Chapter 1

International Student Achievement in Science

What Are the Overall Differences in Science Achievement?

Chapter 1 summarizes achievement on the TIMSS science test for each of the participating countries. Comparisons are provided overall and by gender for the upper grade tested (often the eighth grade) and the lower grade tested (often the seventh grade), as well as for 13-year-olds.

Table 1.1 presents the mean (or average) achievement for 41 countries at the eighth grade.[1] The 25 countries shown by decreasing order of mean achievement in the upper part of the table were judged to have met the TIMSS requirements for testing a representative sample of students. Although all countries tried very hard to meet the TIMSS sampling requirements, several encountered resistance from schools and teachers and did not have participation rates of 85% or higher as specified in the TIMSS guidelines (i.e., Australia, Austria, Belgium (French), Bulgaria, the Netherlands, and Scotland). To provide a better curricular match, four countries (i.e., Colombia, Germany, Romania, and Slovenia) elected to test their seventh- and eighth-grade students even though that meant not testing the two grades with the most 13-year-olds and led to their students being somewhat older than those in the other countries. The countries in the remaining two categories encountered various degrees of difficulty in implementing the prescribed methods for sampling classrooms within schools. Because the Philippines did not document clearly its procedures for sampling schools, its achievement results are presented in Appendix C. A full discussion of the sampling procedures and outcomes for each country can be found in Appendix A.

To aid in interpretation, the table also contains the years of formal schooling and average age of the students. Equivalence of chronological age does not necessarily mean that students have received the same number of years of formal schooling or studied the same curriculum. Most notably, students in the three Scandinavian countries, Sweden, Norway, and Denmark, had fewer years of formal schooling than their counterparts in other countries,[2] and those in England, Scotland, New Zealand, and Kuwait had more. Countries with a high percentage of older students may have policies that include retaining students in lower grades.

The results reveal substantial differences in science achievement between the top- and bottom-performing countries, although the average achievement of most countries was somewhere in the middle ranges. The broad range of achievement both across

[1] TIMSS used item response theory (IRT) methods to summarize the achievement results for both grades on a scale with a mean of 500 and a standard deviation of 100. Scaling averages students' responses to the subsets of items they took in a way that accounts for differences in the difficulty of those items. It allows students' performance to be summarized on a common metric even though individual students responded to different items in the science test. For more detailed information, see the "IRT Scaling and Data Analysis" section of Appendix A.

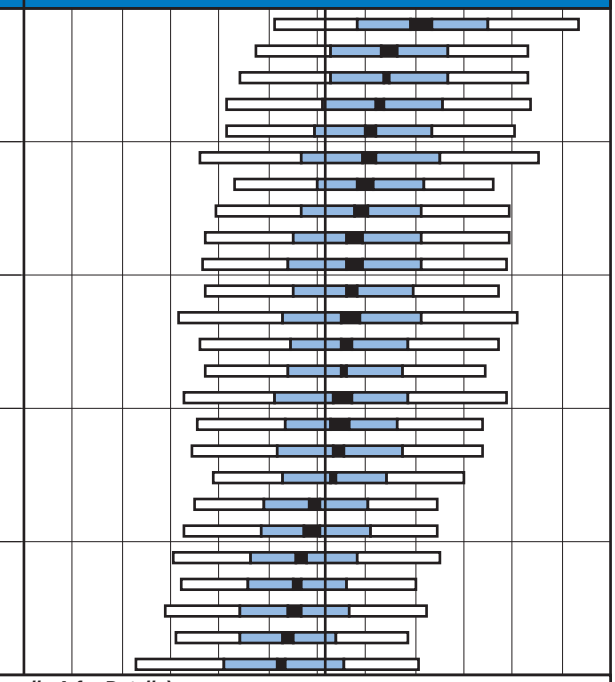
[2] Achievement results for the eighth-grade students in Denmark and Sweden, as well as for the eighth-grade students in German-speaking schools in Switzerland are presented in Appendix D.

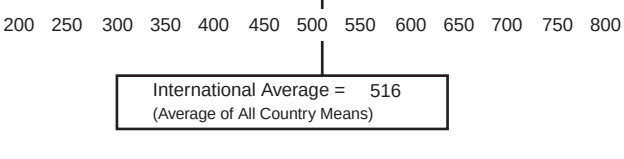
Table 1.1

Distributions of Achievement in the Sciences - Upper Grade (Eighth Grade*)

Country	Mean	Years of Formal Schooling	Average Age
Singapore	607 (5.5)	8	14.5
Czech Republic	574 (4.3)	8	14.4
Japan	571 (1.6)	8	14.4
Korea	565 (1.9)	8	14.2
Hungary	554 (2.8)	8	14.3
†[2] England	552 (3.3)	9	14.0
† Belgium (Fl)	550 (4.2)	8	14.1
Slovak Republic	544 (3.2)	8	14.3
Russian Federation	538 (4.0)	7 or 8	14.0
Ireland	538 (4.5)	8	14.4
Sweden	535 (3.0)	7	13.9
† United States	534 (4.7)	8	14.2
Canada	531 (2.6)	8	14.1
Norway	527 (1.9)	7	13.9
New Zealand	525 (4.4)	8.5 - 9.5	14.0
Hong Kong	522 (4.7)	8	14.2
[1] Switzerland	522 (2.5)	7 or 8	14.2
Spain	517 (1.7)	8	14.3
France	498 (2.5)	8	14.3
Iceland	494 (4.0)	8	13.6
[1] Latvia (LSS)	485 (2.7)	8	14.3
Portugal	480 (2.3)	8	14.5
[1] Lithuania	476 (3.4)	8	14.3
Iran, Islamic Rep.	470 (2.4)	8	14.6
Cyprus	463 (1.9)	8	13.7
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):			
Australia	545 (3.9)	8 or 9	14.2
Austria	558 (3.7)	8	14.3
Belgium (Fr)	471 (2.8)	8	14.3
Bulgaria	565 (5.3)	8	14.0
Netherlands	560 (5.0)	8	14.3
Scotland	517 (5.1)	9	13.7
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):			
Colombia	411 (4.1)	8	15.7
†[1] Germany	531 (4.8)	8	14.8
Romania	486 (4.7)	8	14.6
Slovenia	560 (2.5)	8	14.8
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):			
Denmark	478 (3.1)	7	13.9
Greece	497 (2.2)	8	13.6
Thailand	525 (3.7)	8	14.3
Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):			
[1] Israel	524 (5.7)	8	14.1
Kuwait	430 (3.7)	9	15.3
South Africa	326 (6.6)	8	15.4

Science Achievement Scale Score





*Eighth grade in most countries; see Table 2 for information about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
[1]National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
[2]National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Figure 1.1

Multiple Comparisons of Achievement in the Sciences - Upper Grade (Eighth Grade*)

Instructions: Read ***across*** the row for a country to compare performance with the countries listed in the heading of the chart. The symbols indicate whether the mean achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the two countries.†

