (0.4)	536 (11.2)
Indonesia	39 (1.8)	460 (4.3)	30 (1.1)	436 (5.2)	12 (0.9)	420 (8.3)	5 (0.5)	378 (9.8)	13 (1.0)	408 (9.6)
Iran, Islamic Rep.	48 (1.7)	469 (5.5)	6 (0.4)	437 (11.1)	6 (0.5)	421 (10.8)	4 (0.5)	421 (10.1)	36 (1.2)	434 (5.2)
Israel	59 (1.0)	497 (5.0)	16 (0.6)	456 (6.3)	11 (0.7)	421 (9.6)	1 (0.2)	~ ~	13 (0.7)	435 (10.1)
Italy	33 (1.3)	531 (6.1)	19 (0.9)	504 (8.0)	31 (1.1)	477 (4.5)	7 (0.6)	403 (8.6)	9 (0.7)	472 (9.5)
Japan	38 (0.9)	579 (3.6)	18 (0.6)	540 (2.8)	18 (0.7)	512 (5.2)	1 (0.1)	~ ~	25 (0.7)	544 (3.6)
Jordan	60 (1.1)	483 (3.3)	11 (0.6)	403 (9.1)	5 (0.5)	394 (10.6)	3 (0.3)	369 (13.3)	21 (0.8)	434 (7.8)
Korea, Rep. of	77 (0.7)	565 (2.7)	8 (0.4)	486 (4.1)	4 (0.3)	472 (9.2)	0 (0.1)	~ ~	11 (0.5)	510 (6.6)
Latvia (LSS)	65 (1.5)	521 (5.4)	13 (0.9)	476 (5.7)	8 (0.7)	475 (7.9)	1 (0.1)	~ ~	13 (1.0)	463 (7.5)
Lithuania †	45 (2.1)	527 (4.6)	25 (1.2)	468 (6.7)	6 (0.6)	441 (9.7)	2 (0.3)	~ ~	23 (1.2)	454 (8.5)
Macedonia, Rep. of	53 (1.8)	502 (4.3)	11 (0.7)	462 (9.6)	17 (1.1)	429 (5.6)	8 (0.6)	390 (9.2)	11 (0.9)	397 (10.4)
Malaysia	65 (1.4)	505 (4.7)	18 (0.9)	472 (6.1)	4 (0.4)	452 (11.8)	2 (0.2)	~ ~	11 (0.8)	480 (8.1)
Moldova	45 (1.7)	481 (4.6)	20 (1.1)	458 (5.3)	9 (0.8)	442 (8.5)	4 (0.6)	427 (13.4)	22 (1.2)	435 (7.8)
Morocco	43 (0.9)	349 (6.3)	22 (0.9)	308 (6.9)	6 (0.4)	314 (13.2)	6 (0.7)	285 (16.5)	23 (0.7)	322 (7.4)
Netherlands	22 (2.8)	583 (9.2)	30 (1.8)	557 (5.3)	29 (2.6)	511 (9.3)	1 (0.2)	~ ~	18 (0.9)	537 (7.6)
New Zealand	52 (1.5)	536 (5.7)	16 (0.7)	507 (4.6)	16 (0.8)	473 (6.9)	3 (0.3)	450 (14.5)	13 (0.7)	473 (8.5)
Philippines	64 (2.0)	382 (7.9)	10 (0.6)	294 (9.9)	9 (0.6)	271 (11.1)	8 (0.8)	273 (10.3)	8 (0.7)	309 (8.8)
Romania	43 (2.0)	515 (6.0)	10 (0.6)	447 (8.4)	25 (1.3)	456 (7.2)	4 (0.8)	461 (18.7)	19 (1.3)	422 (7.1)
Russian Federation	61 (1.5)	547 (6.0)	19 (1.0)	518 (6.7)	7 (0.5)	493 (11.3)	2 (0.5)	~ ~	11 (0.7)	496 (9.2)
Singapore	57 (2.1)	597 (7.3)	26 (1.6)	529 (7.7)	2 (0.3)	~ ~	0 (0.0)	~ ~	15 (0.7)	544 (11.1)
Slovak Republic	46 (2.3)	568 (3.6)	11 (0.8)	539 (7.0)	33 (1.6)	500 (4.2)	2 (0.3)	~ ~	8 (0.7)	507 (7.9)
Slovenia	40 (1.0)	576 (3.6)	32 (0.9)	514 (4.0)	18 (0.7)	501 (6.5)	4 (0.4)	454 (7.3)	6 (0.5)	510 (8.4)
South Africa	55 (1.4)	268 (10.3)	18 (0.9)	226 (11.6)	10 (0.6)	215 (12.3)	9 (0.7)	194 (11.8)	8 (0.6)	215 (9.7)
Thailand	55 (1.6)	502 (4.5)	4 (0.3)	486 (13.0)	23 (1.2)	461 (5.3)	5 (0.5)	440 (10.6)	13 (0.9)	455 (9.4)
Tunisia	59 (1.0)	434 (3.5)	23 (0.7)	423 (9.4)	6 (0.4)	414 (7.9)	2 (0.2)	~ ~	10 (0.5)	431 (8.4)
Turkey	62 (1.3)	452 (4.3)	15 (0.8)	410 (8.2)	8 (0.5)	398 (8.4)	4 (0.4)	380 (16.9)	12 (0.5)	409 (4.4)
United States	78 (1.2)	530 (4.2)	9 (0.6)	484 (6.5)	5 (0.4)	447 (7.3)	1 (0.1)	~ ~	7 (0.5)	484 (7.1)
International Avg.	52 (0.3)	515 (0.9)	17 (0.1)	470 (1.2)	15 (0.2)	445 (1.4)	3 (0.1)	397 (3.8)	14 (0.1)	461 (1.2)

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

Background data provided by students.

* Response categories were defined by each country to conform to their own educational system and may not be strictly comparable across countries. See reference exhibit R1.6 for country modifications to the definitions of educational levels.

¹ In most countries, finish university is defined as completion of at least a 4-year degree program at a university or an equivalent institute of higher education.² In some countries, may include higher post-secondary education levels.³ In most countries, finish secondary school corresponds to completion of an upper-secondary track terminating after 11 to 13 years of schooling (ISCED level 3 vocational, apprenticeship or academic tracks).

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

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

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

An "*" indicates a 70-84% student response rate.

How Much of Their Out-of-School Time Do Students Spend on Homework During the School Week?

One of the major ways that students can consolidate and extend classroom learning is to spend time out of school studying or doing homework in school subjects. Well-chosen homework assignments can reinforce classroom learning, and by providing a challenge can encourage students to extend their understanding of the subject matter. Homework also allows students who are having trouble keeping up with their classmates to review material taught in class.

To summarize the amount of time typically devoted to homework in each country, TIMSS constructed an index of out-of-school study time (OST) that assigns students to a high, medium, or low level on the basis of the amount of time they reported studying science, mathematics, and other subjects. Students at the high level reported spending more than three hours each day out of school studying all subjects combined. Students at the medium level reported spending more than one hour but not more than three, while those at the low level reported one hour or less per day of out-of-school study.




Exhibit 4.5 presents the percentages of students at the various levels of this index across countries, and their average science achievement. On average across countries, 38 percent of eighth-grade students were at the high level of the out-of-school study time index, and a further 48 percent were at the medium level. Only 14 percent, on average, were at the low level, with just one hour of homework or less each day. Countries with a heavy emphasis on homework included Iran, Malaysia, Singapore, Italy, Jordan, Tunisia, Turkey, Macedonia, Romania, Moldova, and Morocco, where more than half of the students were at the high level of the index. In these countries, homework seems to be an important part of teachers' instructional strategy. In contrast, there seems to be relatively little emphasis on homework in Australia, Chile, Chinese Taipei, the Czech Republic, Hong Kong, Japan, Korea, New Zealand, and the United States, where one-fifth or more of students were at the low level of the index.

On average internationally, and in all countries, students at the low level of the index also had lower average science achievement than their classmates who reported more out-of-school study time. However, spending a lot of time studying was not usually associated with higher achievement. On average internationally and in many countries, students at the medium level of the study index had average achievement that was as high as or higher than that of students at the high level. This pattern suggests that, compared with their higher-achieving counterparts, the lower-per-



forming students may do less homework, either because they simply do not do it or because their teachers do not assign it, or more homework, perhaps in an effort to keep up academically.

Exhibit 4.6 presents information on trends in the index of out-of-school study time from 1995 to 1999. Internationally on average there was no change. Among countries with a significant decrease in the percentage at the high level were Cyprus, Hong Kong, Japan, Korea, Singapore, and Thailand. In contrast, Canada, Latvia (LSS), Lithuania, and the Russian Federation had increased percentages at the high level of the index.

More detailed information on the amount of time students reported

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Exhibit 4.5 Index of Out-of-School Study Time (OST)

Index of Out-of-School Study Time

Index based on students' responses to three questions about out-of-school study time: time spent after school studying science or doing science homework; time spent after school studying mathematics or doing mathematics homework; time spent after school studying or doing homework in school subjects other than science and mathematics (see reference exhibit R1.11). Number of hours based on: no time = 0, less than 1 hour = 0.5, 1-2 hours = 1.5, 3-5 hours = 4, more than 5 hours = 7. High level indicates more than three hours studying all subjects combined. Medium level indicates more than one hour to three hours studying all subjects combined. Low level indicates one hour or less studying all subjects combined.

