International Association for the Evaluation of Educational Achievement

Effective Schools in Science and Mathematics

IEA's Third International Mathematics and Science Study

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Overview of Procedures and Results

Introduction

In the constant struggle to improve education in countries everywhere, the issue of school effectiveness has attracted considerable attention in recent years.[1] School effectiveness as an area of study seeks to improve educational practice by studying how schools discharge their role as institutions for learning and instruction, and in particular what makes for a successful school. Since in every country, schools are almost universally the primary institutions for student learning, discoveries about the essentials of effective schooling have the potential to have a great impact, particularly if they can help to raise the performance of the low-achieving schools to match the schools with the highest levels.

Although at first glance it might seem that effective schools are simply those with high average student achievement, since the pertinent literature makes it clear that often high achievement depends mainly upon the composition of the student intake, it is important to take into account the difficulty of the educational task when evaluating the effectiveness of a school. Schools with a high proportion of well-prepared students from homes and communities with strong support for learning are already well on the way to high achievement levels, regardless of the contribution of the school in terms of instruction, facilities and support. Schools in less-advantaged circumstances face a more difficult challenge. Accordingly, studies of school effectiveness typically attempt to disentangle the effects of the organizational and instructional practices of the school from the effects of the abilities and level of preparation of the student body prior to entering the school. Although this can never be completely successful, advances in statistical methodology using hierarchical linear modeling (HLM) have provided powerful techniques for this endeavor.

While a great deal of work has already been accomplished in a range of countries, both with national data and with data from international studies, the data provided by the Third International Mathematics and Science Study (TIMSS)[2] offer unprecedented opportunities for cross-national analyses of school effectiveness. Based on a collaborative venture involving 39 countries, and sponsored by the International Association for the Evaluation of Educational Achievement (IEA), TIMSS is the most ambitious and complex comparative education study undertaken to date. With student achieve-

1 Wyatt, T. (1996), "School Effectiveness Research: Dead End, Damp Squib or Smoldering Fuse?" *Issues in Educational Research*, 6(1), 79-112.

2 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: IEA's Third International Mathematics and Science Study (TIMSS).* Chestnut Hill, MA: Boston College.

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 (TIMSS).* Chestnut Hill, MA: Boston College.

ment data in mathematics and science collected with the same instruments and following the same procedures in each country, TIMSS provides a cross-national platform of unusual breadth for investigating effective schooling in science and mathematics.

This report presents the findings of an exploratory study of school effectiveness, using data from TIMSS for eighth-grade students. This report has two parts.

- As a starting point to identifying characteristics of effective schools, the first part of the study divided schools in each country into high-performing and low-performing groups on the basis of average student achievement in eighth-grade mathematics and science, and then looked for variables that discriminated between the two groups. Variables that were characteristic of high-performing schools but not of low-performers were retained for further analysis in the second part of the study.

- Building on this work, the second set of analyses sought to identify attributes of effective schools, i.e., those characteristics of schools in each country that were associated with high student achievement even after adjusting statistically for the effect of students' home background on achievement. These analyses made use of hierarchical linear modeling techniques.

Which Countries Were Included in the Report?

Countries participating in TIMSS were required to administer mathematics and science tests to the two adjacent grade levels in their systems containing the most 13-year-old students.[3] This report is based on data from the upper of these two grades, which was the eighth grade in most countries. Exhibit 1 provides information about the grade tested in each country.

Having valid and efficient samples in each country is crucial to the quality and success of any international comparative study.[4] TIMSS developed procedures and guidelines to ensure that the national samples were of the highest quality possible. Standards for coverage of the target population, participation rates, and the age of students were established, as were clearly documented procedures on how to obtain the national samples. For the most part, the national samples

[3] For countries also wanting to participate at the primary and secondary school levels, TIMSS tested students in the two grades with the most 9-year olds (third and fourth grades in most countries), and in the final year of secondary school (twelfth grade in the U.S. and many countries). These data were not included in this report.

[4] The technical aspects of TIMSS are described in a series of technical reports:
Martin, M.O. and Kelly, D.L. (Eds). (1996). *Third International Mathematics and Science Study (TIMSS) Technical Report Volume I: Design and Development*. Chestnut Hill, MA: Boston College.

Martin, M.O. and Kelly, D.L. (Eds.). (1997). *Third International Mathematics and Science Study (TIMSS) Technical Report Volume II: Implementation and Analysis in the Primary and Middle School Years*. Chestnut Hill, MA: Boston College.

Martin, M.O. and Mullis, I.V.S. (Eds.). (1996). *Third International Mathematics and Science Study (TIMSS): Quality Assurance in Data Collection*. Chestnut Hill, MA: Boston College.

were drawn in accordance with the TIMSS standards, and achievement results can be compared with confidence. The 34 countries that satisfied the TIMSS standards with approved sampling procedures at the classroom level are included in the first part of this report. Appendix A (Exhibit A.1) shows the participating countries grouped according to the degree of compliance with the guidelines for sample implementation and participation rates.

What Was the Nature of the Data?

TIMSS was very much a collaboration among countries. Each participant designated a national center to conduct the activities of the study and a National Research Coordinator (NRC) to assume responsibility for the successful completion of these tasks. For the sake of comparability, all testing was conducted at the end of the school year. The four countries on a Southern Hemisphere school schedule (Australia, Korea, New Zealand, and Singapore) tested the mathematics and science achievement of their students in September through November of 1994, which was the end of the school year in the Southern Hemisphere. The remaining countries tested at the end of the 1994-95 school year, most often in May and June of 1995.

The Achievement Tests in Science and Mathematics

Together with the quality of the samples, the quality of the test also receives considerable scrutiny in any comparative study of the magnitude and importance of TIMSS. All participants wish to ensure that the achievement items are appropriate for their students and reflect their current curriculum. Developing the TIMSS tests was a cooperative venture involving all of the NRCs during the entire process. Through a series of efforts, countries submitted items that were reviewed by subject-matter specialists, and additional items were written to ensure that the desired topics were covered adequately. Every effort was made to ensure that the tests represented the curricula of the participating countries and that the items did not exhibit any bias toward or against any country.