Country	Singapore	Czech Republic	Japan	Korea	*Bulgaria*	*Netherlands*	*Slovenia*	*Austria*	Hungary	England	Belgium (Fl)	*Australia*	Slovak Republic	Russian Fed.	Ireland	Sweden	United States	*Germany*	Canada	Norway	New Zealand	*Thailand*	*Israel*	Hong Kong	Switzerland	*Scotland*	Spain	France	*Greece*	Iceland	*Romania*	Latvia (LSS)	Portugal	*Denmark*	Lithuania	*Belgium (Fr)*	Iran, Islamic Rep.	Cyprus	*Kuwait*	*Colombia*	*South Africa*
Singapore		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Czech Republic	▼		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Japan	▼	●		●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Korea	▼	●	●		●	●	●	●	▲	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Bulgaria	▼	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Netherlands	▼	●	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovenia	▼	●	▼	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Austria	▼	●	▼	●	●	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hungary	▼	▼	▼	▼	●	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
England	▼	▼	▼	▼	●	●	●	●	●		●	●	●	●	●	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Belgium (Fl)	▼	▼	▼	●	●	●	●	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Australia	▼	▼	▼	▼	●	●	▼	●	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovak Republic	▼	▼	▼	▼	▼	●	▼	●	●	●	●	●		●	●	●	●	●	▲	▲	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Russian Fed.	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●		●	●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Ireland	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Sweden	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●		●	●	●	●	●	●	●	●	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
United States	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Germany	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●		●	●	●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Canada	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	●	●	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Norway	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
New Zealand	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Thailand	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Israel	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●	●	●	●		●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hong Kong	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●	●	●		●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Switzerland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	●	●	●	●	●	●	●	●	●		●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Scotland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●	●	●	●	●		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Spain	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	▼	●	●	●	●	●	●	●		▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
France	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲
Greece	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●		●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲
Iceland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●		●	●	●	●	●	▲	▲	▲	▲	▲
Romania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●		●	●	●	●	●	▲	▲	▲	▲
Latvia (LSS)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●		●	●	●	▲	▲	▲	▲	▲	▲
Portugal	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●		●	●	●	●	▲	▲	▲	▲
Denmark	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●		●	●	●	▲	▲	▲	▲
Lithuania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●		●	●	▲	▲	▲	▲
Belgium (Fr)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	●	●	●	●		●	▲	▲	▲	▲
Iran, Islamic Rep.	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	●	●	●	●	●		●	▲	▲	▲
Cyprus	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	●	●	●	●	●	●		▲	▲	▲
Kuwait	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Colombia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲
South Africa	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	

Countries are ordered by mean achievement across the heading and down the rows.

▲ Mean achievement significantly higher than comparison country

● No statistically significant difference from comparison country

▼ Mean achievement significantly lower than comparison country

*Eighth grade in most countries; see Table 2 for information about the grades tested in each country.

†Statistically significant at .05 level, adjusted for multiple comparisons.

Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A for details).

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

and within countries is illustrated in Table 1.1 by a graphical representation of the distribution of student performance within each country. Achievement for each country is shown for the 25th and 75th percentiles as well as for the 5th and 95th percentiles.[3] Each percentile point indicates the percentages of students performing below and above that point on the scale. For example, 25% of the eighth-grade students in each country performed below the 25th percentile for that country, and 75% performed above the 25th percentile. The range between the 25th and 75th percentiles represents performance by the middle half of the students. In contrast, performance at the 5th and 95th percentiles represents the extremes in both lower and higher achievement. The dark boxes at the midpoints of the distributions show the 95% confidence intervals around the average achievement in each country.[4] These intervals can be compared to the international average of 516, which was derived by averaging across the means for each of the 41 participants shown in the table.[5] A number of countries had mean achievement well above or well below that level.

Considerable variation in student performance is observed between countries. For example, average performance in Singapore was comparable to or even exceeded performance at the 95th percentile in the lower-performing countries such as Colombia, Kuwait, and South Africa. The differences between the extremes in performance were also very large within most countries.

Figure 1.1 provides a method for making appropriate comparisons in overall mean achievement between countries.[6] This figure shows whether or not the differences in mean achievement between pairs of countries are statistically significant. Selecting a country of interest and reading across the table, a triangle pointing up indicates significantly higher performance than the country listed across the top, a dot indicates no significant difference in performance, and a triangle pointing down indicates significantly lower performance.

At the eighth grade, Singapore, with all triangles pointing up, had a significantly higher mean achievement than other participating countries. Other countries that performed very well included the Czech Republic, Japan, Korea, Bulgaria, the Netherlands, Slovenia, and Austria. These countries had performance levels similar to each other, although Japan had significantly higher performance than Slovenia and Austria. Interestingly, from the top-performing countries on down through the list of participants, the differences in performance from one country to the next was often negligible. For example, in addition to performing at about the same level as the other countries mentioned above, the Netherlands did not differ significantly from Hungary, England,

[3] Tables of the percentile values and standard deviations for all countries are presented in Appendix E.

[4] See the "IRT Scaling and Data Analysis" section of Appendix A for more details about calculating standard errors and confidence intervals for the TIMSS statistics.

[5] Because the Flemish and French educational systems in Belgium participated separately, their results are presented separately in the tables of this report.

[6] The significance tests in Figures 1.1 and 1.2 are based on a Bonferroni procedure for multiple comparisons that holds to 5% the probability of erroneously declaring the mean of one country to be different from another country.

Flemish-speaking Belgium, Australia, and the Slovak Republic. In turn, Hungary, while performing less well than Singapore, the Czech Republic, Japan, and Korea, performed at about the same level as Bulgaria, the Netherlands, Slovenia, Austria, England, Flemish-speaking Belgium, Australia, the Slovak Republic, the Russian Federation, and Ireland, and higher than all other countries.

Despite the small differences between adjacent countries when participants are ordered by performance, the differences between the top-performing and bottom-performing countries was very large. Because of this large range in performance, the pattern for a number of countries was one of having lower mean achievement than some countries, about the same mean achievement as other countries, and higher mean achievement than a third group. In contrast, Kuwait, Colombia, and South Africa performed less well than the other countries, with Colombia having significantly lower achievement than Kuwait, and South Africa having significantly lower achievement than Colombia.

Table 1.2 and Figure 1.2 present corresponding data for the seventh grade.[7] At the seventh grade there was no significant difference in mean science achievement among the seven top-performing countries – Singapore, Korea, the Czech Republic, Japan, Bulgaria, Slovenia, and Belgium (Flemish). The three lowest-performing countries were Lithuania, Colombia, and South Africa. However, students in Colombia performed less well than those in Lithuania, and students in South Africa below those in Colombia. For the remaining countries, performance rankings also tended to be similar, but not identical, to those found at the eighth grade.

Performance in eighth grade was naturally somewhat higher than that in seventh grade, since eighth-grade students have had one year more of schooling. The international average at the eighth grade (516) was 37 points higher than the international average of 479 at the seventh grade. Even though equivalent achievement increases cannot be assumed from grade to grade throughout schooling, this 37-point difference does provide a rough indication of grade-by-grade increases in science achievement during the middle years. By this gauge, the achievement differences across countries at both grades reflect several grade levels in learning between the higher- and lower-performing countries. A similarly large range in performance can be noted within most countries. There needs to be a further note of caution, however, in using growth from grade to grade as an indicator of achievement. The TIMSS scale measures achievement in science judged to be appropriate for seventh- and eighth-grade students around the world. Thus, higher performance does not mean students can do advanced high-school science, only that they are more proficient at middle-school science.