		High OST		Medium OST		Low OST	
		Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Iran, Islamic Rep.	r	69 (1.1)	457 (4.6)	27 (0.9)	448 (5.5)	4 (0.4)	426 (13.5)
Malaysia		65 (1.2)	495 (4.6)	31 (1.0)	495 (6.0)	3 (0.3)	465 (11.8)
Singapore		59 (1.2)	573 (7.2)	35 (0.9)	571 (9.8)	7 (0.6)	514 (13.3)
Italy		58 (1.3)	504 (4.4)	36 (1.2)	497 (5.0)	6 (0.6)	419 (8.6)
Jordan	s	58 (1.2)	475 (4.4)	33 (0.9)	465 (6.2)	8 (0.7)	396 (12.6)
Tunisia	r	58 (0.9)	432 (3.2)	34 (0.8)	439 (5.5)	8 (0.6)	432 (7.5)
Turkey	r	56 (1.3)	444 (4.1)	39 (1.0)	433 (4.5)	6 (0.5)	408 (13.0)
Macedonia, Rep. of	r	55 (1.3)	475 (5.5)	39 (1.1)	471 (5.0)	6 (0.5)	445 (9.7)
Romania	r	55 (1.6)	488 (5.3)	33 (1.1)	467 (7.2)	12 (1.0)	444 (9.2)
Moldova	r	52 (1.3)	469 (4.3)	38 (1.1)	468 (5.8)	10 (0.8)	441 (8.5)
Morocco	s	51 (1.5)	338 (4.5)	34 (1.1)	330 (4.4)	15 (0.8)	327 (11.1)
Russian Federation		48 (1.3)	541 (6.3)	46 (1.2)	536 (7.0)	6 (0.6)	493 (9.7)
Philippines	s	48 (0.9)	364 (8.2)	45 (0.9)	375 (8.7)	7 (0.5)	329 (11.0)
Indonesia		47 (1.4)	441 (5.3)	43 (1.0)	442 (4.5)	11 (0.8)	428 (8.4)
Thailand		45 (1.2)	494 (4.7)	47 (1.0)	479 (4.7)	8 (0.5)	448 (5.6)
Bulgaria		45 (1.5)	533 (6.1)	40 (1.0)	525 (5.7)	15 (1.2)	494 (8.7)
South Africa	s	44 (1.3)	260 (9.8)	41 (0.7)	273 (11.3)	15 (1.1)	217 (13.7)
Belgium (Flemish)		41 (1.3)	529 (3.0)	52 (1.1)	545 (3.6)	7 (1.0)	514 (14.4)
Hungary		40 (1.3)	554 (3.8)	52 (1.1)	560 (3.9)	8 (0.6)	516 (9.2)
Latvia (LSS)		40 (1.2)	498 (5.3)	54 (1.2)	512 (5.3)	6 (0.5)	484 (11.2)
Cyprus		35 (1.1)	465 (4.6)	51 (1.1)	475 (3.4)	14 (0.7)	413 (8.3)
Lithuania [†]		35 (1.2)	495 (4.8)	57 (1.2)	493 (4.7)	8 (0.8)	451 (8.2)
Israel		35 (1.5)	462 (5.5)	53 (1.2)	489 (4.2)	12 (0.8)	465 (8.7)
Slovenia		32 (1.0)	522 (4.5)	55 (0.9)	544 (3.5)	13 (0.8)	532 (7.0)
Chile		29 (0.9)	424 (4.6)	51 (0.7)	432 (4.5)	20 (0.8)	416 (4.9)
Slovak Republic		24 (0.9)	526 (4.6)	65 (1.1)	541 (3.5)	10 (0.7)	536 (6.9)
Canada		24 (0.8)	519 (3.3)	59 (1.0)	542 (2.3)	18 (0.8)	531 (4.6)
Chinese Taipei		23 (1.0)	604 (4.0)	42 (0.8)	581 (4.5)	35 (1.3)	533 (5.7)
United States		22 (0.8)	520 (5.1)	56 (0.9)	531 (4.2)	23 (1.3)	492 (6.5)
Netherlands		19 (1.4)	519 (12.8)	74 (1.3)	553 (6.9)	7 (1.0)	543 (11.4)
Australia		17 (0.9)	539 (5.9)	61 (1.4)	554 (4.2)	22 (1.4)	511 (5.9)
New Zealand		17 (1.0)	501 (7.3)	63 (1.3)	531 (4.7)	20 (1.2)	470 (6.4)
Japan		17 (0.9)	558 (5.9)	49 (0.9)	558 (2.7)	35 (1.3)	535 (3.7)
Hong Kong, SAR		16 (0.8)	545 (6.0)	42 (0.9)	541 (3.5)	42 (1.4)	513 (4.5)
Czech Republic		16 (1.1)	522 (5.3)	62 (1.4)	547 (4.6)	22 (1.3)	537 (6.3)
Korea, Rep. of		16 (0.7)	574 (4.6)	43 (0.7)	561 (3.7)	41 (1.0)	527 (2.9)
Finland		9 (0.7)	516 (8.3)	82 (1.0)	541 (3.5)	9 (0.8)	520 (9.2)
England		--	--	--	--	--	--
International Avg.		38 (0.2)	491 (1.0)	48 (0.2)	496 (0.9)	14 (0.1)	464 (1.3)

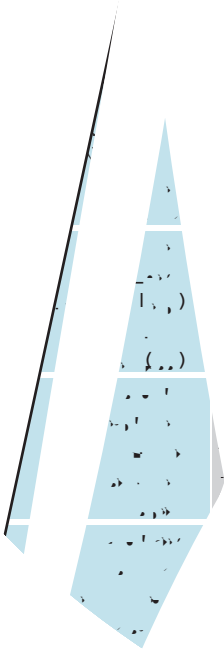
SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1998-1999.

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

A dash (–) indicates data are not available.

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

An "r" indicates a 70-84% student response rate. An "s" indicates a 50-69% student response rate.



SOURCE:



	16 (0.7)	17 (0.9)	1 (1.1)	58 (1.1)	61 (1.4)	2 (1.7)	26 (1.2)	22 (1.4)	-3 (1.9)
	42 (1.6)	41 (1.3)	-1 (2.0)	52 (1.3)	52 (1.1)	-1 (1.7)	6 (0.7)	7 (1.0)	1 (1.2)
	19 (0.9)	24 (0.8)	4 (1.3)	55 (1.2)	59 (1.0)	4 (1.6)	26 (1.5)	18 (0.8)	-8 (1.7)
	41 (0.9)	35 (1.1)	-5 (1.4)	44 (0.9)	51 (1.1)	7 (1.4)	15 (0.8)	14 (0.7)	-2 (1.0)
	13 (0.7)	16 (1.1)	3 (1.3)	60 (1.3)	62 (1.4)	2 (1.9)	27 (1.6)	22 (1.3)	-5 (2.1)
	28 (1.1)	16 (0.8)	-12 (1.4)	50 (1.0)	42 (0.9)	-8 (1.4)	22 (1.4)	42 (1.4)	20 (2.0)
	39 (1.4)	40 (1.3)	2 (1.9)	53 (1.3)	52 (1.1)	0 (1.7)	9 (0.7)	8 (0.6)	-1 (0.9)
	74 (1.6)	69 (1.1)	-4 (1.9)	24 (1.4)	27 (0.9)	3 (1.7)	3 (0.4)	4 (0.4)	2 (0.6)
	31 (1.9)	33 (1.7)	2 (2.5)	54 (1.7)	55 (1.4)	1 (2.2)	14 (1.3)	12 (0.9)	-3 (1.6)
	60 (1.6)	60 (1.6)	0 (2.2)	34 (1.4)	34 (1.4)	1 (2.0)	6 (0.7)	6 (0.7)	-1 (1.0)
	27 (1.0)	17 (0.9)	-10 (1.3)	52 (0.9)	49 (0.9)	-3 (1.3)	21 (1.1)	35 (1.3)	14 (1.7)
	27 (1.2)	16 (0.7)	-11 (1.4)	50 (1.1)	43 (0.7)	-6 (1.3)	24 (1.0)	41 (1.0)	17 (1.4)

Background data provided by students.

[†] Countries with unapproved sampling procedures at the classroom level in 1995.

[§] International average is for countries that participated and met sampling guidelines in both 1995 and 1999. Trend notes: Because coverage fell below 65% in 1995 and 1999, Latvia is annotated LSS for Latvian-Speaking Schools only. Lithuania tested later in 1999 than in 1995, at the beginning of the next school year. In 1995, Italy and Israel were unable to cover their International Desired Population; 1999 data are based on their comparable populations.

Background data for Bulgaria and South Africa are unavailable for 1995.

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

A dash (-) indicates data are not available.

An "r" indicates a 70-84% student response rate, based on the lower response rate in either 1995 or 1999. An "s" indicates a 50-69% student response rate, based on the lower response rate in either 1995 or 1999.

Exhibit 4.7

Total Amount of Out-of-School Time Students Spend Studying Science or Doing Science Homework on a Normal School Day