Six content areas were covered by the mathematics tests taken by the eighth-grade students. These areas, and the percentage of test items devoted to each, include fractions and number sense (34%); measurement (12%); proportionality (7%); data representation, analysis, and probability (14%); geometry (15%); and algebra (18%). The eighth-grade science test consisted of just five content areas: earth science (16%); life science (30%); physics (30%); chemistry (14%); and environmental issues and the nature of science (10%). About one-fourth of the questions were in free-response format, requiring stu-

Exhibit 1 Grade Tested in Participating Countries – Eighth Grade

Country	Grade Tested
Australia	8 or 9
Austria	4, Klasse
Belgium (Flemish)	2A & 2P
Belgium (French)	2A & 2P
Canada	8
Colombia	8
Cyprus	8
Czech Republic	8
England	9
France	4 eme (90%) or 4 eme Technologique (10%)
Germany	8
Hong Kong	Secondary 1
Hungary	8
Iceland	8
Iran, Islamic Rep.	8
Ireland	2nd Year
Japan	2nd Grade Lower Secondary
Korea, Republic of	2nd Grade Middle School
Latvia (LSS)	8
Lithuania	8
Netherlands	Secondary 2
New Zealand	Form 3
Norway	7
Portugal	Grade 8
Romania	8
Russian Federation	8
Scotland	Secondary 2
Singapore	Secondary 2
Slovak Republic	8
Slovenia	8
Spain	8 EGB
Sweden	7
Switzerland	7 (German); 8 (French and Italian)
United States	8

dents to generate and write their answers. These questions, some of which required extended responses, were allotted approximately one-third of the testing time. Responses to the free-response questions were evaluated to capture diagnostic information, and some were scored using procedures that permitted partial credit.[5]

The TIMSS tests were prepared in English and translated into 30 additional languages using explicit guidelines and procedures. A series of verification checks were conducted to ensure the comparability of the translations.

There were 135 science items and 151 mathematics items developed for the eighth-grade TIMSS tests. The tests were organized so that no one student took all of the items, which would have required more than three hours. Instead, the tests were assembled in eight booklets, each requiring 90 minutes to complete. Each student took only one booklet, and the items were distributed across the booklets so that each item was answered by a representative sample of students.

The Questionnaires

To provide an educational context for interpreting the achievement results, TIMSS used questionnaires to collect descriptive information from students, their teachers, and the principals of their schools. In all, the questionnaires provided data on approximately 1500 variables, and, together with the achievement results, formed the basis for the analyses presented in this report.

The student questionnaire elicited information from the students about resources for learning in their homes, their attitudes towards mathematics and science, and their learning experiences in school. With regard to schooling, the questionnaire asked about the frequency of occurrence of a range of classroom instructional activities, and the students' perception of their school's social climate.

TIMSS administered questionnaires to mathematics and science teachers to gather information about their backgrounds, education and training, and attitudes towards mathematics and science. The questionnaires asked how the teachers divide their time among their teaching tasks, about their level of preparation to teach specific subject matter, and about the instructional approaches that they use in their classrooms. Information also was collected about the materials used in instruction, the activities students do in class, the use of calculators and computers, the role of homework, and the reliance on different types of assessment approaches.

5 TIMSS scoring reliability studies within and across countries indicate that the percent of exact agreement for correctness scores averaged over 85%. For more details, see Mullis, I.V.S. and Smith, T.A. (1996). "Quality Control Steps for Free-Response Scoring," in M.O. Martin and I.V.S. Mullis (eds.), *Third International Mathematics and Science Study: Quality Assurance in Data Collection*. Chestnut Hill, MA: Boston College.

The school questionnaire asked principals to provide information about the school's location, organization and structure, and resources for learning.

How Was the Analysis Conducted?

As a first step in preparing this report, TIMSS researchers reviewed the contents of the TIMSS database in the light of the effective-schools literature to identify variables that were likely to characterize effective schools. These variables were correlated with student achievement in science and mathematics in an extensive exploratory analysis. Variables that were significantly related to achievement were retained for further study. This exercise reduced the number of variables under consideration to fewer than 100. Where possible, individual variables were combined to form an index that was more global and more stable than the original variables. For example, the school questionnaire contained several questions that pertained to student misbehavior. On the basis of a principal component analysis, these variables were combined to provide two indices of student misbehavior: "student administrative violations" and "serious student misconduct."

For the analyses reported in the first chapter of this report, schools within each country were first ranked by their average achievement, separately for mathematics and science. Schools in the top third of the average achievement distribution were assigned to the high-achieving group, and those in the bottom third were assigned to the low-achieving group. Again, this was done separately for mathematics and science. The idea was to work through the variables and indices identified in the exploratory stage to see which of them could discriminate effectively between the high-achieving schools and the low-achieving schools. Each variable and index was dichotomized at a point that seemed to maximize the discrimination between the two groups of schools, and a t-test was applied to the data from each country to determine whether the frequency of occurrence of the variable differed significantly between the two groups. Variables and indices that showed significant differences in most of the participating countries, or showed particularly big differences in a few countries, were included in this report.

Contrasting the characteristics on which high- and low-achieving schools differ most is a useful device for highlighting areas that might prove fruitful for further study of school effectiveness. However, the fact that a school is in the low-achieving group in the study does not necessarily mean that it is ineffective in providing mathematics or science instruction. The educational burden varies from school to school, and so it is possible that a school that is not well-resourced, and that has a socially and economically disadvantaged student body, might be very effective in overcoming its handicaps without managing to raise average student achievement sufficiently to make the high-achieving group. Such a school still would be regarded as an effective one. In contrast, a well-resourced school in an affluent area might be "resting on its laurels" and producing average student achievement below what could be expected given its student intake. Such a school could make it into the high-achieving group largely on the strength of the student body, but might be regarded as less than effective as an organization for teaching and learning.

Seen in this light, a school is effective to the extent that it "adds value" by realizing the potential of the student body through efficient organization and effective instruction. From this perspective, the student body may be considered the raw material that the school has to work with as an organization for promoting learning. If all schools had students with the same initial level of advantage and preparation, then school effectiveness would simply be a matter of comparing average student achievement at the end of the school year. However, since schools in many countries vary considerably in the composition of their student bodies, any study of school effectiveness must take this fact into account.

In the second part of this report, school effectiveness was studied through a multilevel analysis that examined the relationship between a range of school and student variables and student achievement, while simultaneously adjusting for differences in the home background of the students. More specifically, the analysis compared the efficacy of a series of models of home, home/school, and school factors in accounting for the adjusted (for student home background) difference between schools in achievement. The multi-level analysis was conducted using the HLM program.[6]

For the modeling of school effectiveness, the analysis concentrated on countries where there was substantial variation between schools in average achievement. In countries such as Japan, Korea, Norway, and Cyprus, the difference between schools was very small, and so there was little to be gained from an analysis of school differences. Accordingly, these countries were not included in the multilevel analysis. Also excluded were countries with relatively high levels of missing data, or with low average student achievement. In all, 18 countries were included in the multilevel analysis for mathematics, and 14 for science.