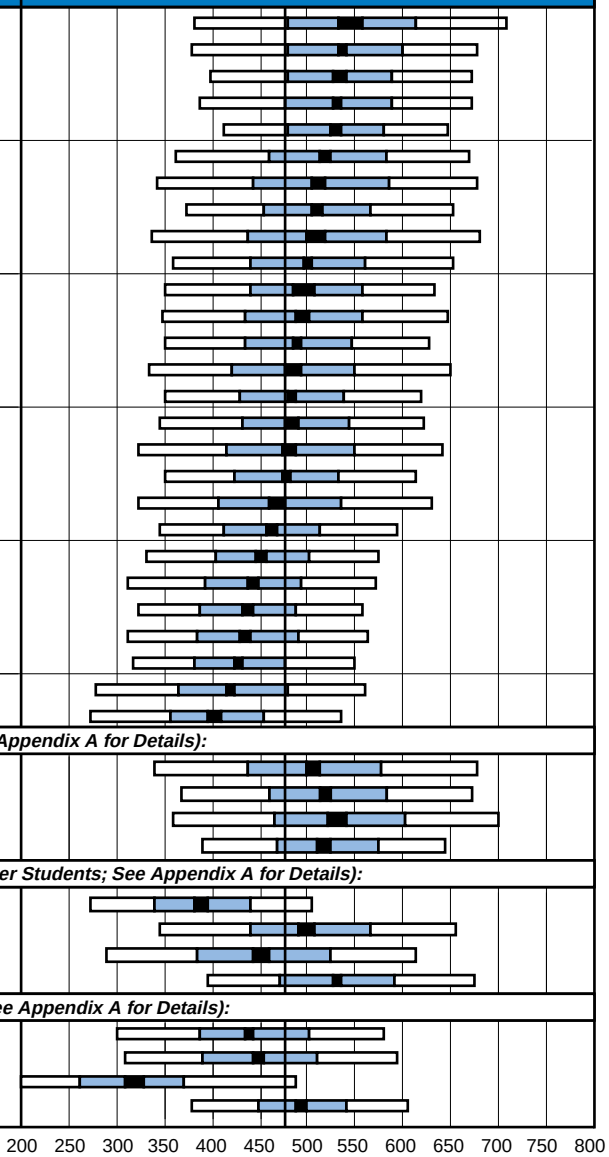
[7] Results are presented for 27 countries in the top portion of Table 1.2 because French-speaking Belgium and Scotland met the sampling requirements at this grade. Thirty-nine countries are presented in total because Kuwait and Israel tested only the eighth grade.

Table 1.2

Distributions of Achievement in the Sciences - Lower Grade (Seventh Grade*)

Country	Mean	Years of Formal Schooling	Average Age
Singapore	545 (6.6)	7	13.3
Korea	535 (2.1)	7	13.2
Czech Republic	533 (3.3)	7	13.4
Japan	531 (1.9)	7	13.4
† Belgium (Fl)	529 (2.6)	7	13.0
Hungary	518 (3.2)	7	13.4
†2 England	512 (3.5)	8	13.1
Slovak Republic	510 (3.0)	7	13.3
† United States	508 (5.5)	7	13.2
Canada	499 (2.3)	7	13.1
Hong Kong	495 (5.5)	7	13.2
Ireland	495 (3.5)	7	13.4
Sweden	488 (2.6)	6	12.9
Russian Federation	484 (4.2)	6 or 7	13.0
1 Switzerland	484 (2.5)	6 or 7	13.1
Norway	483 (2.9)	6	12.9
New Zealand	481 (3.4)	7.5 - 8.5	13.0
Spain	477 (2.1)	7	13.2
† Scotland	468 (3.8)	8	12.7
Iceland	462 (2.8)	7	12.6
France	451 (2.6)	7	13.3
† Belgium (Fr)	442 (3.0)	7	13.2
Iran, Islamic Rep.	436 (2.6)	7	13.6
1 Latvia (LSS)	435 (2.7)	7	13.3
Portugal	428 (2.1)	7	13.4
Cyprus	420 (1.8)	7	12.8
1 Lithuania	403 (3.4)	7	13.4
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):			
Australia	504 (3.6)	7 or 8	13.2
Austria	519 (3.1)	7	13.3
Bulgaria	531 (5.4)	7	13.1
Netherlands	517 (3.6)	7	13.2
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):			
Colombia	387 (3.2)	7	14.5
†1 Germany	499 (4.1)	7	13.8
Romania	452 (4.4)	7	13.7
Slovenia	530 (2.4)	7	13.8
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):			
Denmark	439 (2.1)	6	12.9
Greece	449 (2.6)	7	12.6
† South Africa	317 (5.3)	7	13.9
Thailand	493 (3.0)	7	13.5

Science Achievement Scale Score



*Seventh grade in most countries; see Table 2 for information about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
1National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
2National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Figure 1.2

Multiple Comparisons of Achievement in the Sciences - Lower Grade (Seventh Grade*)

Instructions: Read ***across*** the row for a country to compare performance with the countries listed in the heading of the chart. The symbols indicate whether the mean achievement of the country in the row is significantly lower than that of the comparison country, significantly higher than that of the comparison country, or if there is no statistically significant difference between the two countries.†

Country	Singapore	Korea	Czech Republic	Japan	*Bulgaria*	*Slovenia*	Belgium (Fl)	*Austria*	Hungary	*Netherlands*	England	Slovak Republic	United States	*Australia*	*Germany*	Canada	Hong Kong	Ireland	*Thailand*	Sweden	Russian Fed.	Switzerland	Norway	New Zealand	Spain	Scotland	Iceland	*Romania*	France	*Greece*	Belgium (Fr)	*Denmark*	Iran, Islamic Rep.	Latvia (LSS)	Portugal	Cyprus	Lithuania	*Colombia*	*South Africa*
Singapore		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Korea	●		●	●	●	●	●	▲	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Czech Republic	●	●		●	●	●	●	●	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Japan	●	●	●		●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Bulgaria	●	●	●	●		●	●	●	●	●	●	▲	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovenia	●	●	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Belgium (Fl)	●	●	●	●	●	●		●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Austria	▼	▼	●	▼	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hungary	▼	▼	▼	▼	●	●	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Netherlands	▼	▼	●	▼	●	●	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
England	▼	▼	▼	▼	●	▼	▼	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Slovak Republic	▼	▼	▼	▼	▼	▼	▼	●	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
United States	▼	▼	▼	▼	●	▼	▼	●	●	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Australia	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Germany	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Canada	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Hong Kong	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Ireland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●		●	●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Thailand	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Sweden	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Russian Fed.	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Switzerland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●		●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Norway	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●		●	●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
New Zealand	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●	●	●	●	●		●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Spain	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	▼	▼	●	●	●	●		●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Scotland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	●	●	●		●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Iceland	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●		●	●	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲
Romania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●		●	●	●	●	●	▲	▲	▲	▲	▲	▲
France	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●		●	●	▲	▲	▲	▲	▲	▲	▲	▲
Greece	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●		●	●	▲	▲	▲	▲	▲	▲	▲
Belgium (Fr)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●		●	●	●	▲	▲	▲	▲	▲
Denmark	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	●	●		●	●	▲	▲	▲	▲	▲
Iran, Islamic Rep.	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	▼	▼	●	●		●	●	▲	▲	▲	▲
Latvia (LSS)	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●		●	▲	▲	▲	▲
Portugal	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●	●	●	●		●	▲	▲	▲
Cyprus	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	●		▲	▲	▲
Lithuania	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲	▲
Colombia	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼		▲
South Africa	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	▼	

Countries are ordered by mean achievement across the heading and down the rows.

▲ Mean achievement significantly higher than comparison country

● No statistically significant difference from comparison country

▼ Mean achievement significantly lower than comparison country

*Seventh grade in most countries; see Table 2 for information about the grades tested in each country.
†Statistically significant at .05 level, adjusted for multiple comparisons.
Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Appendix A for details).

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

What Are the Increases in Achievement Between the Lower and Upper Grades?

Table 1.3 presents the increases in mean achievement between the two grades tested in each TIMSS country. Countries in the upper portion of the table are shown in decreasing order by the amount of this between-grade difference. Increases in mean performance between the two grades ranged from a high of 73 points in Lithuania to 22 points in the Flemish-speaking part of Belgium[8] and a low of 9 points in South Africa.[9] This degree of increase can be compared to the difference of 37 points between the international average of 516 at eighth grade and that of 479 at seventh grade. Despite the larger increases in some countries compared to others, there is no obvious relationship between mean seventh-grade performance and the between-grade increase. That is, countries showing the highest performance at the seventh grade did not necessarily show either the largest or smallest increases in achievement at the eighth grade. Still, in general, countries with high mean performance in the seventh grade also had high mean performance in the eighth grade.