TIMSS¹⁹⁹⁹
8th grade
Science

	One Hour or More		Less Than One Hour		No Time		Average Hours ¹
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement	
Australia	14 (0.8)	533 (6.9)	65 (1.4)	553 (4.4)	21 (1.4)	510 (6.6)	0.6 (0.02)
Belgium (Flemish)	31 (1.4)	520 (3.7)	55 (1.2)	543 (3.9)	14 (1.1)	538 (8.8)	0.8 (0.03)
Bulgaria	45 (1.5)	528 (7.0)	38 (1.2)	523 (6.7)	17 (1.6)	505 (8.7)	1.1 (0.03)
Canada	18 (0.7)	515 (4.4)	62 (0.9)	541 (2.3)	20 (1.0)	525 (4.1)	0.6 (0.01)
Chile	30 (1.0)	417 (5.4)	53 (0.8)	431 (4.7)	17 (0.7)	415 (4.9)	0.9 (0.02)
Chinese Taipei	20 (0.9)	607 (4.7)	42 (0.9)	588 (4.4)	38 (1.3)	530 (5.7)	0.6 (0.02)
Cyprus	25 (1.0)	461 (5.0)	57 (0.9)	474 (3.1)	18 (0.7)	425 (6.6)	0.7 (0.02)
Czech Republic	20 (1.1)	530 (5.0)	62 (1.2)	546 (4.5)	18 (1.1)	529 (7.0)	0.6 (0.02)
England	--	--	--	--	--	--	--
Finland	8 (0.6)	511 (10.8)	84 (0.9)	541 (3.5)	8 (0.8)	514 (9.7)	0.5 (0.01)
Hong Kong, SAR	13 (0.6)	539 (6.6)	48 (1.0)	543 (4.0)	39 (1.3)	513 (4.2)	0.5 (0.01)
Hungary	45 (1.3)	554 (4.0)	49 (1.2)	558 (4.0)	6 (0.6)	505 (8.6)	1.1 (0.02)
Indonesia	47 (1.1)	435 (5.9)	40 (0.9)	442 (4.9)	13 (0.8)	432 (6.7)	1.1 (0.02)
Iran, Islamic Rep.	68 (1.1)	451 (4.6)	29 (1.0)	453 (4.1)	3 (0.3)	432 (16.0)	1.6 (0.03)
Israel	23 (1.1)	450 (6.5)	60 (1.1)	487 (4.6)	17 (0.8)	449 (7.8)	0.8 (0.02)
Italy	45 (1.4)	498 (4.3)	48 (1.4)	501 (4.3)	7 (0.7)	435 (8.6)	1.0 (0.02)
Japan	12 (0.7)	555 (7.5)	50 (1.2)	560 (2.3)	39 (1.4)	535 (3.2)	0.4 (0.01)
Jordan	56 (1.1)	465 (3.7)	37 (1.0)	466 (5.0)	7 (0.5)	396 (9.2)	1.5 (0.03)
Korea, Rep. of	13 (0.6)	578 (4.6)	42 (0.7)	564 (3.1)	45 (0.8)	527 (2.9)	0.4 (0.01)
Latvia (LSS)	25 (1.0)	496 (6.3)	66 (1.0)	509 (5.4)	9 (0.6)	480 (9.9)	0.8 (0.02)
Lithuania [‡]	25 (1.2)	494 (4.9)	66 (1.2)	493 (4.8)	10 (0.9)	456 (8.2)	0.8 (0.02)
Macedonia, Rep. of	72 (1.2)	470 (5.3)	25 (1.0)	453 (5.9)	3 (0.3)	428 (15.3)	2.0 (0.05)
Malaysia	60 (1.2)	495 (4.9)	36 (1.1)	493 (5.1)	4 (0.3)	460 (10.6)	1.3 (0.02)
Moldova	63 (1.2)	467 (4.2)	29 (1.0)	460 (5.8)	7 (0.6)	439 (10.8)	1.7 (0.04)
Morocco ^r	51 (1.7)	335 (6.4)	35 (1.2)	330 (4.9)	14 (0.8)	323 (12.4)	1.5 (0.06)
Netherlands	15 (1.3)	507 (12.9)	80 (1.5)	555 (6.4)	6 (0.8)	530 (11.6)	0.6 (0.02)
New Zealand	15 (1.0)	491 (7.7)	66 (1.2)	528 (4.8)	18 (1.1)	472 (6.8)	0.6 (0.02)
Philippines	54 (0.9)	348 (7.7)	41 (0.8)	365 (9.7)	5 (0.4)	294 (14.4)	1.7 (0.04)
Romania	48 (1.3)	484 (5.6)	36 (1.0)	479 (7.8)	16 (0.9)	451 (8.4)	1.2 (0.03)
Russian Federation	61 (1.3)	536 (6.4)	34 (1.3)	534 (7.1)	5 (0.4)	494 (8.4)	1.5 (0.03)
Singapore	55 (1.2)	573 (7.1)	38 (1.1)	573 (9.9)	7 (0.6)	507 (13.2)	1.2 (0.02)
Slovak Republic	25 (1.2)	532 (4.8)	67 (1.2)	539 (3.7)	8 (0.7)	521 (7.5)	0.8 (0.02)
Slovenia	38 (1.1)	521 (4.2)	52 (1.1)	546 (3.7)	10 (0.8)	526 (6.7)	0.9 (0.02)
South Africa	47 (1.3)	237 (8.7)	39 (1.1)	269 (11.1)	15 (1.8)	211 (14.0)	1.5 (0.05)
Thailand	42 (1.2)	493 (5.2)	50 (1.1)	480 (4.8)	8 (0.5)	455 (4.8)	1.0 (0.02)
Tunisia	48 (1.0)	425 (2.8)	39 (0.9)	434 (5.3)	13 (0.8)	438 (8.2)	1.2 (0.03)
Turkey	51 (1.2)	444 (4.4)	44 (0.9)	433 (4.0)	6 (0.5)	409 (12.9)	1.2 (0.02)
United States	16 (0.8)	502 (5.9)	60 (1.3)	532 (4.6)	24 (1.4)	495 (6.4)	0.6 (0.01)
International Avg.	36 (0.2)	486 (1.0)	49 (0.2)	495 (1.0)	14 (0.2)	462 (1.2)	1.0 (0.00)

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

Background data provided by students.

¹ Average hours based on: No time=0; less than 1 hour=5; 1-2 hours=1.5; 3-5 hours=4; more than 5 hours=7.[‡] Lithuania tested the same cohort of students as other countries, but later in 1999, at the beginning of the next school year.

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

A dash (–) indicates data are not available.

An "r" indicates a 70-84% student response rate.

Exhibit 4.8 Index of Students' Self-Concept in the Sciences (SCS)

Index of Students' Self-Concept in the Sciences

Index based on students' responses to four statements about their science ability:

1) I would like science much more if it were not so difficult; 2) although I do my best, science is more difficult for me than for many of my classmates; 3) nobody can be good in every subject, and I am just not talented in science; 4) science is not one of my strengths. In countries where science is taught as separate subjects, students were asked about each subject area separately.

High level indicates student disagrees or strongly disagrees with all four statements. Low level indicates student agrees or strongly agrees with all four statements. Medium level includes all other possible combinations of responses.

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	High SCS		Medium SCS		Low SCS	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
General/Integrated Science (SCS-G)						
United States	45 (1.2)	550 (4.5)	40 (0.8)	505 (4.4)	15 (0.7)	459 (6.2)
England	42 (1.3)	573 (5.8)	45 (1.2)	528 (4.6)	13 (0.8)	486 (8.6)
Israel	40 (1.1)	515 (3.5)	47 (0.9)	457 (5.5)	13 (0.8)	399 (10.5)
Italy	38 (1.3)	523 (3.6)	49 (1.1)	487 (4.4)	12 (0.7)	441 (6.3)
Canada	38 (0.8)	562 (2.5)	45 (0.7)	526 (2.9)	17 (0.6)	490 (4.7)
Australia	37 (1.2)	581 (4.4)	45 (1.0)	531 (4.8)	19 (1.0)	486 (5.3)
Tunisia	36 (0.9)	445 (4.5)	55 (0.8)	424 (3.2)	9 (0.5)	408 (5.0)
Iran, Islamic Rep.	35 (1.1)	478 (3.6)	53 (1.0)	443 (4.0)	12 (0.7)	398 (6.3)
Turkey	33 (1.0)	461 (5.4)	48 (0.7)	431 (4.2)	19 (0.7)	410 (5.7)
New Zealand	32 (1.2)	553 (5.4)	49 (1.1)	502 (4.4)	19 (0.8)	467 (6.5)
Chile	27 (1.0)	461 (5.3)	51 (0.9)	420 (4.0)	22 (0.9)	381 (6.0)
Jordan	25 (1.0)	513 (3.7)	53 (0.9)	451 (3.7)	21 (0.8)	413 (5.3)
Cyprus	23 (1.0)	511 (3.5)	55 (1.1)	460 (3.5)	22 (0.9)	412 (4.0)
Malaysia	23 (1.0)	524 (5.7)	69 (1.0)	486 (4.4)	8 (0.6)	461 (6.9)
Singapore	21 (1.1)	616 (8.9)	59 (0.8)	562 (7.8)	19 (0.9)	533 (8.7)
Japan	21 (0.6)	592 (4.1)	63 (0.6)	543 (2.3)	16 (0.6)	521 (4.4)
Hong Kong, SAR	20 (0.8)	556 (4.2)	58 (0.7)	532 (3.4)	22 (0.8)	504 (5.9)
Chinese Taipei ^a	14 (0.6)	617 (5.1)	61 (0.8)	572 (4.9)	25 (0.8)	538 (4.0)
South Africa	12 (1.1)	358 (19.2)	58 (0.9)	243 (7.5)	30 (1.1)	202 (6.2)
Thailand	12 (0.6)	512 (6.0)	53 (0.9)	488 (4.5)	35 (1.0)	466 (4.7)
Korea, Rep. of	12 (0.5)	601 (5.0)	80 (0.6)	547 (2.6)	8 (0.4)	490 (4.5)
Indonesia ^b	8 (0.6)	465 (6.3)	73 (0.7)	438 (4.5)	19 (0.8)	416 (5.2)
Philippines	8 (0.6)	424 (11.5)	67 (0.9)	354 (7.6)	25 (0.9)	319 (8.5)
International Avg.	26 (0.2)	521 (1.4)	56 (0.2)	475 (1.0)	18 (0.2)	439 (1.3)
Earth Science (SCS-E)						
Russian Federation	68 (1.2)	545 (6.4)	22 (0.9)	519 (7.2)	10 (0.6)	488 (8.1)
Netherlands	50 (1.7)	555 (7.3)	43 (1.4)	538 (8.3)	7 (0.6)	527 (9.8)
Slovak Republic	49 (1.7)	551 (4.9)	39 (1.2)	531 (3.9)	12 (0.9)	495 (8.3)
Czech Republic	48 (1.5)	552 (4.8)	43 (1.2)	533 (4.6)	9 (0.7)	506 (8.2)
Macedonia, Rep. of	48 (1.5)	501 (4.4)	39 (1.2)	444 (5.3)	13 (0.9)	390 (10.0)
Finland	47 (1.4)	555 (3.9)	36 (1.0)	530 (3.9)	16 (1.1)	495 (7.6)
Hungary	47 (1.4)	566 (3.8)	41 (1.2)	551 (4.3)	13 (0.8)	516 (7.4)
Moldova	40 (1.6)	486 (4.4)	47 (1.3)	452 (4.8)	13 (0.8)	427 (7.9)
Bulgaria	38 (1.7)	539 (4.8)	42 (1.4)	521 (7.6)	20 (1.0)	491 (6.5)
Belgium (Flemish)	36 (1.1)	555 (4.5)	49 (1.3)	535 (3.5)	15 (0.9)	511 (5.3)
Romania	23 (1.3)	511 (6.3)	52 (1.1)	479 (6.3)	25 (1.1)	436 (6.8)
Morocco ^r	14 (0.8)	351 (7.4)	57 (1.2)	324 (5.7)	29 (1.0)	317 (6.3)
Latvia (LSS)	--	--	--	--	--	--
Lithuania [†]	--	--	--	--	--	--
Slovenia	--	--	--	--	--	--
International Avg.	42 (0.4)	522 (1.5)	43 (0.3)	496 (1.5)	15 (0.3)	467 (2.0)

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

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

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

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




^c Netherlands: Data in physics panel pertain to physics/chemistry course.

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

A dash (–) indicates data are not available.

An "r" indicates a 70-84% student response rate.