Since this report is entitled "Effective Schools in Science and Mathematics," it is important to be aware of how schools were characterized in the data. The basic TIMSS sampling plan called for a random sample of approximately 150 schools in each country, and for at least one intact mathematics class in each sampled school. In most

6 See Appendix A for details.

countries, therefore, a school was represented by a single, randomly selected, mathematics class. In Australia, Cyprus, Sweden, and the United States, however, two mathematics classes were sampled in each school. Each was treated as a separate unit for the purposes of the analyses in this report. In England, students were sampled at random from across the entire grade, without reference to classes.

Whereas in most countries the school average in mathematics is based on the students in a single mathematics class, in science the situation is more complicated. School averages in science also were based on the students in the sampled mathematics class, but while sometimes this group also formed an intact science class, frequently it was made up of students from a range of eighth-grade science classes in the school. If this study had been about mathematics only it might have made sense to think of classes rather than schools as the unit of analysis, but this was not possible for science. Consequently, it was decided to talk about schools, while keeping in mind that school and class effects cannot be analytically disentangled.

The Structure of This Report

The following two chapters present the findings for the two sets of analyses conducted for this report. A procedural appendix, Appendix A, describes the methods used to perform the analyses presented in Chapters 1 and 2. Appendices B and C present detailed multilevel analysis results for science and mathematics, respectively, for participating countries.

Summary of Results

The contrast between the highest- and lowest-achieving schools in science and mathematics in each country showed that home background indicators of socioeconomic status and of parental support for academic achievement most consistently distinguished between the two groups of schools. In almost all countries, students in the high-achieving schools had higher levels of book ownership, study aids, possessions in the home, and parental education, and spent less time working in the home. Another distinguishing factor, related to the home, was student aspirations for higher education. In most countries, plans to attend university after secondary school were much more frequently reported by students in the high-achieving schools.

Factors more directly related to the school were less uniformly effective in distinguishing between the high- and low-achieving schools. Although factors such as school size and location, school social climate, student attitude to science and mathematics, and instructional activities in science and mathematics class did discriminate between the high- and low-achieving schools in some countries, few school variables worked consistently across all countries. This indicates that analyses of characteristics of effective schools are likely to be most fruitful using different variables in different countries, or groups of countries, rather than common variables that operate in the same way across all countries.

The results presented in the second chapter show that the extent to which achievement in science and mathematics can be related to school factors varies considerably from country to country, and that the extent to which schools differed in the home background of their students also is not the same in all countries. It is clear that the way student home background relates to student achievement, and the way the school system moderates or magnifies this relationship, are closely linked to societal and school organizational factors unique to each country, and any cross-national analytic efforts should take this into account.

Although only a small set of classroom-related variables survived the variable-selection process, they accounted for quite a large proportion of the differences between schools in most countries. The most prominent indicator was doing daily homework in a range of subjects (language, mathematics, and science). Schools where eighth-grade students were expected to spend time on homework in a range of subjects had higher average achievement in science and mathematics, even after adjusting for the home background of the students in the school. Teacher characteristics, school social climate, and demographic characteristics such as school location and class size were less consistent predictors of achievement across countries. Among variables that arguably may be influenced by both the home and the school (the home-school interface), the average level of students' aspirations for further education was a significant predictor of school achievement in science in most countries and in mathematics in almost all countries.

While the results show that classroom-related variables are related to average school achievement even after adjusting for the home background of the students in the school, the strong relationship that persists between the average level of home background and adjusted student achievement also serves as a reminder that, in many countries, home background, schooling, and student achievement are closely intertwined, and that teasing out the influences of the various contributing factors remains a major challenge.

1

Characteristics of High-Achieving and Low-Achieving Schools in Science and Mathematics

Overview

The purpose of this chapter is to search for indicators of school effectiveness by examining those school, class, and student characteristics that distinguish between schools with the highest average achievement and those with the lowest average achievement in science and mathematics at the eighth grade. While variables identified using this approach are not necessarily characteristics of effective schools, this procedure does provide an opportunity to review attributes of high-achieving schools as a prelude to the more analytic approach in Chapter 2.

What Is the Achievement Difference Between the High-Achieving and Low-Achieving Schools in each Country?

The contrast between high- and low-achieving schools is likely to be most informative in countries where the gap between the two groups is greatest. In countries where the differences between schools are small, there are likely to be few variables that can distinguish between high- and low-performing schools. Since the extent of differences between schools is likely to vary across countries, this chapter begins with a brief examination of the differences between the two groups of schools in each country.

Average achievement for eighth-grade students overall, as well as the mean for the highest-achieving one third and the lowest-achieving one third of the schools in the sample for each country and the difference between these two groups, is shown in Exhibits 1.1 and 1.2 for science and mathematics, respectively. These exhibits show that while the average achievement of the high- and the low-achieving schools clearly differs in every country in both subjects, the difference in some countries is very much greater than in others. In science, the difference ranges from as little as 51 scale score points in Japan to as much as 138 points in Germany and Singapore. In mathematics, the range is slightly greater, from a low of 56 in Iran to a high of 152 in the Netherlands. Although differences between the high- and low-achieving schools were slightly greater in mathematics than in science, generally countries with a big difference in mathematics also had a big difference in science. Belgium (both French and Flemish parts) and Sweden were exceptions to this, with considerably smaller differences in science than in mathematics.