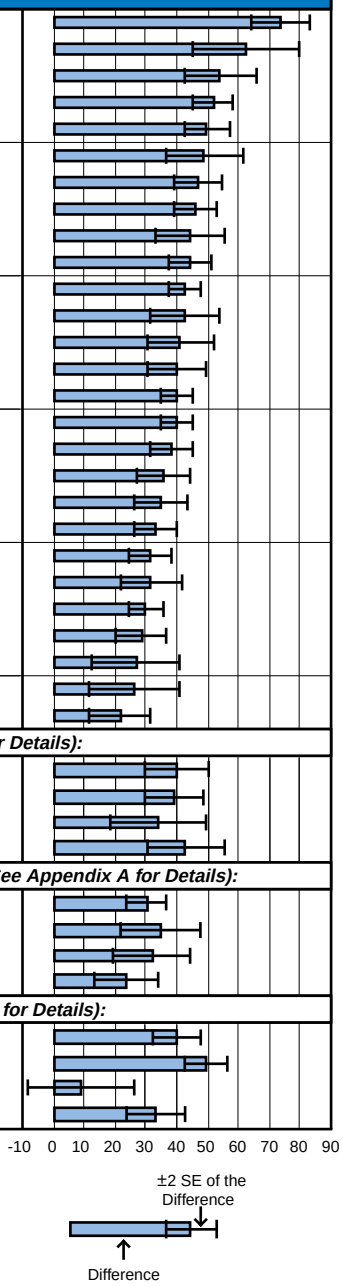
[8] Both educational systems in Belgium have policies whereby lower-performing sixth-grade students continue their study of the primary school curriculum and then re-enter the system as part of a vocational track in the eighth grade. Since these lower-performing students are not included in the seventh-grade results, but do compose about 10% of the sample at the eighth grade, this contributed to reduced performance differences between grades 7 and 8.

[9] In South Africa, there is no structural reason to explain the relatively small difference between seventh- and eighth-grade performance. However, in 1995, its education system was undergoing radical reorganization from 18 racially-divided systems into 9 provincial systems.

Table 1.3

Achievement Differences in the Sciences Between Lower and Upper Grades (Seventh and Eighth Grades*)

Country	Seventh Grade Mean	Eighth Grade Mean	Eighth-Seventh Difference
[1] Lithuania	403 (3.4)	476 (3.4)	73 (4.8)
Singapore	545 (6.6)	607 (5.5)	63 (8.6)
Russian Federation	484 (4.2)	538 (4.0)	54 (5.8)
Portugal	428 (2.1)	480 (2.3)	52 (3.1)
[1] Latvia (LSS)	435 (2.7)	485 (2.7)	50 (3.8)
† Scotland	468 (3.8)	517 (5.1)	49 (6.4)
Sweden	488 (2.6)	535 (3.0)	47 (3.9)
France	451 (2.6)	498 (2.5)	46 (3.6)
New Zealand	481 (3.4)	525 (4.4)	44 (5.5)
Norway	483 (2.9)	527 (1.9)	44 (3.5)
Cyprus	420 (1.8)	463 (1.9)	43 (2.7)
Ireland	495 (3.5)	538 (4.5)	43 (5.7)
Czech Republic	533 (3.3)	574 (4.3)	41 (5.4)
†[2] England	512 (3.5)	552 (3.3)	40 (4.8)
Japan	531 (1.9)	571 (1.6)	40 (2.5)
Spain	477 (2.1)	517 (1.7)	40 (2.7)
[1] Switzerland	484 (2.5)	522 (2.5)	38 (3.5)
Hungary	518 (3.2)	554 (2.8)	36 (4.2)
Slovak Republic	510 (3.0)	544 (3.2)	35 (4.4)
Iran, Islamic Rep.	436 (2.6)	470 (2.4)	33 (3.5)
Canada	499 (2.3)	531 (2.6)	32 (3.5)
Iceland	462 (2.8)	494 (4.0)	32 (4.9)
Korea	535 (2.1)	565 (1.9)	30 (2.9)
† Belgium (Fr)	442 (3.0)	471 (2.8)	29 (4.2)
Hong Kong	495 (5.5)	522 (4.7)	27 (7.2)
† United States	508 (5.5)	534 (4.7)	26 (7.2)
† Belgium (Fl)	529 (2.6)	550 (4.2)	22 (4.9)
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):			
Australia	504 (3.6)	545 (3.9)	40 (5.3)
Austria	519 (3.1)	558 (3.7)	39 (4.8)
Bulgaria	531 (5.4)	565 (5.3)	34 (7.6)
Netherlands	517 (3.6)	560 (5.0)	43 (6.1)
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):			
Slovenia	530 (2.4)	560 (2.5)	30 (3.4)
Romania	452 (4.4)	486 (4.7)	34 (6.5)
†[1] Germany	499 (4.1)	531 (4.8)	32 (6.3)
Colombia	387 (3.2)	411 (4.1)	24 (5.2)
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):			
Denmark	439 (2.1)	478 (3.1)	39 (3.8)
Greece	449 (2.6)	497 (2.2)	49 (3.4)
† South Africa	317 (5.3)	326 (6.6)	9 (8.5)
Thailand	493 (3.0)	525 (3.7)	33 (4.8)



*Seventh and eighth grades in most countries; see Table 2 for infomation about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
[1]National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
[2]National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

What Are the Differences in Performance Compared to Three Marker Levels of International Science Achievement?

Tables 1.4 and 1.5 portray the performance of students in each TIMSS country in terms of international levels of achievement for the eighth and seventh grades, respectively. This method provides another useful comparison of student performance across countries by determining the percentage of students in each country reaching specific levels of performance. Since the TIMSS achievement tests do not have any pre-specified performance standards, three marker levels were chosen on the basis of the combined performance of all students at a grade level in the study – the Top 10%, the Top Quarter (25%), and the Top Half (50%). For example, Table 1.4 shows that 10% of all eighth graders in countries participating in the TIMSS study achieved at the level of 655 or better. This score point, then, was designated as the marker level for the Top 10%. Similarly, the Top Quarter marker level was determined as 592 and the Top Half marker level as 522. At the seventh grade, these marker levels are 615, 553 and 483, respectively.

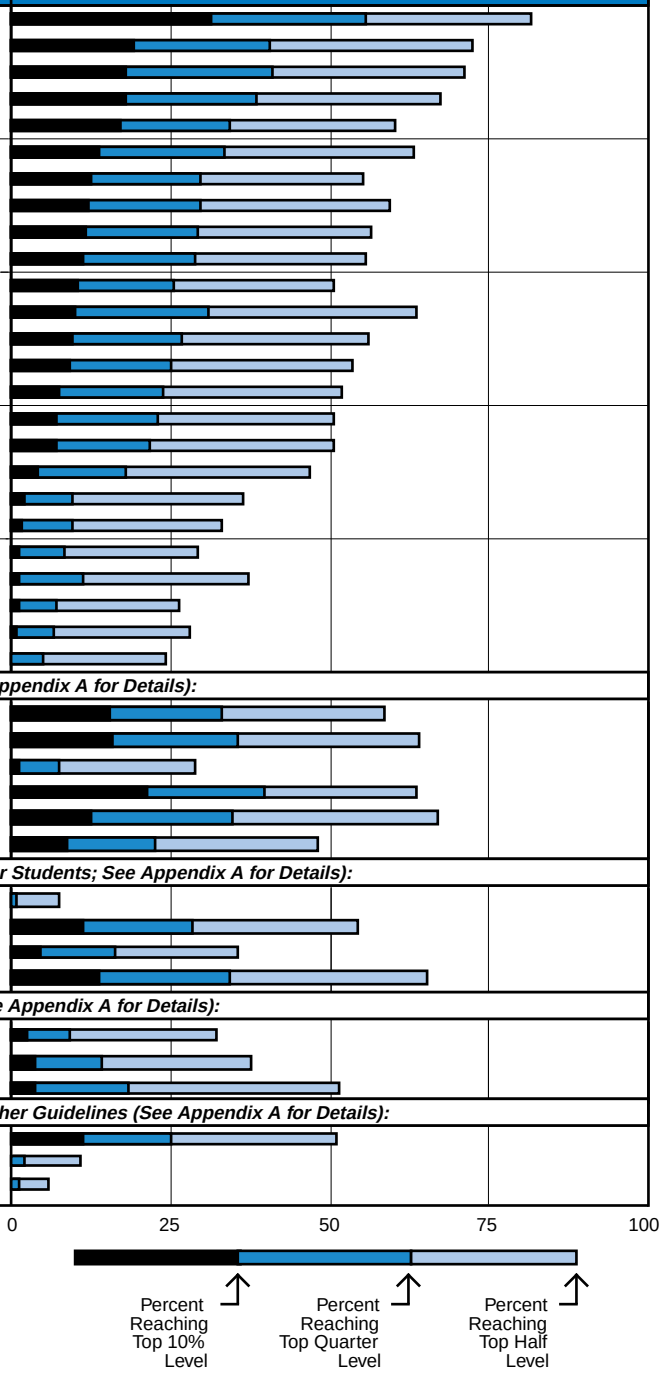
If every country had the same distribution of high-, medium-, and low-performing students, then each country would be expected to have approximately 10% of its students reaching the Top 10% level, 25% reaching the Top Quarter level, and 50% reaching the Top Half level. Although no country achieved exactly this pattern, the distributions of eighth- and/or seventh-grade students in several countries were quite close. For example, 9%, 24%, and 49% of the seventh-grade students in the Russian Federation reached the corresponding levels. Similarly, percentages close to the international norm were noted at the eighth grade for New Zealand, Sweden, Scotland, and Israel. In contrast, in Singapore nearly one-third (31%) of the eighth-grade students and 24% of seventh-grade students reached the Top 10% level, approximately half or more reached the Top Quarter level (56% at the eighth grade and 48% at the seventh grade), and about three-quarters or more reached the Top Half level (82% at the eighth grade and 74% at the seventh grade).