Exhibit 4.8: Index of Students' Self-Concept in the Sciences (SCS) (Continued 2)

	High SCS		Medium SCS		Low SCS	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Biology (SCS-B)						
 Russian Federation	78 (1.2)	542 (6.3)	17 (0.9)	510 (7.6)	5 (0.5)	481 (11.7)
Netherlands	54 (1.4)	556 (8.1)	39 (1.3)	535 (7.3)	7 (0.6)	514 (9.8)
Hungary	53 (1.5)	568 (4.1)	39 (1.2)	544 (5.1)	9 (0.7)	501 (8.5)
Slovenia	52 (1.3)	547 (3.8)	42 (1.2)	524 (3.7)	6 (0.5)	496 (8.4)
Czech Republic	52 (1.5)	551 (4.8)	40 (1.2)	532 (4.8)	8 (0.8)	506 (7.3)
Latvia (LSS)	49 (1.5)	515 (5.9)	44 (1.4)	495 (5.1)	6 (0.7)	465 (8.2)
Finland	49 (1.3)	554 (4.0)	39 (1.0)	528 (3.6)	12 (0.9)	489 (7.9)
Macedonia, Rep. of	45 (1.1)	503 (4.0)	42 (1.0)	445 (6.1)	12 (0.9)	386 (8.6)
Bulgaria	42 (1.9)	543 (6.9)	43 (1.5)	515 (5.4)	15 (1.4)	484 (5.9)
Belgium (Flemish)	40 (1.2)	557 (3.9)	48 (1.2)	529 (2.9)	12 (0.8)	496 (6.3)
Lithuania [†]	39 (1.6)	513 (4.6)	52 (1.4)	480 (4.5)	8 (0.7)	438 (10.3)
Slovak Republic	39 (1.7)	557 (4.6)	46 (1.3)	535 (3.1)	15 (1.0)	488 (5.6)
Moldova	35 (1.5)	486 (5.1)	52 (1.3)	455 (4.3)	13 (1.0)	429 (8.5)
Romania	24 (1.3)	509 (7.4)	55 (1.0)	477 (5.7)	20 (1.2)	432 (5.9)
Morocco ^r	16 (0.7)	358 (7.2)	58 (0.8)	325 (3.7)	27 (0.8)	318 (7.1)
International Avg.	45 (0.4)	524 (1.4)	44 (0.3)	495 (1.2)	12 (0.2)	461 (2.1)
Physics (SCS-P)						
 Russian Federation	63 (1.1)	548 (6.5)	24 (0.8)	520 (7.0)	13 (0.8)	490 (10.0)
Netherlands ^c	44 (2.4)	563 (8.2)	45 (1.8)	533 (6.9)	11 (1.2)	526 (8.4)
Bulgaria	35 (1.8)	546 (6.3)	41 (0.9)	520 (7.1)	24 (1.6)	491 (5.1)
Slovenia	35 (1.2)	557 (4.1)	49 (1.1)	532 (4.1)	16 (0.8)	494 (4.8)
Hungary	34 (1.4)	579 (5.8)	46 (1.1)	549 (4.0)	20 (0.9)	519 (5.5)
Macedonia, Rep. of	33 (1.3)	498 (4.6)	44 (1.0)	461 (5.4)	22 (1.0)	419 (7.6)
Belgium (Flemish)	33 (1.8)	561 (6.9)	49 (1.5)	539 (5.9)	18 (1.1)	530 (7.5)
Czech Republic	33 (1.6)	564 (5.2)	47 (1.1)	534 (4.6)	20 (1.3)	512 (5.6)
Finland	31 (1.2)	559 (5.2)	40 (1.2)	534 (5.2)	29 (1.1)	504 (3.4)
Moldova	28 (1.3)	488 (5.2)	54 (1.4)	457 (4.9)	18 (1.1)	440 (7.6)
Slovak Republic	27 (1.3)	568 (6.0)	48 (1.1)	536 (3.2)	25 (1.0)	502 (4.4)
Latvia (LSS)	24 (1.4)	526 (5.3)	49 (1.1)	505 (5.4)	26 (1.3)	480 (6.2)
Morocco ^r	22 (1.0)	372 (7.3)	56 (0.8)	324 (3.8)	22 (0.9)	299 (8.3)
Lithuania [†]	22 (1.2)	526 (6.5)	55 (1.1)	488 (4.3)	23 (1.2)	458 (4.9)
Romania	13 (0.9)	496 (10.2)	47 (1.2)	483 (6.8)	40 (1.2)	462 (5.5)
International Avg.	32 (0.4)	530 (1.6)	46 (0.3)	501 (1.5)	22 (0.3)	475 (2.0)
Chemistry (SCS-C)						
 Russian Federation	53 (1.6)	551 (6.2)	28 (0.8)	524 (7.8)	19 (1.2)	499 (9.2)
Finland	40 (1.3)	562 (4.9)	40 (1.2)	529 (4.6)	20 (1.0)	498 (3.8)
Slovak Republic	35 (1.5)	558 (5.1)	46 (1.1)	535 (2.9)	19 (1.2)	500 (4.6)
Czech Republic	32 (1.7)	561 (5.6)	48 (1.3)	537 (3.8)	20 (1.4)	511 (5.9)
Macedonia, Rep. of	30 (1.2)	498 (5.3)	45 (0.9)	464 (5.4)	25 (1.2)	424 (7.9)
Slovenia	29 (1.1)	562 (4.3)	51 (0.9)	531 (3.9)	20 (0.9)	502 (5.3)
Bulgaria	28 (1.4)	541 (6.2)	43 (1.2)	524 (6.3)	29 (1.4)	503 (6.6)
Hungary	27 (1.3)	577 (4.9)	48 (1.0)	552 (3.8)	26 (1.1)	528 (5.0)
Moldova	25 (1.2)	481 (4.9)	56 (1.1)	461 (4.9)	20 (0.9)	444 (6.8)
Latvia (LSS)	24 (1.4)	525 (6.4)	51 (1.0)	506 (6.0)	25 (1.3)	479 (4.3)
Morocco ^r	17 (0.8)	363 (8.7)	57 (0.8)	324 (5.2)	27 (0.7)	309 (6.7)
Romania	15 (0.9)	498 (9.5)	47 (1.1)	481 (6.2)	39 (1.2)	462 (6.1)
Lithuania [†]	15 (0.9)	517 (6.3)	57 (1.1)	494 (4.4)	28 (1.2)	465 (5.0)
Belgium (Flemish)	--	--	--	--	--	--
Netherlands	--	--	--	--	--	--
International Avg.	28 (0.4)	523 (1.5)	47 (0.3)	497 (1.5)	24 (0.3)	471 (1.8)

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

	High SCS		Medium SCS		Low SCS	
	Percent of Students		Percent of Students		Percent of Students	
	Girls	Boys	Girls	Boys	Girls	Boys

General/Integrated Science (SCS-G)






<p>33 (1.5)</p> <p>35 (1.3)</p> <p>29 (1.5)</p> <p>10 (0.6)</p> <p>23 (1.3)</p>		▲		▲		
<p>36 (1.9)</p> <p>16 (1.0.38 410. 5714 T-398.80)▲</p> <p>16 (1.0.38 410. 468.6((1.547 0 0 7</p>		▲		▲		▲
			▲			▲
			▲			▲
			▲			▲
International Avg.			▲			▲

Earth Science (SCS-E)



			▲			▲
	▲					▲
	▲		▲			▲
International Avg.			▲			▲

Exhibit 4.9: Index of Students' Self-Concept in the Sciences (SCS) by Gender* (Continued)

		High SCS		Medium SCS		Low SCS	
		Percent of Students		Percent of Students		Percent of Students	
		Girls	Boys	Girls	Boys	Girls	Boys
Biology (SCS-B)							
	Belgium (Flemish)	42 (2.1)	39 (1.6)	47 (2.3)	49 (1.6)	10 (1.4)	13 (1.3)
	Bulgaria	48 (2.9)	36 (2.9)	40 (2.2)	47 (3.2)	13 (1.5)	17 (1.8)
	Czech Republic	57 (1.9) ▲	47 (1.5)	38 (1.7)	43 (1.3)	6 (0.9)	10 (1.1) ▲
	Finland	47 (1.9)	50 (1.8)	41 (1.5)	37 (1.3)	11 (1.2)	13 (1.3)
	Hungary	59 (1.9) ▲	46 (1.7)	35 (1.6)	42 (1.4) ▲	6 (0.8)	12 (1.0) ▲
	Latvia (LSS)	53 (2.0) ▲	45 (1.8)	42 (1.9)	47 (1.6)	5 (0.7)	8 (1.1)
	Lithuania †	42 (1.9)	37 (1.8)	52 (1.7)	53 (1.7)	6 (0.8)	11 (1.0) ▲
	Macedonia, Rep. of	53 (1.7) ▲	37 (1.4)	39 (1.6)	46 (1.3) ▲	8 (0.8)	17 (1.2) ▲
	Moldova	36 (1.9)	34 (1.8)	54 (1.7)	50 (1.5)	11 (1.0)	16 (1.4) ▲
	Morocco s	18 (1.2)	14 (0.9)	54 (1.3)	60 (1.1) ▲	28 (1.6)	25 (1.1)
	Netherlands	56 (1.7)	52 (1.9)	39 (1.5)	40 (1.9)	5 (0.8)	8 (1.1)
	Romania	29 (1.8) ▲	20 (1.4)	55 (1.5)	55 (1.5)	16 (1.4)	25 (1.5) ▲
	Russian Federation	82 (1.3) ▲	73 (1.5)	16 (1.0)	19 (1.1)	2 (0.4)	8 (0.8) ▲
	Slovak Republic	42 (2.2)	36 (2.1)	45 (1.8)	47 (1.7)	13 (1.1)	17 (1.2) ▲
	Slovenia	61 (1.7) ▲	43 (1.5)	36 (1.7)	50 (1.5) ▲	4 (0.6)	7 (0.7) ▲
	International Avg.	48 (0.5) ▲	41 (0.5)	42 (0.4)	46 (0.4) ▲	10 (0.3)	14 (0.3) ▲
Physics (SCS-P)							
	Belgium (Flemish)	30 (2.5)	36 (2.2)	50 (2.0)	47 (1.9)	20 (1.9)	17 (1.0)
	Bulgaria	34 (2.5)	36 (1.9)	41 (1.6)	42 (1.5)	25 (1.9)	22 (1.8)
	Czech Republic	26 (1.8)	40 (1.8) ▲	51 (1.7) ▲	43 (1.4)	23 (1.4)	17 (1.8)
	Finland	17 (1.3)	46 (1.6) ▲	45 (1.5) ▲	36 (1.5)	39 (1.7) ▲	18 (1.2)
	Hungary	28 (1.7)	40 (1.7) ▲	50 (1.6) ▲	41 (1.3)	22 (1.2)	19 (1.1)
	Latvia (LSS)	15 (1.3)	34 (2.0) ▲	52 (1.3)	47 (1.7)	33 (1.8) ▲	19 (1.3)
	Lithuania †	17 (1.5)	27 (1.7) ▲	56 (1.6)	55 (1.6)	27 (1.8) ▲	18 (1.2)
	Macedonia, Rep. of	35 (1.5)	32 (1.5)	44 (1.2)	45 (1.4)	21 (1.2)	24 (1.2)
	Moldova r	25 (1.5)	31 (1.6)	55 (1.6)	53 (1.7)	19 (1.3)	16 (1.4)
	Morocco	24 (1.7)	21 (1.0)	54 (1.4)	57 (1.1)	22 (1.3)	22 (1.0)
	Netherlands c	35 (3.4)	53 (3.1) ▲	52 (2.4) ▲	38 (2.6)	13 (1.6)	9 (1.6)
	Romania	11 (1.0)	15 (1.1) ▲	48 (1.4)	46 (1.6)	41 (1.7)	39 (1.5)
	Russian Federation	62 (1.2)	64 (1.3)	25 (1.0)	24 (1.0)	14 (0.9)	13 (0.9)
	Slovak Republic	21 (1.4)	34 (2.1) ▲	51 (1.5)	45 (1.8)	29 (1.5) ▲	21 (1.3)
	Slovenia	30 (1.5)	40 (1.5) ▲	50 (1.3)	48 (1.4)	19 (1.3) ▲	12 (0.9)
	International Avg.	27 (0.5)	36 (0.5) ▲	48 (0.4) ▲	44 (0.4)	25 (0.4) ▲	19 (0.3)
Chemistry (SCS-C)							
	Belgium (Flemish)	--	--	--	--	--	--
	Bulgaria	30 (1.8)	26 (1.5)	44 (1.4)	43 (1.6)	27 (1.8)	32 (1.4)
	Czech Republic	31 (2.1)	32 (1.8)	49 (1.6)	47 (1.7)	20 (1.5)	21 (1.7)
	Finland	27 (1.6)	53 (1.7) ▲	46 (1.6) ▲	34 (1.5)	27 (1.5) ▲	13 (1.1)
	Hungary	24 (1.3)	30 (1.6) ▲	49 (1.4)	46 (1.4)	27 (1.4)	24 (1.3)
	Latvia (LSS)	21 (1.6)	26 (1.6) ▲	52 (1.5)	50 (1.3)	28 (1.7)	23 (1.7)
	Lithuania †	13 (1.0)	17 (1.3)	57 (1.6)	58 (1.6)	30 (1.7)	25 (1.4)
	Macedonia, Rep. of	32 (1.6)	27 (1.4)	46 (1.2)	45 (1.3)	22 (1.4)	28 (1.4) ▲
	Moldova	24 (1.6)	25 (1.5)	57 (1.4)	54 (1.5)	18 (1.1)	21 (1.2)
	Morocco r	18 (1.4)	15 (1.1)	53 (1.8)	59 (1.6)	29 (1.4)	25 (1.1)
	Netherlands	--	--	--	--	--	--
	Romania	16 (1.3)	14 (1.1)	47 (1.5)	47 (1.5)	38 (1.9)	39 (1.3)
	Russian Federation	53 (1.7)	52 (2.0)	29 (1.1)	28 (1.1)	18 (1.3)	20 (1.4)
	Slovak Republic	35 (1.8)	36 (2.0)	46 (1.2)	45 (1.8)	19 (1.5)	19 (1.5)
	Slovenia	29 (1.4)	29 (1.4)	52 (1.3)	49 (1.4)	19 (1.3)	22 (1.1)
	International Avg.	27 (0.4)	29 (0.4) ▲	48 (0.4) ▲	47 (0.4)	25 (0.4) ▲	24 (0.4)