It might be expected that the smallest differences between high- and low-achieving schools would be in countries where the average achievement was generally low; and while that was true in countries such as Colombia, Cyprus, Iran, Latvia(LSS), Lithuania, Portugal, and Romania, it was not always the case. Japan and Korea were among the highest-achieving countries in both mathematics and sci-

text continued page 18

Exhibit 1.1 Average Science Achievement for all Students, and for Students in the Lowest-Achieving and Highest-Achieving Schools at the Eighth Grade*

Country	Average Science Achievement All Schools	Average Science Achievement Lowest Achieving Third of Schools	Average Science Achievement Highest Achieving Third of Schools	Difference Between Highest and Lowest Third of Schools
Australia	545 (3.9)	494 (4.6)	600 (3.7)	106 (5.9)
Austria	558 (3.7)	509 (6.6)	624 (3.5)	115 (7.4)
Belgium (Fl)	550 (4.2)	509 (4.9)	600 (2.3)	91 (5.4)
Belgium (Fr)	471 (2.8)	429 (3.0)	519 (2.0)	89 (3.6)
Canada	531 (2.6)	480 (2.2)	566 (2.3)	86 (3.2)
Colombia	411 (4.1)	373 (3.8)	453 (3.6)	80 (5.2)
Cyprus	463 (1.9)	435 (2.8)	493 (3.1)	58 (4.2)
Czech Republic	574 (4.3)	531 (3.6)	611 (5.2)	80 (6.3)
England	552 (3.3)	500 (2.2)	605 (4.2)	105 (4.7)
France	498 (2.5)	466 (4.0)	531 (2.8)	65 (4.9)
Germany	531 (4.8)	456 (5.8)	594 (2.9)	138 (6.4)
Hong Kong	522 (4.7)	467 (4.7)	574 (3.6)	108 (5.9)
Hungary	554 (2.8)	512 (3.5)	592 (2.6)	80 (4.3)
Iceland	494 (4.0)	460 (4.2)	526 (4.0)	66 (5.8)
Iran, Islamic Rep.	470 (2.4)	439 (2.3)	500 (2.6)	61 (3.4)
Ireland	538 (4.5)	465 (5.2)	595 (3.0)	130 (6.0)
Japan	571 (1.6)	546 (1.6)	596 (2.7)	51 (3.2)
Korea	565 (1.9)	533 (2.1)	594 (2.1)	61 (2.9)
Latvia (LSS)	485 (2.7)	450 (2.9)	520 (2.7)	70 (4.0)
Lithuania	476 (3.4)	434 (2.8)	520 (4.3)	87 (5.1)
Netherlands	560 (5.0)	502 (5.2)	616 (3.6)	114 (6.4)
New Zealand	525 (4.4)	464 (3.3)	583 (3.7)	119 (5.0)
Norway	527 (1.9)	498 (2.8)	553 (1.9)	54 (3.4)
Portugal	480 (2.3)	449 (2.1)	509 (2.3)	60 (3.2)
Romania	486 (4.7)	421 (3.6)	555 (4.4)	135 (5.6)
Russian Federation	538 (4.0)	481 (2.3)	588 (3.5)	108 (4.2)
Scotland	517 (5.2)	461 (3.8)	571 (6.2)	110 (7.2)
Singapore	607 (5.5)	530 (2.9)	669 (4.2)	138 (5.1)
Slovak Republic	544 (3.2)	504 (2.2)	588 (3.8)	84 (4.4)
Slovenia	560 (2.5)	531 (2.1)	589 (3.0)	58 (3.6)
Spain	517 (1.7)	485 (1.9)	546 (1.6)	60 (2.5)
Sweden	535 (3.0)	501 (2.7)	567 (2.7)	67 (3.8)
Switzerland	522 (2.5)	467 (3.3)	578 (2.4)	112 (4.1)
United States	534 (4.7)	458 (3.8)	585 (3.1)	126 (4.9)

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

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedure (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

Exhibit 1.2 Average Mathematics Achievement for all Students, and for Students in the Lowest-Achieving and Highest-Achieving Schools at the Eighth Grade*

Country	Average Mathematics Achievement All Schools	Average Mathematics Achievement Lowest Achieving Third of Schools	Average Mathematics Achievement Highest Achieving Third of Schools	Difference Between Highest and Lowest Third of Schools
Australia	530 (4.0)	453 (2.5)	604 (3.8)	151 (4.5)
Austria	539 (3.0)	489 (4.3)	618 (2.5)	129 (5.0)
Belgium (Fl)	565 (5.7)	492 (5.3)	637 (3.0)	145 (6.1)
Belgium (Fr)	526 (3.4)	460 (6.1)	583 (2.5)	123 (6.6)
Canada	527 (2.4)	476 (3.3)	564 (3.4)	88 (4.8)
Colombia	385 (3.4)	351 (3.3)	425 (3.7)	74 (5.0)
Cyprus	474 (1.9)	440 (1.9)	507 (2.3)	67 (3.0)
Czech Republic	564 (4.9)	509 (2.8)	612 (6.4)	103 (7.0)
England	506 (2.6)	461 (2.1)	555 (4.7)	94 (5.2)
France	538 (2.9)	492 (3.8)	581 (3.6)	88 (5.3)
Germany	509 (4.5)	438 (3.8)	578 (3.2)	140 (4.9)
Hong Kong	588 (6.5)	508 (7.4)	660 (4.4)	151 (8.6)
Hungary	537 (3.2)	489 (3.1)	584 (2.9)	95 (4.2)
Iceland	487 (4.5)	450 (5.2)	519 (5.3)	69 (7.4)
Iran, Islamic Rep.	428 (2.2)	400 (2.7)	455 (2.2)	56 (3.5)
Ireland	527 (5.1)	448 (3.8)	592 (3.5)	144 (5.1)
Japan	605 (1.9)	574 (2.2)	638 (2.3)	64 (3.2)
Korea	607 (2.4)	568 (2.5)	646 (2.9)	78 (3.8)
Latvia (LSS)	493 (3.1)	450 (3.1)	533 (3.9)	83 (5.0)
Lithuania	477 (3.5)	428 (2.5)	526 (3.8)	98 (4.5)
Netherlands	541 (6.7)	465 (7.3)	617 (5.6)	152 (9.2)
New Zealand	508 (4.5)	447 (3.6)	569 (4.6)	122 (5.8)
Norway	503 (2.2)	472 (2.1)	531 (2.6)	59 (3.4)
Portugal	454 (2.5)	426 (1.5)	485 (2.7)	59 (3.1)
Romania	482 (4.0)	420 (2.3)	543 (3.3)	123 (4.1)
Russian Federation	535 (5.3)	469 (2.1)	588 (4.0)	119 (4.5)
Scotland	499 (5.5)	444 (3.3)	552 (6.6)	108 (7.4)
Singapore	643 (4.9)	570 (3.3)	698 (3.0)	129 (4.5)
Slovak Republic	547 (3.3)	505 (2.1)	595 (4.9)	90 (5.3)
Slovenia	541 (3.1)	506 (2.3)	574 (3.8)	68 (4.4)
Spain	487 (2.0)	453 (2.2)	521 (2.5)	68 (3.3)
Sweden	519 (3.0)	449 (3.8)	562 (2.4)	113 (4.5)
Switzerland	545 (2.8)	480 (4.1)	611 (1.9)	131 (4.5)
United States	500 (4.6)	421 (2.1)	563 (3.8)	142 (4.3)

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

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedure (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

continued from page 15

ence, and yet the high- and low-achieving schools differ very little, in relative terms. This implies that these countries not only have high achievement on average, but that this high achievement is characteristic of most, if not all, of their schools.