It can be informative to look at performance at each marker level. For example, at the eighth grade, Norway, Switzerland, and Hong Kong did not quite attain the Top 10% level, with 7% of students reaching that level. However, performance in these countries approximated both the Top Quarter and Top Half levels. In comparison, eighth-grade students in Belgium (Flemish) attained approximately the Top 10% level (10%) and exceeded both the Top Quarter and Top Half levels (31% and 64%). This pattern for the Belgian (Flemish) students was even more pronounced at the seventh grade, with 73% of students reaching the Top Half level.

Table 1.4

Percentages of Students Achieving International Marker Levels in the Sciences Upper Grade (Eighth Grade*)

Country	Top 10% Level	Top Quarter Level	Top Half Level
Singapore	31 (2.3)	56 (2.5)	82 (1.6)
Czech Republic	19 (1.6)	41 (2.1)	72 (1.6)
Japan	18 (0.6)	41 (0.8)	71 (0.7)
Korea	18 (0.8)	39 (0.9)	68 (0.9)
†2 England	17 (0.9)	34 (1.4)	60 (1.4)
Hungary	14 (0.8)	34 (1.3)	63 (1.4)
† United States	13 (0.8)	30 (1.6)	55 (1.9)
Slovak Republic	12 (0.9)	30 (1.4)	59 (1.5)
Ireland	12 (0.9)	29 (1.6)	57 (2.0)
Russian Federation	11 (0.8)	29 (1.3)	56 (1.8)
New Zealand	11 (0.9)	26 (1.5)	51 (1.9)
† Belgium (Fl)	10 (0.8)	31 (1.8)	64 (2.1)
Sweden	9 (0.6)	27 (1.2)	56 (1.5)
Canada	9 (0.6)	25 (0.9)	54 (1.3)
Norway	7 (0.5)	24 (0.9)	52 (1.1)
1 Switzerland	7 (0.6)	23 (1.0)	51 (1.2)
Hong Kong	7 (0.8)	22 (1.5)	51 (2.3)
Spain	4 (0.3)	18 (0.7)	47 (1.0)
Iceland	2 (0.5)	10 (1.3)	36 (2.1)
1 Latvia (LSS)	2 (0.3)	10 (0.7)	33 (1.3)
1 Lithuania	1 (0.3)	8 (0.8)	29 (1.7)
France	1 (0.2)	11 (0.8)	37 (1.5)
Cyprus	1 (0.2)	7 (0.5)	26 (0.9)
Portugal	1 (0.1)	7 (0.6)	28 (1.2)
Iran, Islamic Rep.	1 (0.1)	5 (0.6)	24 (1.5)
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):			
Australia	16 (0.9)	33 (1.3)	59 (1.6)
Austria	16 (0.9)	35 (1.2)	64 (1.6)
Belgium (Fr)	1 (0.2)	8 (0.6)	29 (1.4)
Bulgaria	21 (1.4)	40 (2.2)	64 (2.3)
Netherlands	12 (1.1)	35 (2.3)	67 (2.4)
Scotland	9 (1.1)	23 (1.8)	48 (2.2)
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):			
Colombia	0 (0.1)	1 (0.2)	8 (0.9)
†1 Germany	11 (1.0)	29 (1.6)	54 (2.1)
Romania	5 (0.6)	16 (1.3)	36 (2.0)
Slovenia	14 (0.9)	34 (1.3)	65 (1.2)
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):			
Denmark	2 (0.3)	9 (0.7)	32 (1.3)
Greece	4 (0.4)	14 (0.7)	38 (1.3)
Thailand	4 (0.5)	18 (1.7)	51 (2.2)
Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):			
1 Israel	11 (1.2)	25 (2.3)	51 (2.6)
Kuwait	0 (0.0)	2 (0.4)	11 (1.3)
South Africa	1 (0.2)	1 (0.3)	5 (1.3)



The international levels correspond to the percentiles computed from the combined data from all of the participating countries.

Top 10% Level (90th Percentile) = 655
Top Quarter Level (75th Percentile) = 592
Top Half Level (50th Percentile) = 522

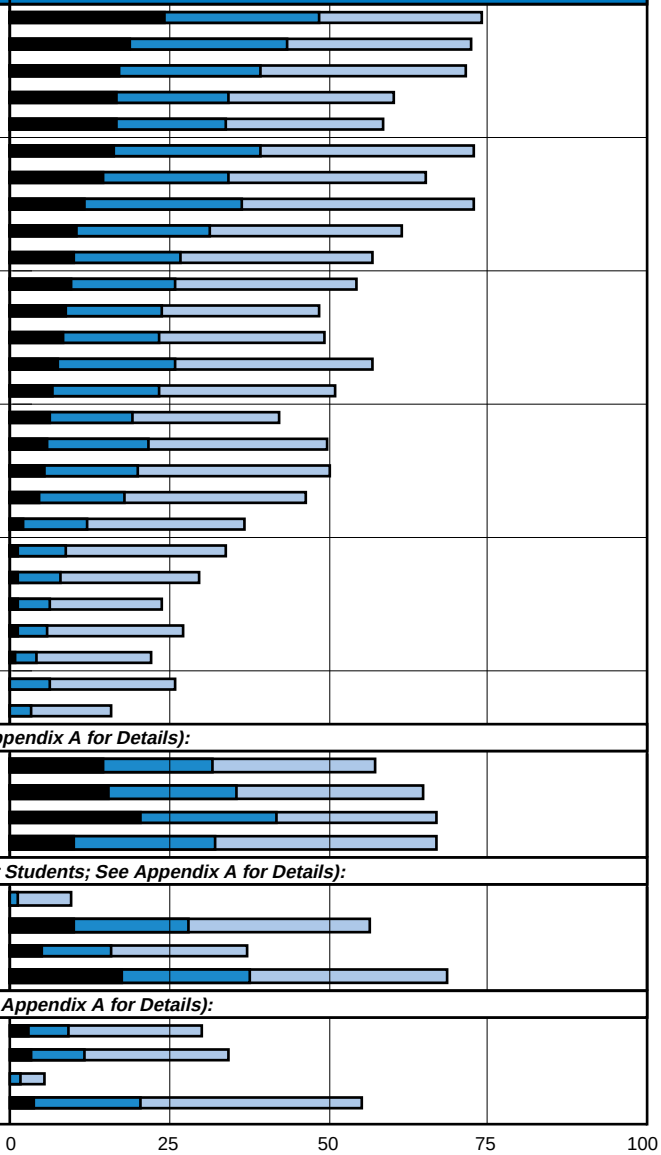
*Eighth grade in most countries; see Table 2 for information about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
1National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
2National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 1.5