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







Exhibit 13 displays trends from 1995 to 1999 in the percentages of girls and boys at the high level of the index. There was very little change over time in the relative attitudes of girls and boys towards science; no country experienced a significant change, positive or negative, in the gender difference in attitudes. For most countries that had a gender difference in 1995, the difference persisted in 1999.



Exhibit 4.10 Index of Students' Positive Attitudes Towards the Sciences (PATS)

Index of Students' Positive Attitudes Towards the Sciences

Index based on students' responses to five statements about science: 1) I like science; 2) I enjoy learning science; 3) science is boring (reversed scale); 4) science is important to everyone's life; 5) I would like a job that involved using science. Average is computed across the five items based on a 4-point scale: 1 = strongly negative; 2 = negative; 3 = positive; 4 = strongly positive. In countries where science is taught as separate subjects, students were asked about each subject area separately. High level indicates average is greater than 3. Medium level indicates average is greater than 2 and less than or equal to 3. Low level indicates average is less than or equal to 2.

	High PATS		Medium PATS		Low PATS	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
General/Integrated Science (PATS-G)						
G Malaysia	72 (1.0)	498 (4.7)	28 (1.0)	480 (5.8)	1 (0.1)	~ ~
Philippines	63 (1.4)	372 (7.3)	35 (1.3)	314 (8.9)	2 (0.2)	~ ~
Tunisia	63 (1.1)	430 (3.8)	33 (0.9)	430 (4.2)	4 (0.4)	429 (6.3)
Jordan	59 (1.4)	472 (3.7)	35 (1.1)	438 (5.1)	5 (0.6)	447 (11.1)
South Africa	58 (1.7)	251 (8.7)	35 (1.1)	234 (9.4)	6 (1.0)	232 (17.9)
Iran, Islamic Rep.	56 (1.4)	454 (4.5)	40 (1.3)	444 (5.1)	4 (0.3)	445 (10.8)
Indonesia ^b	52 (1.3)	435 (4.9)	47 (1.2)	438 (4.5)	0 (0.1)	~ ~
Chile	49 (1.3)	425 (4.5)	45 (1.0)	419 (4.3)	5 (0.5)	428 (8.6)
Singapore	46 (1.4)	594 (8.1)	49 (1.2)	549 (7.8)	5 (0.6)	509 (12.3)
Turkey	45 (1.2)	443 (5.3)	49 (0.9)	431 (4.0)	5 (0.5)	428 (7.3)
Thailand	43 (1.3)	492 (4.9)	55 (1.3)	476 (4.6)	1 (0.2)	~ ~
England	39 (1.1)	559 (5.5)	53 (1.1)	532 (5.6)	8 (0.6)	514 (10.2)
Cyprus	33 (0.9)	494 (2.9)	53 (0.8)	448 (2.7)	13 (0.8)	434 (6.4)
United States	32 (0.9)	543 (5.9)	51 (0.8)	515 (4.5)	16 (0.6)	489 (4.3)
Israel	30 (1.2)	484 (7.2)	50 (0.9)	474 (4.7)	20 (1.1)	461 (6.8)
Canada	30 (0.8)	556 (2.8)	52 (0.8)	530 (2.6)	18 (0.8)	511 (4.0)
Italy	29 (1.2)	514 (4.9)	58 (1.1)	489 (4.2)	13 (0.9)	475 (6.1)
New Zealand	28 (1.0)	525 (7.3)	56 (0.8)	511 (5.3)	16 (0.9)	493 (5.7)
Australia	27 (1.1)	569 (5.5)	53 (1.0)	541 (4.6)	20 (1.2)	507 (6.6)
Chinese Taipei ^a	27 (0.8)	607 (4.7)	64 (0.7)	561 (4.4)	10 (0.6)	528 (6.7)
Hong Kong, SAR	25 (1.0)	555 (5.1)	65 (0.8)	526 (3.7)	9 (0.6)	497 (4.8)
Korea, Rep. of	10 (0.5)	613 (4.3)	66 (0.7)	550 (2.6)	24 (0.8)	519 (3.4)
Japan	10 (0.5)	599 (6.3)	60 (0.9)	554 (2.6)	30 (1.0)	527 (3.0)
International Avg.	40 (0.2)	499 (1.1)	49 (0.2)	473 (1.0)	10 (0.1)	467 (2.4)
Earth Science (PATS-E)						
 Macedonia, Rep. of	58 (1.6)	464 (5.9)	40 (1.4)	466 (5.5)	3 (0.4)	484 (14.9)
Romania	40 (1.5)	488 (6.1)	56 (1.3)	468 (5.8)	4 (0.6)	454 (16.4)
Bulgaria	35 (1.8)	522 (5.9)	54 (1.5)	514 (5.3)	11 (2.1)	533 (17.1)
Moldova	33 (1.1)	468 (5.5)	65 (1.1)	459 (4.2)	2 (0.3)	~ ~
Russian Federation	28 (1.8)	542 (10.2)	65 (1.6)	529 (6.2)	7 (0.6)	526 (8.7)
Slovak Republic	24 (1.2)	539 (6.2)	66 (1.0)	535 (3.3)	11 (1.1)	541 (6.0)
Czech Republic	23 (1.4)	544 (6.1)	64 (1.2)	538 (4.4)	13 (1.0)	547 (7.6)
Finland	19 (0.9)	547 (6.7)	65 (1.1)	536 (3.8)	15 (1.1)	518 (5.3)
Hungary	14 (0.8)	565 (6.1)	67 (1.0)	549 (3.7)	18 (1.0)	563 (5.0)
Netherlands	11 (1.3)	544 (12.0)	65 (1.5)	548 (7.2)	23 (1.7)	540 (9.6)
Belgium (Flemish)	9 (0.7)	546 (7.4)	56 (1.2)	545 (3.8)	35 (1.5)	539 (3.4)
Morocco	x x	x x	x x	x x	x x	x x
Latvia (LSS)	--	--	--	--	--	--
Lithuania [†]	--	--	--	--	--	--
Slovenia	--	--	--	--	--	--
International Avg.	27 (0.4)	524 (2.1)	60 (0.4)	517 (1.4)	13 (0.4)	525 (3.3)

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

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

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

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

^c Netherlands: Data in physics panel pertain to physics/chemistry course.

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

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

An "s" indicates a 50-69% student response rate. An "x" indicates a <50% student response rate.

General/Integrated Science (PATS-G)

1	100
2	100
3	100
4	100
5	100
6	100
7	100
8	100
9	100
10	100
11	100
12	100
13	100
14	100
15	100
16	100
17	100
18	100
19	100
20	100
21	100
22	100
23	100
24	100
25	100
26	100
27	100
28	100
29	100
30	100
31	100
32	100
33	100
34	100
35	100
36	100
37	100
38	100
39	100
40	100
41	100
42	100
43	100
44	100
45	100
46	100
47	100
48	100
49	100
50	100
51	100
52	100
53	100
54	100
55	100
56	100
57	100
58	100
59	100
60	100
61	100
62	100
63	100
64	100
65	100
66	100
67	100
68	100
69	100
70	100
71	100
72	100
73	100
74	100
75	100
76	100
77	100
78	100
79	100
80	100
81	100
82	100
83	100
84	100
85	100
86	100
87	100
88	100
89	100
90	100
91	100
92	100
93	100
94	100
95	100
96	100
97	100
98	100
99	100
100	100

International Avg.