Several countries with high average achievement, including Belgium (Flemish), the Czech Republic, Hong Kong, and Singapore in mathematics, and Austria, the Netherlands, and Singapore in science, had comparatively large differences in the achievement levels of the high- and low-achieving schools. All of these countries employ some form of streaming or tracking for eighth-grade students, either within schools or between school types.

What are the Distinguishing Characteristics of High- and Low- Achieving Schools?

As described in the introduction, all TIMSS variables pertaining to school, teacher, and student factors were first screened to identify those that were associated with student achievement in mathematics or science. The variables that survived this initial screening were further examined to isolate those that discriminated between high-achieving and low-achieving schools (see Appendix A for more details). The surviving variables were grouped into the following six categories:

- *Home Background.* This category consists of variables that are indicative of material and literacy resources in the home, including having a range of family possessions, a selection of study aids, lots of books, and having parents with high levels of education.

- *Home-School Interface.* Included here are variables that may be influenced by both home and school factors, such as student aspirations and maternal and peer pressure for achievement.

- *School Size and Location.* These variables operate at the school level. They include the degree of urbanicity of the school, and the size of the school and of the class sampled.

- *School Social Climate.* The school social climate consists of factors that are conducive to a safe, orderly, and productive learning environment. Included are school discipline problems, both "administrative" problems such as dress code violations and more serious misbehavior.

- *Student Attitude towards Science or Mathematics.* This category consists of student attitudinal factors, including attitude towards science, attitude towards mathematics, and a belief in the efficacy of science.

- *Instructional Activities in Science or Mathematics Class.* This includes variables that describe aspects of classroom instruction, such as frequency of experiments in science, and the frequency with which the teacher checks homework in mathematics.

Home Background

Previous studies of schools effectiveness[1] have emphasized the need to take into account the effects of student home background and the composition of the student body when studying the effects of school factors on achievement. Student home background in this context includes not only socioeconomic factors, but also indices of parental emphasis on and support for academic achievement.[2]

In the present study the home background category includes indicators of both academic emphasis and socioeconomic status. There are five variables in all:

- number of books in the home
- presence of study aids (dictionary, study desk, computer)
- possessions in the home
- level of educational attainment of parents
- number of hours spent working at home

Books in the Home

The number of books in the home is a very useful indicator of home literacy support, and is one of the few variables that correlates positively with student achievement in practically all TIMSS countries. Common sense would support the notion that educational benefits flow from the availability of a range of reading materials within students' homes. Students can strengthen and deepen their understanding of concepts covered in class through the use of encyclopedias and other reference books at home; and more generally, a wide range of reading material at home can be thought to foster academic interests and serve to encourage learning.

Students were asked to estimate the number of books in their homes. This variable discriminated very effectively between high-achieving and low-achieving schools. In almost all countries, as shown in Exhibits 1.3 and 1.4, substantially greater percentages of students in the high-achieving schools reported having at least 100 books at

1 Coleman, J. (1966). *Equality of Educational Opportunity*. Washington, U.S. Government Printing Office.

Jencks, C. S., Smith, M., Acland, H., Bane, M. J., Cohen, D., Ginter, H., Heyns, B., and Michelson, S. (1972). *Inequality: A Reassessment of the Effect of the Family and Schooling in America*. New York: Basic Books.

Blakey, L.S., and Heath, A.F. (1992). "Differences Between Comprehensive Schools: Some Preliminary Findings." In D. Reynolds and P. Cuttance (Eds.) *School Effectiveness: Research, policy and practice*. London: Cassell.

2 Hanson, S.L., and Ginsburg, A.L. (1988). "Gaining Ground: Values and High School Success," *American Educational Research Journal*, Vol. 25, 334-365.

homes. This difference was significant in all countries except Iceland, Iran, and Latvia for science, and Canada, Iceland, Iran, and Hong Kong for mathematics. Across countries, the average difference was 23 percentage points for both mathematics and science.

In many countries, the percentage of students that reported having at least 100 books at home was indeed much higher among high-achieving schools. For example, in Austria, England, Germany, the Netherlands, Scotland, Switzerland, and the United States, the percentage of students in the high-achieving schools in science that reported having at least 100 books was more than twice the percentage in the low-achieving schools. In mathematics, the situation was similar, with these seven countries also among those with the greatest difference in book ownership.

Not surprisingly, perhaps, the countries with the greatest difference in book ownership between high- and low-achieving schools also had very large differences in mean achievement in science and mathematics between the two groups of schools. Conversely, the 15 countries with the smallest disparities in the percentages of students with at least 100 books also had relatively small differences between the high- and low-achieving schools in science achievement. A notable exception to this trend was Hong Kong.[3] A similar trend was noticeable in the mathematics results, although here the exceptions were Belgium (Flemish), the Czech Republic, Hong Kong, Singapore, and Sweden, where the difference in book ownership was small, but the achievement difference was large.

Study Aids in the Home

The availability of specific resources that promote learning in the home can help develop a positive attitude toward learning and enhance study practices. The presence of a study desk, dictionary, and computer are indicators not only of the importance placed upon education, but also of the economic resources available to the family. Taken together, the presence of these study aids in students' homes serves as a powerful discriminator between high- and low-achieving schools, second only to the number of books in the family home in this study.

The percentages of eighth-grade students having all three study aids (study desk, dictionary, and computer) in their homes are presented in Exhibits 1.5 and 1.6 for science and mathematics, respectively. For most countries, significantly greater percentages of students in the high-achieving schools reported having all three aids than did students in the low-achieving schools. The difference was most pronounced in Hungary, Singapore, and the United States. The average difference was 14 percentage points for both science and mathematics.

[3] In Hong Kong, high population density and high property values combine to keep living quarters and storage space small, and consequently, high levels of book ownership are not usual.

Possessions in the Home

The material possessions of a family can be a useful indicator of the socioeconomic status of the family. The student questionnaire included a section in which each country presented a list of items that would be likely to be found in the homes of affluent families in that country. Students were asked to indicate which of the items they had in their own homes. The list varied from country to country; for example, the Swedish list had 12 items, including a sauna, a video camera, a sail or motor boat, and access to a summer house. Norway also had 12 items, but included both educational supports (an encyclopedia, an atlas, and a globe) and recreational elements (video camera, more than one TV, and more than one car).