Percentages of Students Achieving International Marker Levels in the Sciences Lower Grade (Seventh Grade*)

Country	Top 10% Level	Top Quarter Level	Top Half Level
Singapore	24 (2.3)	48 (3.1)	74 (2.3)
Korea	19 (0.8)	43 (1.0)	72 (1.2)
Japan	17 (0.9)	39 (1.0)	72 (0.7)
†2 England	17 (1.4)	34 (1.6)	60 (1.2)
† United States	17 (1.5)	34 (2.2)	58 (2.1)
Czech Republic	16 (1.1)	39 (1.6)	73 (1.4)
Hungary	15 (0.9)	34 (1.4)	65 (1.4)
† Belgium (Fl)	12 (0.8)	36 (1.4)	73 (1.3)
Slovak Republic	10 (0.9)	31 (1.3)	62 (1.4)
Canada	10 (0.6)	27 (1.1)	57 (1.1)
Ireland	9 (0.7)	26 (1.3)	54 (1.7)
Russian Federation	9 (1.1)	24 (1.6)	49 (2.0)
New Zealand	8 (0.8)	23 (1.3)	49 (1.6)
Hong Kong	8 (0.9)	26 (2.0)	57 (2.7)
Sweden	7 (0.5)	24 (1.1)	51 (1.4)
† Scotland	6 (0.6)	19 (1.2)	42 (1.8)
Norway	6 (0.6)	22 (1.2)	50 (1.5)
1 Switzerland	5 (0.4)	20 (0.8)	50 (1.2)
Spain	4 (0.4)	18 (0.8)	46 (1.2)
Iceland	2 (0.3)	12 (1.1)	37 (1.9)
France	1 (0.2)	9 (0.7)	34 (1.4)
† Belgium (Fr)	1 (0.2)	8 (0.8)	30 (1.5)
Cyprus	1 (0.2)	6 (0.4)	24 (0.8)
1 Latvia (LSS)	1 (0.2)	6 (0.6)	27 (1.1)
Portugal	1 (0.1)	4 (0.4)	22 (1.1)
Iran, Islamic Rep.	0 (0.2)	6 (1.4)	26 (1.6)
1 Lithuania	0 (0.1)	3 (0.4)	16 (1.3)
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):			
Australia	15 (0.8)	32 (1.3)	57 (1.4)
Austria	16 (0.8)	36 (1.3)	65 (1.4)
Bulgaria	20 (1.7)	42 (2.3)	67 (2.2)
Netherlands	10 (1.1)	32 (2.0)	67 (2.1)
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):			
Colombia	0 (0.0)	1 (0.3)	9 (0.9)
†1 Germany	10 (0.8)	28 (1.6)	57 (1.9)
Romania	5 (0.6)	16 (1.3)	37 (1.8)
Slovenia	17 (0.9)	38 (1.1)	69 (1.2)
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):			
Denmark	3 (0.3)	9 (0.7)	30 (1.2)
Greece	3 (0.4)	11 (0.8)	34 (1.2)
† South Africa	0 (0.1)	1 (0.4)	5 (1.1)
Thailand	3 (0.4)	20 (1.4)	55 (1.8)



The international levels correspond to the percentiles computed from the combined data from all of the participating countries.

Top 10% Level (90th Percentile) = 615
Top Quarter Level (75th Percentile) = 553
Top Half Level (50th Percentile) = 483

*Seventh grade in most countries; see Table 2 for information about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
[1]National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
[2]National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

What Are the Gender Differences in Science Achievement?

Tables 1.6 and 1.7 reveal that boys had significantly higher mean science achievement than girls at both the seventh and eighth grades internationally and in many countries. Each of the two tables, the first one for the eighth grade and the second for the seventh grade, presents mean science achievement separately for boys and girls for each country, as well as the difference between the means. Countries in the upper part of the tables are shown in increasing order of this gender difference. The visual representation of the gender difference for each country, shown by a bar, indicates the amount of the difference, whether the direction of the difference favored girls or boys, and whether or not the difference is statistically significant (indicated by a darkened bar).

In the eighth grade, statistically significant differences favoring boys ranged from 12 points in Canada to 33 points in Israel, with boys averaging 20 or more points higher than girls in 12 countries. For most of these countries, and many others, the seventh-grade gender differences were somewhat smaller. In only seven countries were there no statistically significant differences in science achievement between boys and girls in both grades – Cyprus, the United States, Singapore, Australia, Romania, Thailand, and South Africa. This finding of a pervasive difference favoring boys in science is substantially more pronounced than in the TIMSS mathematics results for seventh and eighth grades, which indicate an international pattern of gender differences favoring males but show few significant differences for individual countries.[10] The TIMSS findings, however, are very consistent with the results from the second IEA science study conducted in 1983-84. For 14-year-olds (or students in the grade with the most 14-year-olds) that study found standard score differences favoring boys in all 23 of the participating countries.[11]

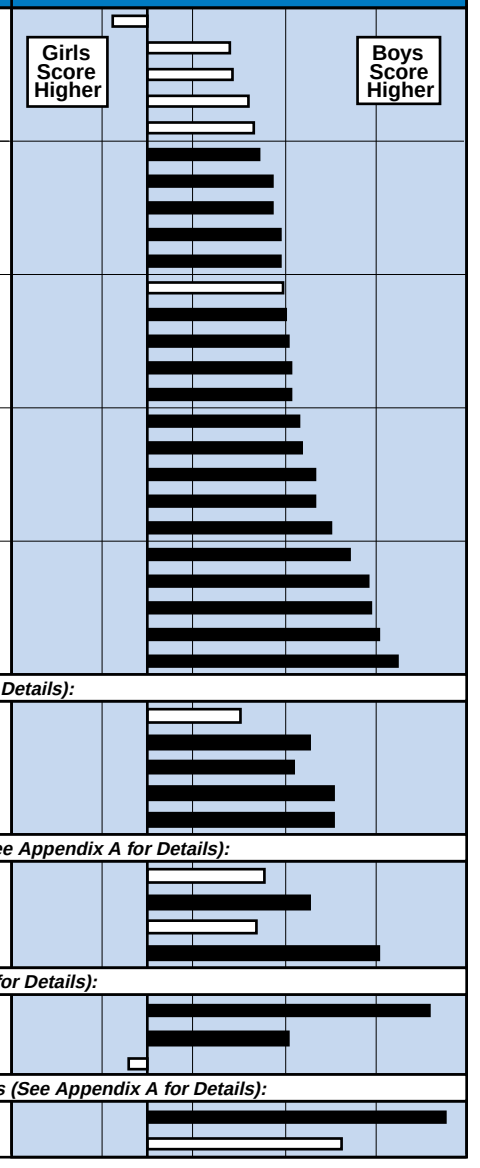
[10] Beaton, A.E., Mullis, I.V.S., Martin, M.O., Gonzalez, E.J., Kelly, D.L., and Smith, T.A. (1996). *Mathematics Achievement in the Middle School Years: The IEA's Third International Mathematics and Science Study (TIMSS).* Chestnut Hill, MA: Boston College.

[11] Postlethwaite, T.N. and Wiley, D.E. (1992). *The IEA Study of Science II: Science Achievement in Twenty-Three Countries.* New York, NY: Pergamon Press.