Earth Science (PATS-E)




1	100
2	100
3	100
4	100
5	100
6	100
7	100
8	100
9	100
10	100
11	100
12	100
13	100
14	100
15	100
16	100
17	100
18	100
19	100
20	100
21	100
22	100
23	100
24	100
25	100
26	100
27	100
28	100
29	100
30	100
31	100
32	100
33	100
34	100
35	100
36	100
37	100
38	100
39	100
40	100
41	100
42	100
43	100
44	100
45	100
46	100
47	100
48	100
49	100
50	100
51	100
52	100
53	100
54	100
55	100
56	100
57	100
58	100
59	100
60	100
61	100
62	100
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67	100
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69	100
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71	100
72	100
73	100
74	100
75	100
76	100
77	100
78	100
79	100
80	100
81	100
82	100
83	100
84	100
85	100
86	100
87	100
88	100
89	100
90	100
91	100
92	100
93	100
94	100
95	100
96	100
97	100
98	100
99	100
100	100

International Avg.

0 20 40 60 80 100






Exhibit 4.10: Index of Students' Positive Attitudes Towards the Sciences (PATS) (Continued 2)

	High PATS		Medium PATS		Low PATS	
	Percent of Students	Average Achievement	Percent of Students	Average Achievement	Percent of Students	Average Achievement
Biology (PATS-B)						
 Macedonia, Rep. of	65 (1.2)	466 (5.3)	34 (1.2)	458 (6.5)	1 (0.2)	~ ~
Bulgaria	52 (1.4)	520 (7.2)	43 (1.3)	519 (6.1)	5 (0.5)	500 (9.4)
Morocco ^s	48 (1.3)	335 (7.0)	46 (1.1)	327 (3.9)	7 (0.6)	312 (14.5)
Russian Federation	41 (1.6)	536 (7.6)	55 (1.5)	529 (6.6)	4 (0.3)	530 (11.9)
Romania	37 (1.4)	479 (7.4)	55 (1.2)	473 (5.5)	7 (0.7)	473 (10.5)
Moldova	35 (1.5)	459 (6.1)	64 (1.4)	462 (4.2)	1 (0.3)	~ ~
Czech Republic	27 (1.5)	546 (5.1)	60 (1.1)	537 (4.5)	12 (1.2)	541 (7.3)
Lithuania [†]	27 (1.3)	493 (6.2)	65 (1.2)	488 (4.8)	8 (0.7)	486 (8.4)
Latvia (LSS)	26 (1.5)	502 (8.0)	66 (1.3)	503 (4.9)	8 (0.8)	508 (6.2)
Hungary	23 (1.1)	566 (6.2)	65 (1.1)	548 (3.6)	12 (0.8)	553 (7.9)
Slovenia	22 (1.1)	538 (5.4)	64 (1.0)	532 (3.9)	14 (1.0)	540 (5.3)
Netherlands	21 (1.8)	543 (11.7)	63 (1.4)	541 (9.1)	16 (1.3)	550 (8.3)
Slovak Republic	19 (1.2)	549 (5.0)	70 (1.2)	532 (3.5)	11 (0.9)	539 (6.0)
Finland	18 (0.7)	549 (6.2)	65 (1.1)	536 (3.8)	18 (1.1)	519 (5.5)
Belgium (Flemish)	17 (0.9)	555 (3.4)	61 (1.2)	541 (3.6)	23 (1.1)	518 (4.5)
International Avg.	32 (0.3)	509 (1.7)	58 (0.3)	502 (1.2)	10 (0.2)	505 (3.0)
Physics (PATS-P)						
 Macedonia, Rep. of	45 (1.5)	461 (6.1)	47 (1.2)	468 (5.4)	9 (0.8)	481 (8.4)
Bulgaria	35 (2.0)	527 (6.8)	53 (1.9)	515 (5.6)	12 (1.3)	509 (13.1)
Russian Federation	31 (1.4)	551 (8.0)	63 (1.3)	526 (6.7)	6 (0.6)	516 (9.3)
Moldova	24 (1.1)	461 (5.0)	72 (1.0)	463 (4.4)	4 (0.4)	462 (13.4)
Latvia (LSS)	18 (1.1)	511 (6.8)	68 (1.1)	502 (4.8)	14 (1.1)	500 (7.9)
Lithuania [†]	17 (1.0)	509 (6.6)	65 (1.2)	486 (4.7)	18 (1.2)	481 (4.7)
Romania	17 (1.2)	479 (9.0)	64 (1.0)	474 (5.6)	18 (1.3)	480 (7.6)
Czech Republic	15 (1.3)	565 (9.2)	59 (1.5)	539 (4.6)	26 (1.8)	533 (4.5)
Slovak Republic	14 (0.8)	559 (7.5)	64 (1.1)	531 (3.4)	22 (1.2)	539 (3.8)
Slovenia	12 (0.7)	558 (7.4)	60 (1.2)	532 (4.1)	28 (1.3)	530 (4.0)
Belgium (Flemish)	11 (0.9)	564 (7.9)	58 (1.5)	548 (5.1)	31 (1.9)	533 (6.8)
Hungary	11 (0.7)	580 (8.1)	62 (1.1)	548 (4.2)	27 (1.2)	557 (4.7)
Finland	11 (0.8)	563 (9.5)	55 (1.2)	536 (4.0)	34 (1.4)	518 (4.8)
Netherlands ^c	11 (0.8)	564 (12.8)	59 (1.7)	550 (7.9)	30 (2.0)	532 (7.2)
Morocco	x x	x x	x x	x x	x x	x x
International Avg.	19 (0.3)	532 (2.2)	61 (0.3)	516 (1.3)	20 (0.4)	512 (2.3)
Chemistry (PATS-C)						
 Morocco ^s	53 (1.6)	334 (6.5)	42 (1.3)	318 (8.6)	5 (0.5)	328 (20.3)
Macedonia, Rep. of	42 (1.6)	458 (6.4)	50 (1.3)	467 (4.8)	8 (0.8)	481 (10.0)
Russian Federation	28 (1.2)	546 (8.4)	62 (1.0)	528 (6.5)	10 (0.9)	522 (8.2)
Bulgaria	26 (1.3)	519 (6.5)	56 (1.3)	517 (5.4)	18 (1.7)	521 (10.6)
Moldova	24 (1.2)	459 (6.1)	71 (1.1)	462 (4.2)	6 (0.6)	469 (10.4)
Latvia (LSS)	21 (1.2)	507 (6.1)	67 (1.0)	503 (5.2)	12 (1.0)	505 (8.2)
Romania	20 (1.0)	482 (7.8)	61 (1.1)	472 (5.7)	18 (1.1)	479 (7.8)
Slovak Republic	20 (1.2)	554 (6.7)	65 (1.2)	531 (3.3)	16 (1.3)	537 (4.7)
Finland	15 (1.0)	563 (6.9)	62 (1.1)	536 (3.9)	23 (1.1)	515 (4.4)
Czech Republic	14 (1.0)	560 (8.5)	60 (1.5)	538 (4.2)	25 (1.7)	533 (5.1)
Lithuania [†]	12 (0.9)	509 (8.9)	65 (1.2)	487 (4.5)	23 (1.4)	485 (5.2)
Slovenia	11 (0.7)	564 (6.8)	58 (1.3)	531 (3.7)	31 (1.3)	530 (5.1)
Hungary	9 (0.6)	573 (9.3)	61 (1.3)	549 (4.3)	30 (1.5)	556 (5.7)
Belgium (Flemish)	--	--	--	--	--	--
Netherlands	--	--	--	--	--	--
International Avg.	23 (0.3)	510 (2.1)	60 (0.3)	495 (1.7)	17 (0.3)	497 (3.0)

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

Exhibit 4.11: Index of Positive Attitudes Towards the Sciences (PATS) by Gender* (Continued)