Exhibits 1.7 and 1.8 show the percentages of students in the high- and low-achieving schools in each country that reported having in their homes at least half of the items on the list for their country. Across countries, the average difference was 11 percentage points for both science and mathematics. The greatest differences between the high- and low-achieving schools were found in Colombia and Singapore. Countries with no significant difference in either science or mathematics included Canada, the Czech Republic, Hong Kong, Iceland, Lithuania, Norway, Romania, Slovenia, and Sweden.

Educational Attainment of Parents

Homes where parents have attained a high level of education are likely to place high value on academic achievement in children, and to be relatively affluent. As reported in Exhibits 1.9 and 1.10, in almost all countries significantly greater percentages of students in the high-achieving schools reported that they had at least one parent who had completed a university education, than did students in the low-achieving schools. The average difference was 17 percentage points in science and 18 points in mathematics. The four countries with the greatest differences in both mathematics and science included Australia, Belgium (both Flemish and French), Hungary, and the Russian Federation. Countries with no significant difference in either mathematics or science included Iceland, Iran, and Norway.

Students Doing Jobs at Home

However desirable it may seem that children perform their share of household chores, and regardless of the intuitive notion that such activities foster children's development, the TIMSS data show a negative association in most countries between time spent on chores and student achievement. It seems that, despite the positive aspects of children helping in the home, a student who spends considerable time doing household chores is less likely to have time available for study, and that spending as little as one hour per day in such activities may be associated with lower achievement in mathematics and science.

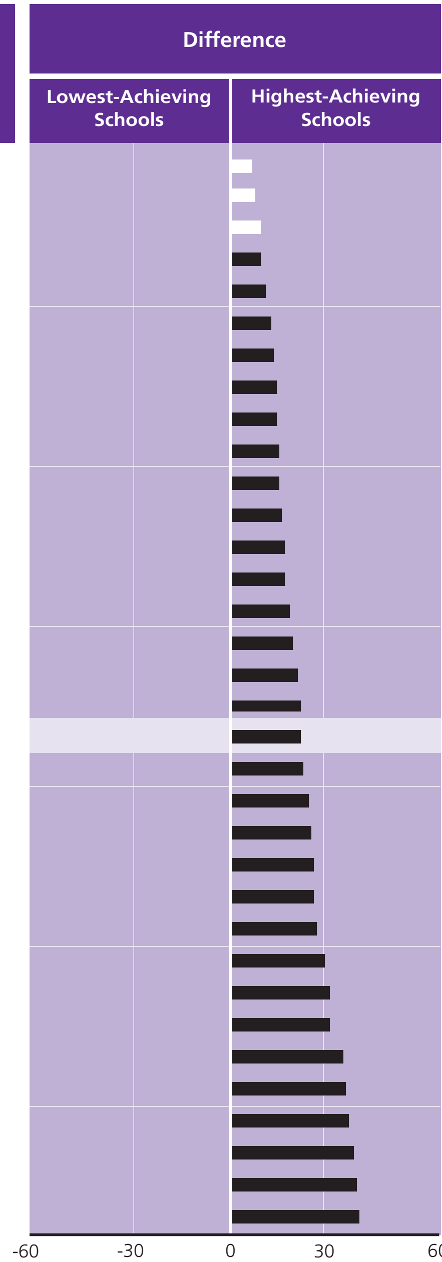
In many countries, significantly greater percentages of students in the low-achieving schools reported that they spent one or more hours daily working at home than did students in the high-achieving schools (see Exhibits 1.11 and 1.12). On average across countries, the difference was greater by 9 percentage points in science and 11 points in mathematics. The difference was particularly pronounced in Singapore, and was also large in Belgium (Flemish and French), the Netherlands, and Switzerland for both science and mathematics. These countries also had large differences in average mathematics achievement (120 points or more) and at least moderate differences in science achievement (89 points or more).

Exhibit 1.3 - 1.12 Overleaf

Exhibit 1.3

Percent of Students Having at Least 100 Books in the Home
Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Iran, Islamic Rep.	12 (1.8)	18 (2.2)	6 (2.8)
Latvia (LSS)	75 (2.3)	82 (1.4)	8 (2.7)
Iceland	62 (3.4)	71 (1.9)	9 (3.9)
Norway	61 (1.4)	71 (1.9)	10 (2.3)
Hong Kong	14 (1.5)	25 (2.9)	11 (3.3)
Colombia	11 (1.9)	24 (2.9)	13 (3.5)
Slovenia	38 (2.8)	52 (2.2)	14 (3.6)
Cyprus	35 (2.0)	50 (1.5)	15 (2.5)
Sweden	56 (2.6)	71 (2.1)	15 (3.4)
Belgium (Fl)	31 (1.6)	47 (2.3)	16 (2.8)
France	34 (2.9)	50 (3.3)	16 (4.4)
Korea	37 (2.2)	53 (2.3)	17 (3.2)
Slovak Republic	34 (2.3)	51 (2.9)	17 (3.7)
Canada	48 (2.2)	65 (2.0)	18 (3.0)
Czech Republic	57 (1.7)	76 (2.6)	19 (3.1)
Romania	25 (3.2)	45 (4.8)	20 (5.8)
Australia	56 (2.0)	78 (1.4)	22 (2.5)
Singapore	15 (1.3)	37 (2.1)	22 (2.5)
International Avg.	36 (0.4)	59 (0.4)	23 (0.6)
Portugal	21 (2.0)	44 (2.9)	23 (3.5)
Spain	34 (2.6)	59 (2.3)	25 (3.5)
Russian Federation	37 (2.9)	63 (3.0)	26 (4.2)
Lithuania	31 (2.0)	58 (2.5)	26 (3.2)
Ireland	29 (1.9)	55 (2.7)	27 (3.3)
New Zealand	52 (2.2)	80 (1.6)	27 (2.7)
Belgium (Fr)	40 (1.5)	71 (2.5)	30 (2.9)
Hungary	46 (2.5)	78 (2.2)	32 (3.4)
United States	32 (2.0)	64 (1.8)	32 (2.7)
Netherlands	24 (2.2)	61 (2.9)	37 (3.6)
England	36 (2.3)	73 (2.4)	37 (3.3)
Austria	27 (2.1)	65 (3.9)	38 (4.5)
Scotland	23 (2.0)	62 (3.4)	39 (3.9)
Germany	31 (2.9)	72 (2.1)	41 (3.5)
Switzerland	27 (2.3)	68 (1.8)	41 (3.0)