Table 1.6

Gender Differences in Achievement in the Sciences - Upper Grade (Eighth Grade*)

Country	Boys' Mean	Girls' Mean	Difference Absolute Value
Cyprus	461 (2.2)	465 (2.7)	4 (3.4)
† United States	539 (4.9)	530 (5.2)	9 (7.2)
Singapore	612 (6.7)	603 (7.0)	9 (9.7)
Russian Federation	544 (4.9)	533 (3.7)	11 (6.2)
Ireland	544 (6.6)	532 (5.2)	12 (8.4)
Canada	537 (3.1)	525 (3.7)	12 (4.8)
Norway	534 (3.2)	520 (2.0)	14 (3.8)
1 Lithuania	484 (3.8)	470 (4.0)	14 (5.5)
Sweden	543 (3.4)	528 (3.4)	15 (4.8)
1 Latvia (LSS)	492 (3.3)	478 (3.2)	15 (4.6)
† Belgium (Fl)	558 (6.0)	543 (5.8)	15 (8.4)
1 Switzerland	529 (3.2)	514 (3.0)	15 (4.4)
Slovak Republic	552 (3.5)	537 (3.9)	15 (5.2)
Iceland	501 (5.1)	486 (4.6)	16 (6.9)
France	506 (2.7)	490 (3.3)	16 (4.3)
Japan	579 (2.4)	562 (2.0)	17 (3.1)
Iran, Islamic Rep.	477 (3.8)	461 (3.2)	17 (4.9)
Spain	526 (2.1)	508 (2.3)	18 (3.1)
Hungary	563 (3.1)	545 (3.4)	18 (4.7)
†2 England	562 (5.6)	542 (4.2)	20 (7.1)
Portugal	490 (2.8)	468 (2.7)	22 (3.9)
Czech Republic	586 (4.2)	562 (5.8)	24 (7.2)
Korea	576 (2.7)	551 (2.3)	24 (3.6)
New Zealand	538 (5.4)	512 (5.2)	25 (7.6)
Hong Kong	535 (5.5)	507 (5.1)	27 (7.5)
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):			
Australia	550 (5.2)	540 (4.1)	10 (6.6)
Austria	566 (4.0)	549 (4.6)	18 (6.1)
Belgium (Fr)	479 (4.8)	463 (2.9)	16 (5.6)
Netherlands	570 (6.4)	550 (4.9)	20 (8.1)
Scotland	527 (6.4)	507 (4.7)	20 (7.9)
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):			
Colombia	418 (7.3)	405 (4.6)	13 (8.6)
†1 Germany	542 (5.9)	524 (4.9)	18 (7.6)
Romania	492 (5.3)	480 (5.0)	12 (7.3)
Slovenia	573 (3.2)	548 (3.2)	25 (4.5)
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):			
Denmark	494 (3.6)	463 (3.9)	31 (5.3)
Greece	505 (2.6)	489 (3.1)	16 (4.0)
Thailand	524 (3.9)	526 (4.3)	2 (5.8)
Unapproved Sampling Procedures at Classroom Level and Not Meeting Other Guidelines (See Appendix A for Details):			
1 Israel	545 (6.4)	512 (6.1)	33 (8.9)
South Africa	337 (9.5)	315 (6.0)	21 (11.3)



International Averages		
Boys	Girls	Difference
525	509	17

(Averages of all country means)

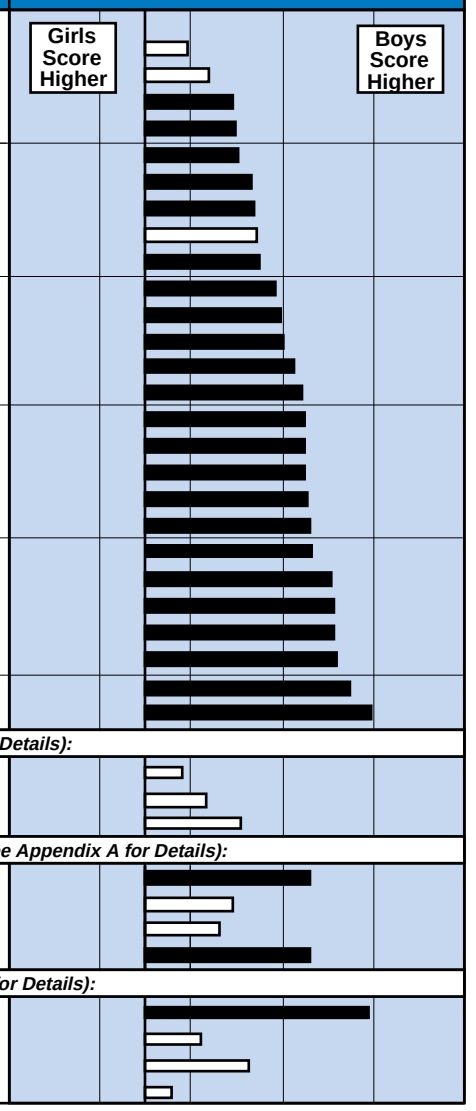
*Eighth grade in most countries; see Table 2 for information about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
1National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
2National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

Table 1.7

Gender Differences in Achievement in the Sciences - Lower Grade (Seventh Grade*)

Country	Boys' Mean	Girls' Mean	Difference (Absolute Value)
Cyprus	420 (2.8)	420 (2.6)	0 (3.9)
[1] Lithuania	405 (3.5)	401 (4.2)	5 (5.5)
Singapore	548 (7.9)	541 (8.2)	7 (11.4)
[1] Latvia (LSS)	440 (3.6)	430 (3.0)	9 (4.7)
Sweden	493 (2.9)	484 (3.3)	10 (4.4)
Japan	536 (2.6)	526 (1.9)	10 (3.2)
Norway	489 (3.6)	477 (3.6)	12 (5.1)
Iceland	468 (4.4)	456 (2.4)	12 (5.0)
† United States	514 (6.3)	502 (5.8)	12 (8.6)
Canada	505 (2.9)	493 (2.5)	12 (3.8)
† Belgium (Fl)	536 (3.3)	521 (3.1)	14 (4.5)
Hungary	525 (3.9)	510 (3.4)	15 (5.1)
Iran, Islamic Rep.	443 (2.9)	428 (4.1)	15 (5.0)
Portugal	436 (2.4)	420 (2.4)	16 (3.4)
Ireland	504 (4.6)	487 (4.5)	17 (6.4)
New Zealand	489 (4.3)	472 (3.7)	17 (5.7)
Russian Federation	493 (5.3)	475 (3.8)	17 (6.5)
[1] Switzerland	492 (2.9)	475 (2.9)	18 (4.1)
† Scotland	477 (4.4)	459 (4.1)	18 (6.0)
France	461 (3.1)	443 (3.0)	18 (4.3)
Hong Kong	503 (6.6)	485 (5.8)	18 (8.7)
Czech Republic	543 (3.2)	523 (4.1)	20 (5.2)
† Belgium (Fr)	453 (3.6)	432 (3.5)	21 (5.0)
Spain	487 (2.9)	467 (2.3)	21 (3.7)
Slovak Republic	520 (4.0)	499 (3.1)	21 (5.1)
†[2] England	522 (5.6)	500 (4.6)	22 (7.3)
Korea	545 (2.8)	521 (3.2)	25 (4.2)
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix A for Details):			
Australia	507 (5.2)	502 (4.0)	4 (6.6)
Austria	522 (4.3)	516 (4.1)	7 (6.0)
Netherlands	523 (4.0)	512 (4.4)	11 (5.9)
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix A for Details):			
Colombia	396 (3.8)	378 (4.4)	18 (5.8)
†[1] Germany	505 (4.9)	495 (4.5)	10 (6.6)
Romania	456 (4.7)	448 (4.9)	8 (6.7)
Slovenia	539 (3.0)	521 (2.8)	18 (4.1)
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix A for Details):			
Denmark	452 (3.0)	427 (2.8)	25 (4.1)
Greece	452 (3.2)	446 (2.8)	6 (4.2)
† South Africa	324 (6.4)	312 (5.2)	11 (8.3)
Thailand	495 (3.3)	492 (3.5)	3 (4.8)



International Averages

Boys	Girls	Difference
485	471	14

(Averages of all country means)

*Seventh grade in most countries; see Table 2 for information about the grades tested in each country.
†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).
[1]National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.
[2]National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).
Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some totals may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

What Are the Differences in Median Performance at Age 13?