		High PATS		Medium PATS		Low PATS	
		Percent of Students		Percent of Students		Percent of Students	
		Girls	Boys	Girls	Boys	Girls	Boys
Biology (PATS-B)							
	Belgium (Flemish)	19 (1.4) ▲	14 (0.9)	61 (1.3)	60 (1.6)	20 (1.3)	25 (1.6)
	Bulgaria	56 (1.8) ▲	49 (1.8)	41 (1.7)	44 (1.7)	3 (0.7)	7 (0.7) ▲
	Czech Republic	34 (2.0) ▲	20 (1.8)	57 (1.6)	64 (1.5)	9 (1.3)	16 (1.4) ▲
	Finland	21 (1.2) ▲	14 (1.1)	64 (1.3)	65 (1.6)	15 (1.4)	20 (1.6)
	Hungary	28 (1.6) ▲	18 (1.2)	65 (1.5)	66 (1.4)	7 (0.8)	16 (1.4) ▲
	Latvia (LSS)	27 (1.7)	25 (1.8)	65 (1.6)	67 (1.7)	8 (0.9)	8 (0.9)
	Lithuania †	31 (1.6) ▲	23 (1.6)	63 (1.6)	67 (1.7)	6 (0.8)	10 (1.0) ▲
	Macedonia, Rep. of	70 (1.3) ▲	60 (1.5)	29 (1.3)	38 (1.4) ▲	1 (0.2)	2 (0.4) ▲
	Moldova	37 (1.8)	32 (1.5)	63 (1.8)	66 (1.5)	1 (0.2)	2 (0.5)
	Morocco s	50 (1.5)	46 (1.9)	44 (1.4)	47 (1.5)	6 (0.8)	7 (0.8)
	Netherlands	27 (2.6) ▲	14 (1.6)	61 (2.0)	66 (1.7)	12 (1.5)	20 (1.8) ▲
	Romania	41 (1.9)	34 (1.8)	53 (1.7)	58 (1.7)	6 (0.9)	8 (1.0)
	Russian Federation	44 (1.9)	39 (1.7)	53 (1.9)	57 (1.5)	3 (0.4)	4 (0.5)
	Slovak Republic	21 (1.5)	16 (1.4)	69 (1.7)	71 (1.4)	10 (1.0)	12 (1.4)
	Slovenia	27 (1.5) ▲	17 (1.2)	62 (1.4)	65 (1.5)	11 (1.0)	18 (1.3) ▲
	International Avg.	35 (0.4) ▲	28 (0.4)	57 (0.4)	60 (0.4) ▲	8 (0.3)	12 (0.3) ▲
Physics (PATS-P)							
	Belgium (Flemish)	9 (1.2)	13 (1.4)	57 (2.1)	59 (1.8)	34 (2.3)	28 (2.6)
	Bulgaria	26 (2.3)	44 (1.9) ▲	59 (2.8) ▲	46 (1.9)	15 (1.6)	9 (1.6)
	Czech Republic	8 (1.4)	22 (1.6) ▲	58 (1.8)	60 (1.9)	34 (2.2) ▲	18 (1.8)
	Finland	4 (0.6)	18 (1.4) ▲	52 (1.7)	58 (1.6)	44 (1.7) ▲	24 (1.4)
	Hungary	5 (0.7)	17 (1.2) ▲	62 (1.4)	62 (1.5)	33 (1.5) ▲	20 (1.4)
	Latvia (LSS)	10 (0.9)	26 (1.8) ▲	71 (1.4)	66 (1.8)	20 (1.5) ▲	8 (1.0)
	Lithuania †	11 (1.1)	24 (1.4) ▲	66 (1.5)	64 (1.6)	23 (1.6) ▲	12 (1.5)
	Macedonia, Rep. of	39 (1.6)	50 (1.8) ▲	51 (1.5) ▲	43 (1.5)	10 (1.0) ▲	7 (0.8)
	Moldova	23 (1.2)	26 (1.5)	73 (1.2)	71 (1.5)	4 (0.5)	3 (0.5)
	Morocco	x x	x x	x x	x x	x x	x x
	Netherlands c	5 (1.1)	17 (1.4) ▲	56 (2.4)	62 (1.7)	38 (2.6) ▲	21 (2.0)
	Romania	13 (1.3)	21 (1.6) ▲	65 (1.3)	64 (1.5)	22 (1.6) ▲	15 (1.5)
	Russian Federation	24 (1.7)	39 (1.6) ▲	68 (1.5) ▲	57 (1.6)	8 (0.9) ▲	4 (0.5)
	Slovak Republic	6 (0.7)	22 (1.4) ▲	66 (1.5)	62 (1.3)	28 (1.6) ▲	16 (1.3)
	Slovenia	6 (0.6)	18 (1.2) ▲	56 (1.7)	65 (1.5) ▲	37 (1.8) ▲	17 (1.2)
	International Avg.	14 (0.3)	29 (0.4) ▲	61 (0.5) ▲	58 (0.4)	25 (0.5) ▲	14 (0.4)
Chemistry (PATS-C)							
	Belgium (Flemish)	--	--	--	--	--	--
	Bulgaria	25 (1.6)	27 (1.7)	59 (1.5)	53 (1.8)	17 (1.7)	20 (2.3)
	Czech Republic	15 (1.4)	14 (1.3)	61 (2.2)	60 (1.9)	24 (2.2)	27 (1.8)
	Finland	9 (1.2)	21 (1.3) ▲	62 (1.5)	62 (1.4)	29 (1.6) ▲	17 (1.3)
	Hungary	8 (0.8)	10 (0.9)	62 (1.7)	61 (1.6)	30 (1.8)	29 (1.8)
	Latvia (LSS)	20 (1.3)	23 (1.7)	68 (1.2)	66 (1.5)	13 (1.2)	11 (1.2)
	Lithuania †	12 (1.2)	12 (1.2)	65 (1.6)	66 (1.6)	24 (1.6)	22 (1.8)
	Macedonia, Rep. of	41 (2.0)	43 (1.8)	51 (1.7)	49 (1.5)	8 (0.9)	8 (0.9)
	Moldova	24 (1.3)	23 (1.7)	72 (1.3)	69 (1.7)	4 (0.5)	8 (0.9) ▲
	Morocco	x x	x x	x x	x x	x x	x x
	Netherlands	--	--	--	--	--	--
	Romania	22 (1.5)	19 (1.2)	60 (1.6)	63 (1.5)	18 (1.4)	18 (1.4)
	Russian Federation	28 (1.5)	28 (1.3)	63 (1.3)	61 (1.2)	9 (1.2)	10 (0.9)
	Slovak Republic	18 (1.4)	21 (1.6)	67 (1.5)	63 (1.6)	16 (1.7)	16 (1.4)
	Slovenia	11 (1.0)	11 (0.9)	58 (1.7)	58 (1.5)	32 (1.7)	31 (1.4)
	International Avg.	19 (0.4)	24 (0.4) ▲	62 (0.5) ▲	59 (0.4)	19 (0.4) ▲	17 (0.4)

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

	High PATS			Medium PATS			Low PATS		
	Percent of Students			Percent of Students			Percent of Students		
	1995	1999	1995-1999 Difference	1995	1999	1995-1999 Difference	1995	1999	1995-1999 Difference
General/Integrated Science (PATS-G)									
G Grade 5	22 (0.8)	27 (1.1)	5 (1.4) ▲	53 (0.9)	53 (1.0)	0 (1.4) ●	25 (1.0)	20 (1.2)	-5 (1.5) ▼
Grade 6	29 (1.1)	30 (0.8)	1 (1.4) ●	52 (1.2)	52 (0.8)	0 (1.4) ●	19 (1.1)	18 (0.8)	-1 (1.4) ●
Grade 7	31 (1.2)	33 (0.9)	2 (1.5) ●	53 (1.0)	53 (0.8)	0 (1.3) ●	15 (1.0)	13 (0.8)	-2 (1.2) ●
Grade 8	36 (1.4)	39 (1.1)	3 (1.8) ●	52 (1.3)	53 (1.1)	1 (1.7) ●	12 (0.9)	8 (0.6)	-4 (1.1) ▼
Grade 9	21 (1.1)	25 (1.0)	4 (1.5) ●	65 (1.1)	65 (0.8)	0 (1.4) ●	13 (1.0)	9 (0.6)	-4 (1.2) ▼
Grade 10	63 (1.2)	56 (1.4)	-7 (1.8) ▼	34 (1.2)	40 (1.3)	7 (1.8) ▲	3 (0.4)	4 (0.3)	1 (0.5) ●
Grade 11	25 (2.4)	26 (1.3)	1 (2.7) ●	55 (2.0)	52 (1.0)	-3 (2.2) ●	20 (1.6)	22 (1.3)	2 (2.0) ●
Grade 12	30 (1.4)	29 (1.4)	-1 (2.0) ●	58 (1.2)	58 (1.3)	0 (1.8) ●	12 (1.3)	13 (1.1)	0 (1.7) ●
Grade 13	10 (0.6)	10 (0.5)	0 (0.8) ●	64 (1.0)	60 (0.9)	-3 (1.3) ●	26 (1.0)	30 (1.0)	4 (1.5) ●
Grade 14	12 (0.7)	10 (0.5)	-2 (0.9) ●	72 (0.9)	66 (0.7)	-6 (1.1) ▼	16 (0.9)	24 (0.8)	7 (1.2) ▲
Grade 15	27 (1.3)	28 (1.0)	1 (1.6) ●	55 (0.9)	56 (0.8)	1 (1.2) ●	17 (0.9)	16 (0.9)	-1 (1.2) ●
Grade 16	48 (1.7)	46 (1.4)	-2 (2.2) ●	48 (1.5)	49 (1.2)	1 (1.9) ●	3 (0.4)	5 (0.6)	2 (0.7) ●
Grade 17	49 (1.4)	43 (1.3)	-5 (1.9) ●	50 (1.3)	55 (1.3)	5 (1.8) ●	1 (0.2)	1 (0.2)	0 (0.3) ●
Grade 18	33 (1.2)	32 (0.9)	-1 (1.5) ●	51 (1.0)	51 (0.8)	0 (1.3) ●	16 (0.7)	16 (0.6)	0 (0.9) ●
International Avg. [§]	30 (0.3)	31 (0.3)	0 (0.5) ●	55 (0.3)	55 (0.3)	0 (0.4) ●	15 (0.3)	15 (0.2)	0 (0.4) ●
Earth Science (PATS-E)									
Grade 5	12 (1.0)	9 (0.7)	-3 (1.2) ●	56 (1.6)	56 (1.2)	0 (2.0) ●	32 (1.9)	35 (1.5)	3 (2.4) ●
Grade 6	19 (1.2)	23 (1.4)	4 (1.9) ●	66 (1.1)	64 (1.2)	-2 (1.6) ●	15 (1.5)	13 (1.0)	-2 (1.8) ●
Grade 7	13 (0.8)	14 (0.8)	1 (1.1) ●	67 (1.1)	67 (1.0)	1 (1.5) ●	20 (1.3)	18 (1.0)	-2 (1.7) ●
Grade 8	9 (0.9)	11 (1.3)	2 (1.6) ●	63 (1.9)	65 (1.5)	3 (2.4) ●	28 (2.4)	23 (1.7)	-5 (2.9) ●
Grade 9	37 (1.3)	40 (1.5)	3 (2.0) ●	56 (1.2)	56 (1.3)	0 (1.7) ●	7 (0.5)	4 (0.6)	-3 (0.8) ▼
Grade 10	21 (1.1)	28 (1.8)	7 (2.1) ▲	67 (0.9)	65 (1.6)	-3 (1.9) ●	11 (0.9)	7 (0.6)	-4 (1.1) ▼
Grade 11	21 (1.1)	24 (1.2)	3 (1.6) ●	67 (0.9)	66 (1.0)	-2 (1.4) ●	12 (0.9)	11 (1.1)	-2 (1.4) ●
International Avg. [§]	20 (0.4)	21 (0.5)	2 (0.6) ●	64 (0.5)	63 (0.5)	-1 (0.7) ●	17 (0.5)	16 (0.4)	-1 (0.7) ●