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

■ Difference **statistically** significant
□ Difference **not statistically** significant

Significance tests adjusted for multiple comparisons

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

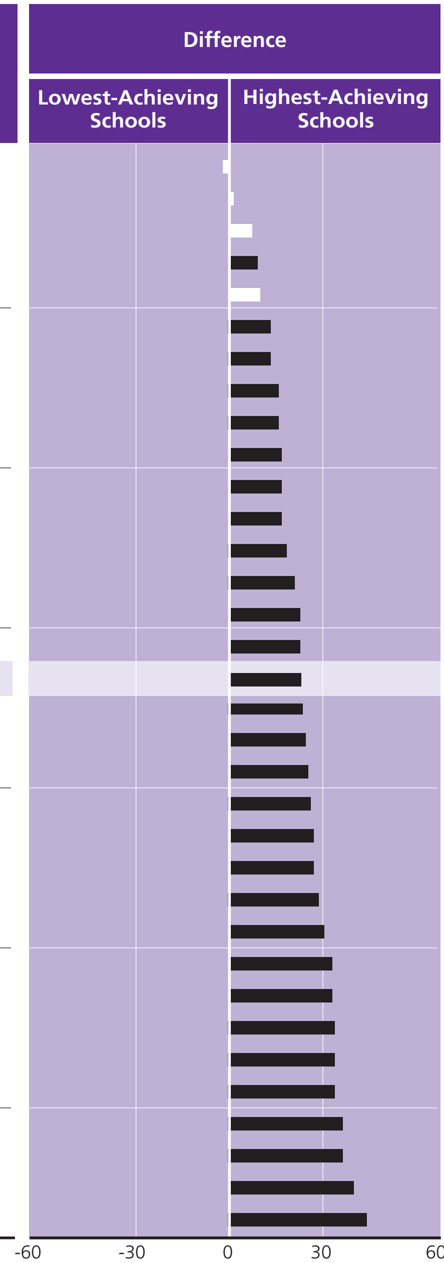
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

Japan: Question not administered or data not available.

Exhibit 1.4 Percent of Students Having at Least 100 Books in the Home

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Canada	56 (3.0)	54 (1.8)	-2 (3.5)
Iceland	67 (2.9)	69 (2.2)	2 (3.8)
Iran, Islamic Rep.	11 (1.3)	19 (2.3)	8 (2.9)
Norway	61 (1.5)	71 (2.0)	9 (2.5)
Hong Kong	15 (1.6)	25 (3.1)	11 (3.6)
Latvia (LSS)	70 (2.7)	84 (1.5)	14 (2.9)
Colombia	10 (2.1)	24 (3.0)	14 (3.7)
Slovenia	34 (2.5)	51 (2.6)	16 (3.8)
Belgium (Fl)	30 (2.1)	47 (2.2)	17 (3.0)
Slovak Republic	35 (2.5)	52 (2.7)	17 (3.9)
Cyprus	33 (1.6)	51 (1.8)	17 (2.4)
France	33 (2.7)	51 (3.1)	18 (4.2)
Czech Republic	56 (2.0)	75 (3.9)	19 (4.4)
Singapore	15 (1.4)	36 (2.2)	21 (2.8)
Sweden	51 (2.6)	74 (2.1)	23 (3.3)
Korea	33 (2.3)	56 (2.1)	23 (3.1)
International Avg.	35 (0.4)	59 (0.5)	23 (0.6)
Australia	54 (1.4)	78 (1.3)	24 (1.8)
New Zealand	53 (2.4)	78 (1.9)	25 (3.1)
Portugal	21 (1.9)	46 (2.8)	25 (3.5)
Ireland	28 (1.9)	55 (2.7)	27 (3.3)
Spain	33 (2.3)	60 (2.6)	27 (3.3)
Russian Federation	34 (2.6)	61 (4.2)	28 (5.9)
Lithuania	28 (1.8)	58 (2.7)	29 (3.3)
Romania	20 (2.7)	51 (4.7)	31 (5.4)
Hungary	46 (2.8)	79 (2.2)	33 (3.7)
Belgium (Fr)	35 (2.3)	69 (2.2)	34 (3.2)
United States	32 (1.8)	66 (1.7)	34 (2.5)
England	36 (2.0)	71 (2.7)	34 (3.3)
Switzerland	28 (2.6)	62 (2.1)	35 (3.4)
Netherlands	25 (2.3)	62 (2.7)	37 (3.6)
Scotland	26 (2.0)	63 (3.2)	37 (3.9)
Austria	26 (2.1)	67 (3.1)	41 (3.8)
Germany	29 (2.2)	73 (2.0)	44 (3.0)



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

■ Difference **statistically** significant

□ Difference **not statistically** significant

Significance tests adjusted for multiple comparisons

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

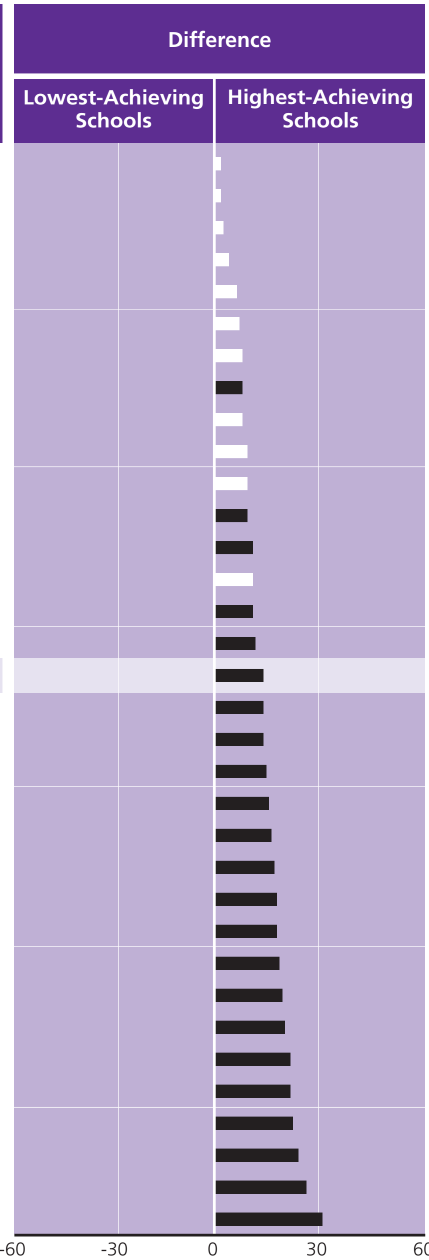
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

Japan: Question not administered or data not available.