Testing the two adjacent grades with the most 13-year-olds provides the opportunity to compare achievement on the basis of age. For countries where the two grades tested contained at least 75% of the 13-year-olds, TIMSS estimated the median performance for this age group. Table 1.8 provides the estimated medians as well as the estimated distributions of 13-year-olds across grades.[12] For many countries, the two grades tested included practically all of their 13-year-olds (nine countries have at least 98%), whereas, for some others, there were substantial percentages outside these grades, mostly in the grade below.[13] For countries included in Table 1.8, Hong Kong, French-speaking Belgium, Hungary, France, Ireland, Latvia (LSS), Spain, Lithuania, Portugal, Austria, Romania, and Thailand had 10% or more of their 13-year-olds below the two grades tested.

The median is the point on the science scale that divides the higher-performing 50% of the students from the lower-performing 50%. Like the mean, the median provides a useful summary statistic on which to compare performance across countries. It is used instead of the mean in this table because it can be reliably estimated even when scores from some members of the population are not available[14] (that is, those 13-year-olds outside the tested grades).

Notwithstanding the additional difficulties in obtaining the achievement estimates for the age-based samples, the results for 13-year-olds appear quite consistent with those obtained for the two grade levels. The relative performance of countries in science achievement on the basis of median performance of 13-year-olds was quite similar to that based on average eighth-grade and/or seventh-grade performance, although there are a few exceptions. For example, the Czech Republic and Ireland did relatively less well among 13-year-olds compared to eighth-grade students. In general, however, the higher-performing countries in the eighth and seventh grades generally were those with higher-performing 13-year-olds.

[12] For information about the distribution of 13-year-olds in all countries, not just those with 75% coverage, see Table A.3 in Appendix A.

[13] The number of 13-year-olds below the lower grade and above the upper grade tested were extrapolated from the distribution of 13-year-olds in the tested grades.

[14] Because TIMSS sampled students in the two adjacent grades with the most 13-year-olds within a country, it was possible to estimate the median for the 13-year-old students when the two tested grades included at least an estimated 75% of the 13-year-olds in that country. To compute the median, TIMSS assumed that those 13-year-old students in the grades below the tested grades would score below the median and those in the grades above the tested grades would score above the median. The percentages assumed to be above and below the median were added to the tails of the distribution before calculating the median using the modified distribution.

Table 1.8

Median Achievement in the Sciences - 13-Year-Old Students
Includes Only Countries Where the Grades Tested Contained at Least 75% of the 13-Year-Olds

Country	Median	Lower Grade	Upper Grade	Estimated Distribution of 13-Year-Olds			
				Percent Below Lower Grade*	Percentage of 13-Year-Old Students Tested		Percent Above Upper Grade*
					Percent in Lower Grade	Percent in Upper Grade	
Singapore	555 (6.8)	Secondary 1	Secondary 2	3.1%	82.2%	14.7%	0.0%
Korea	546 (2.3)	1st Grade Middle School	2nd Grade Middle School	1.5%	69.9%	28.2%	0.4%
† Belgium (Fl)	539 (2.4)	1A	2A & 2P	5.4%	45.6%	48.8%	0.2%
Japan	535 (3.0)	1st Grade Lower Secondary	2nd Grade Lower Secondary	0.3%	90.9%	8.8%	0.0%
Czech Republic	530 (3.4)	7	8	9.6%	73.3%	17.1%	0.0%
†2 England	529 (4.2)	Year 8	Year 9	0.6%	57.2%	41.7%	0.5%
Hungary	521 (3.4)	7	8	10.5%	65.1%	24.2%	20.0%
Slovak Republic	513 (3.9)	7	8	4.7%	73.2%	22.1%	0.0%
Canada	511 (4.1)	7	8	8.1%	48.4%	42.9%	0.6%
Sweden	511 (2.8)	6	7	0.8%	44.9%	54.1%	0.1%
† United States	510 (5.1)	7	8	9.0%	57.8%	33.1%	0.2%
Norway	506 (2.9)	6	7	0.3%	42.5%	57.0%	0.2%
† Scotland	504 (4.2)	Secondary 1	Secondary 2	0.3%	24.0%	75.3%	0.5%
Russian Federation	503 (4.2)	7	8	4.5%	50.4%	44.3%	0.7%
Hong Kong	501 (4.9)	Secondary 1	Secondary 2	10.0%	44.2%	45.6%	0.2%
New Zealand	497 (4.6)	Form 2	Form 3	0.5%	51.7%	47.4%	0.4%
1 Switzerland	495 (2.2)	6 or 7	7 or 8	8.3%	47.6%	43.9%	0.2%
Iceland	489 (3.4)	7	8	0.2%	16.5%	83.0%	0.4%
Ireland	486 (3.1)	1st Year	2nd Year	14.1%	69.0%	16.8%	0.2%
Spain	483 (3.1)	7 EGB	8 EGB	14.9%	45.8%	39.0%	0.3%
France	455 (3.7)	5ème	4ème (90%) or 4ème Technologique (10%)	20.5%	43.5%	34.7%	1.3%
† Belgium (Fr)	452 (3.9)	1A	2A & 2P	13.3%	40.6%	46.0%	0.2%
Cyprus	450 (2.9)	7	8	1.7%	27.7%	69.9%	0.7%
1 Latvia (LSS)	436 (3.7)	7	8	14.3%	59.5%	26.0%	0.2%
Portugal	423 (3.4)	Grade 7	Grade 8	23.5%	44.1%	32.1%	0.3%
1 Lithuania	413 (3.4)	7	8	10.1%	64.1%	25.6%	0.2%
Countries Not Satisfying Guidelines for Sample Participation Rates (See Appendix for Details):							
Australia	509 (3.9)	7 or 8	8 or 9	7.5%	63.6%	28.4%	0.5%
Austria	526 (3.4)	3. Klasse	4. Klasse	10.7%	62.4%	26.9%	0.0%
Bulgaria	543 (4.8)	7	8	3.2%	58.1%	36.9%	1.8%
Netherlands	522 (3.8)	Secondary 1	Secondary 2	9.8%	58.7%	31.2%	0.4%
Countries Not Meeting Age/Grade Specifications (High Percentage of Older Students; See Appendix for Details):							
Romania	414 (4.5)	7	8	23.9%	66.6%	9.3%	0.3%
Countries With Unapproved Sampling Procedures at Classroom Level (See Appendix for Details):							
Denmark	466 (2.8)	6	7	1.0%	34.6%	63.5%	0.9%
Greece	490 (2.9)	Secondary 1	Secondary 2	3.1%	11.2%	84.5%	1.2%
Thailand	485 (3.4)	Secondary 1	Secondary 2	18.0%	58.4%	19.6%	4.0%

*Data are extrapolated; students below the lower grade and above the upper grade were not included in the sample. Denmark, Sweden and Switzerland tested 3 grades.

†Met guidelines for sample participation rates only after replacement schools were included (see Appendix A for details).

1 National Desired Population does not cover all of International Desired Population (see Table A.2). Because coverage falls below 65%, Latvia is annotated LSS for Latvian Speaking Schools only.

2 National Defined Population covers less than 90 percent of National Desired Population (see Table A.2).

( ) Standard errors appear in parentheses. Because results are rounded, some totals may appear inconsistent.

SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.