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

▲ 1999 significantly higher than 1995

● No significant difference between 1995 and 1999

▼ 1999 significantly lower than 1995

Significance tests adjusted for multiple comparisons

	High PATS			Medium PATS			Low PATS		
	Percent of Students			Percent of Students			Percent of Students		
	1995	1999	1995-1999 Difference	1995	1999	1995-1999 Difference	1995	1999	1995-1999 Difference
Biology (PATS-B)									
	24 (1.6)	17 (0.9)	-7 (1.8) ▼	57 (1.2)	61 (1.2)	3 (1.7) ●	19 (1.8)	23 (1.1)	3 (2.1) ●
	16 (1.2)	27 (1.5)	11 (1.9) ▲	66 (1.0)	60 (1.1)	-5 (1.5) ▼	19 (1.4)	12 (1.2)	-6 (1.8) ▼
	22 (1.1)	23 (1.1)	1 (1.6) ●	66 (1.1)	65 (1.1)	-1 (1.6) ●	12 (1.0)	12 (0.8)	0 (1.3) ●
	41 (1.6)	26 (1.5)	-15 (2.1) ▼	45 (1.2)	66 (1.3)	21 (1.8) ▲	13 (1.1)	8 (0.8)	-6 (1.3) ▼
	32 (1.3)	27 (1.3)	-5 (1.8) ●	60 (1.1)	65 (1.2)	5 (1.6) ▲	8 (0.6)	8 (0.7)	0 (1.0) ●
	23 (1.3)	21 (1.8)	-2 (2.2) ●	62 (1.2)	63 (1.4)	1 (1.8) ●	15 (1.3)	16 (1.3)	1 (1.8) ●
	40 (1.5)	37 (1.4)	-2 (2.0) ●	54 (1.3)	55 (1.2)	2 (1.8) ●	7 (0.6)	7 (0.7)	1 (1.0) ●
	36 (1.3)	41 (1.6)	5 (2.1) ●	59 (1.2)	55 (1.5)	-4 (1.9) ●	5 (0.5)	4 (0.3)	-1 (0.6) ●
	18 (1.0)	19 (1.2)	1 (1.6) ●	69 (1.1)	70 (1.2)	1 (1.6) ●	13 (0.9)	11 (0.9)	-2 (1.3) ●
	25 (1.5)	22 (1.1)	-3 (1.9) ●	59 (1.2)	64 (1.0)	4 (1.6) ●	15 (1.3)	14 (1.0)	-1 (1.7) ●
	International Avg. ⁶								
	28 (0.4)	26 (0.4)	-2 (0.6) ●	60 (0.4)	63 (0.4)	3 (0.5) ▲	13 (0.4)	11 (0.3)	-1 (0.5) ●
Physics (PATS-P)									
	13 (1.3)	11 (0.9)	-2 (1.6) ●	58 (2.2)	58 (1.5)	0 (2.6) ●	29 (2.2)	31 (1.9)	2 (2.9) ●
	11 (0.8)	15 (1.3)	3 (1.5) ●	57 (1.5)	59 (1.5)	1 (2.1) ●	31 (1.6)	26 (1.8)	-5 (2.4) ●
	10 (0.8)	11 (0.7)	1 (1.0) ●	62 (1.1)	62 (1.1)	0 (1.5) ●	28 (1.3)	27 (1.2)	-2 (1.8) ●
	23 (1.2)	18 (1.1)	-5 (1.7) ▼	66 (1.2)	68 (1.1)	2 (1.6) ●	11 (1.0)	14 (1.1)	3 (1.5) ●
	15 (1.0)	17 (1.0)	2 (1.4) ●	66 (1.1)	65 (1.2)	-1 (1.6) ●	18 (1.2)	18 (1.2)	-1 (1.7) ●
	14 (1.3)	11 (0.8)	-3 (1.5) ●	60 (1.6)	59 (1.7)	-1 (2.3) ●	26 (2.0)	30 (2.0)	4 (2.8) ●
	25 (1.2)	17 (1.2)	-7 (1.7) ▼	62 (1.1)	64 (1.0)	2 (1.5) ●	13 (1.0)	18 (1.3)	5 (1.6) ▲
	26 (1.1)	31 (1.4)	5 (1.8) ▲	63 (1.4)	63 (1.3)	0 (1.9) ●	11 (1.1)	6 (0.6)	-5 (1.2) ▼
	13 (0.8)	14 (0.8)	1 (1.1) ●	59 (1.2)	64 (1.1)	5 (1.6) ▲	28 (1.4)	22 (1.2)	-6 (1.9) ▼
	13 (0.8)	12 (0.7)	-1 (1.0) ●	62 (1.3)	60 (1.2)	-2 (1.8) ●	25 (1.4)	28 (1.3)	3 (1.9) ●
	International Avg. ⁶								
	16 (0.3)	16 (0.3)	-1 (0.5) ●	62 (0.4)	62 (0.4)	1 (0.6) ●	22 (0.5)	22 (0.4)	0 (0.6) ●
Chemistry (PATS-C)									
	9 (0.6)	14 (1.0)	5 (1.2) ▲	57 (1.4)	60 (1.5)	3 (2.1) ●	33 (1.7)	25 (1.7)	-8 (2.4) ▼
	10 (0.8)	9 (0.6)	-1 (1.0) ●	60 (1.3)	61 (1.3)	2 (1.8) ●	30 (1.4)	30 (1.5)	-1 (2.0) ●
	25 (1.3)	21 (1.2)	-4 (1.7) ●	65 (1.1)	67 (1.0)	2 (1.5) ●	10 (0.9)	12 (1.0)	2 (1.4) ●
	15 (0.8)	12 (0.9)	-3 (1.3) ●	68 (1.1)	65 (1.2)	-3 (1.6) ●	17 (1.1)	23 (1.4)	6 (1.8) ▲
	25 (1.1)	20 (1.0)	-5 (1.5) ▼	61 (1.1)	61 (1.1)	0 (1.5) ●	14 (0.9)	18 (1.1)	4 (1.5) ▲
	19 (0.6)	28 (1.2)	9 (1.3) ▲	69 (1.0)	62 (1.0)	-7 (1.4) ▼	11 (1.0)	10 (0.9)	-1 (1.3) ●
	8 (0.6)	20 (1.2)	11 (1.3) ▲	65 (1.2)	65 (1.2)	0 (1.7) ●	27 (1.3)	16 (1.3)	-11 (1.9) ▼
	11 (0.7)	11 (0.7)	0 (1.0) ●	60 (1.3)	58 (1.3)	-2 (1.9) ●	29 (1.4)	31 (1.3)	2 (1.9) ●
International Avg. ⁶									
15 (0.3)	17 (0.4)	2 (0.5) ▲	63 (0.4)	62 (0.4)	-1 (0.6) ●	21 (0.4)	21 (0.5)	-1 (0.6) ●	

▲ 1999 significantly higher than 1995

● No significant difference between 1995 and 1999


▼ 1999 significantly lower than 1995

Significance tests adjusted for multiple comparisons

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	1995			1999			Change in Gender Difference ¹
	Girls	Boys	Difference (Absolute Value)	Girls	Boys	Difference (Absolute Value)	
Biology (PATS-B)							
...	44 (2.0)	38 (1.8)	6 (2.3)	27 (1.7)	25 (1.8)	2 (2.1)	
...	25 (2.5)	22 (1.4)	2 (2.6)	19 (1.4) ▲	14 (0.9)	5 (1.5)	
...	21 (1.2) ▲	15 (1.3)	6 (1.3)	21 (1.5)	16 (1.4)	5 (1.7)	
...	39 (1.7) ▲	33 (1.5)	6 (1.8)	44 (1.9) ▲	39 (1.7)	5 (1.8)	
...	42 (1.7)	38 (1.6)	4 (1.6)	41 (1.9)	34 (1.8)	6 (2.3)	
...	33 (1.9)	31 (1.3)	2 (2.2)	31 (1.6) ▲	23 (1.6)	7 (1.9)	
...	31 (1.8) ▲	20 (1.6)	11 (1.6)	27 (1.5) ▲	17 (1.2)	10 (1.7)	
...	26 (1.5) ▲	18 (1.4)	9 (1.7)	28 (1.6) ▲	18 (1.2)	10 (1.8)	
...	28 (2.0) ▲	17 (1.8)	10 (2.7)	27 (2.6) ▲	14 (1.6)	13 (2.9)	
...	19 (1.8) ▲	13 (1.1)	7 (1.8)	34 (2.0) ▲	20 (1.8)	14 (2.2)	
International Avg. ^s	31 (0.6) ▲	24 (0.5)	6 (0.6)	30 (0.6) ▲	22 (0.5)	8 (0.6)	
Physics (PATS-P)							
...	8 (2.1)	18 (1.6) ▲	10 (2.8)	9 (1.2)	13 (1.4)	5 (1.7)	
...	21 (1.3)	29 (1.7) ▲	8 (1.9)	13 (1.3)	21 (1.6) ▲	9 (1.7)	
...	6 (0.9)	22 (2.0) ▲	16 (1.9)	5 (1.1)	17 (1.4) ▲	11 (1.8)	
...	6 (0.7)	20 (1.4) ▲	14 (1.5)	6 (0.6)	18 (1.2) ▲	12 (1.4)	
...	5 (0.7)	15 (1.3) ▲	9 (1.4)	5 (0.7)	17 (1.2) ▲	13 (1.3)	
...	11 (1.3)	21 (1.5) ▲	10 (1.9)	11 (1.1)	24 (1.4) ▲	13 (1.5)	
...	5 (0.7)	18 (1.3) ▲	13 (1.3)	8 (1.4)	22 (1.6) ▲	14 (2.0)	
...	18 (1.2)	35 (1.7) ▲	17 (1.9)	24 (1.7)	39 (1.6) ▲	15 (1.8)	
...	5 (0.7)	22 (1.2) ▲	17 (1.2)	6 (0.7)	22 (1.4) ▲	16 (1.5)	
...	13 (1.4)	33 (1.9) ▲	19 (2.3)	10 (0.9)	26 (1.8) ▲	17 (1.9)	
International Avg. ^s	10 (0.4)	23 (0.5) ▲	13 (0.6)	10 (0.4)	22 (0.5) ▲	12 (0.5)	
Chemistry (PATS-C)							
...	11 (1.0)	10 (1.0)	1 (1.3)	11 (1.0)	11 (0.9)	0 (1.4)	
...	14 (1.1)	17 (1.2)	3 (1.6)	12 (1.2)	12 (1.2)	1 (1.5)	
...	9 (0.7)	9 (0.9)	0 (1.0)	15 (1.4)	14 (1.3)	1 (1.8)	
...	17 (1.1)	22 (1.0)	4 (1.7)	28 (1.5)	28 (1.3)	1 (1.4)	
...	7 (0.9)	13 (1.1) ▲	5 (1.2)	8 (0.8)	10 (0.9)	2 (1.2)	
...	25 (1.4)	26 (1.6)	1 (1.9)	22 (1.5)	19 (1.2)	2 (1.6)	
...	24 (1.6)	27 (1.7)	3 (2.1)	20 (1.3)	23 (1.7)	3 (0.5714-3.2857 T 7.1((1.2)) T T (2)-377.1)	
...	7 (0.6)	9 (0.9)	2 (1.0)	18 (1.4)	21 (1.6)	2137 T 7.1((1.2)) T T2	
International Avg. ^s	14 (0.4)	17 (0.4) ▲	2 (0.5)	16 (0.5)	17 (0.5) ▲		

▲ Significantly higher than other gender

Increased 
Decreased 
No change 