Exhibit 1.5

Percent of Students Having a Study Desk, Dictionary, and Computer in the Home
Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Latvia (LSS)	13 (1.6)	14 (1.5)	1 (2.2)
Iran, Islamic Rep.	1 (0.3)	2 (0.6)	2 (0.7)
Iceland	71 (3.9)	73 (2.0)	2 (4.3)
Norway	59 (1.9)	63 (2.3)	4 (3.0)
Netherlands	81 (3.1)	88 (1.4)	7 (3.4)
Lithuania	30 (2.5)	38 (2.2)	7 (3.3)
France	44 (2.5)	52 (2.0)	8 (3.2)
England	77 (1.7)	85 (1.6)	8 (2.4)
Czech Republic	29 (2.3)	37 (2.5)	8 (3.5)
Russian Federation	26 (2.6)	35 (2.2)	9 (3.4)
Slovak Republic	22 (1.6)	31 (2.7)	9 (3.1)
Romania	3 (0.7)	13 (2.4)	10 (2.5)
Sweden	54 (2.6)	65 (2.2)	11 (3.4)
Colombia	6 (2.4)	17 (2.6)	11 (3.5)
Slovenia	38 (2.4)	50 (2.4)	12 (3.4)
Germany	58 (1.9)	71 (1.6)	12 (2.5)
International Avg.	40 (0.4)	54 (0.4)	14 (0.5)
Scotland	65 (2.5)	79 (1.7)	14 (3.0)
Ireland	59 (2.9)	73 (2.2)	14 (3.7)
Austria	52 (2.3)	68 (2.8)	15 (3.6)
Australia	59 (2.3)	75 (2.1)	16 (3.1)
Belgium (Fr)	51 (2.1)	67 (1.5)	17 (2.6)
Canada	46 (2.9)	64 (1.9)	17 (3.5)
Spain	32 (2.2)	50 (2.4)	18 (3.2)
Switzerland	53 (1.8)	71 (1.7)	18 (2.5)
New Zealand	47 (2.1)	66 (2.3)	19 (3.1)
Belgium (Fl)	55 (1.7)	75 (1.5)	20 (2.3)
Cyprus	27 (1.7)	48 (1.2)	21 (2.1)
Hong Kong	23 (1.5)	46 (3.2)	22 (3.5)
Korea	28 (1.8)	50 (2.0)	23 (2.7)
Portugal	24 (2.2)	47 (3.0)	23 (3.8)
Singapore	33 (1.7)	58 (2.6)	25 (3.1)
Hungary	17 (1.5)	45 (2.7)	27 (3.1)
United States	37 (1.9)	69 (1.7)	32 (2.6)



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

■ Difference **statistically** significant
□ Difference **not statistically** significant

Significance tests adjusted for multiple comparisons

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

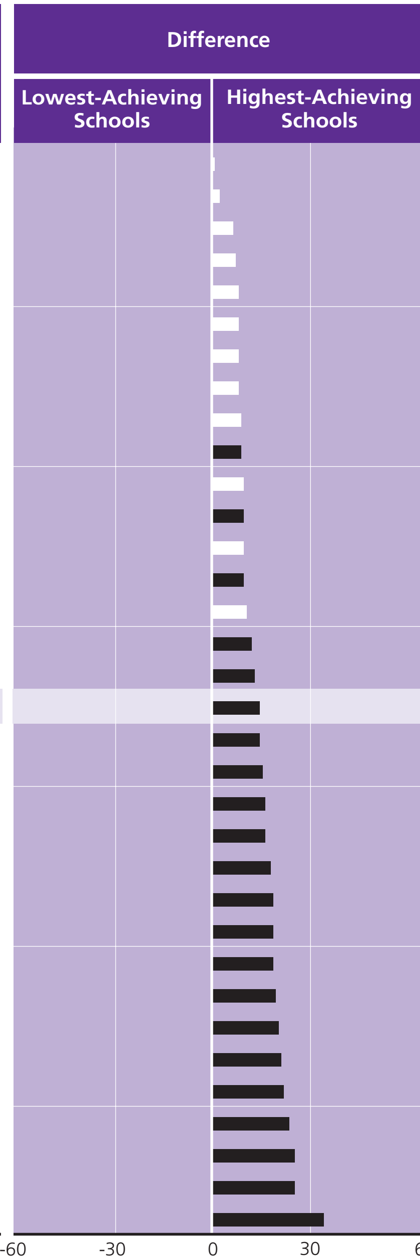
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

Japan: Question not administered or data not available.

Exhibit 1.6

Percent of Students Having a Study Desk, Dictionary, and Computer in the Home
Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Latvia (LSS)	11 (1.5)	12 (1.4)	1 (2.2)
Iran, Islamic Rep.	1 (0.3)	3 (0.8)	2 (0.8)
Iceland	68 (3.8)	74 (2.0)	6 (4.4)
Norway	59 (2.1)	66 (1.8)	8 (2.8)
Canada	50 (1.8)	58 (2.3)	8 (2.6)
France	44 (2.5)	52 (2.4)	8 (3.6)
Netherlands	80 (3.2)	88 (1.5)	8 (3.5)
Russian Federation	24 (2.2)	33 (3.1)	8 (4.3)
Slovak Republic	22 (1.8)	32 (2.7)	9 (3.3)
Germany	62 (2.0)	71 (1.6)	9 (2.7)
Lithuania	29 (2.3)	39 (2.2)	10 (3.4)
Romania	4 (0.7)	14 (2.3)	10 (2.4)
Colombia	7 (2.5)	17 (2.6)	10 (3.6)
England	75 (1.9)	86 (1.5)	10 (2.4)
Scotland	68 (2.8)	78 (1.8)	10 (3.5)
Slovenia	36 (2.2)	48 (2.6)	12 (3.6)
Czech Republic	24 (2.1)	38 (2.4)	13 (3.4)
International Avg.	40 (0.4)	54 (0.4)	14 (0.6)
Ireland	59 (2.9)	74 (2.1)	15 (3.8)
Austria	55 (2.6)	70 (2.0)	15 (3.3)
Cyprus	30 (2.1)	47 (1.5)	16 (2.4)
Spain	33 (2.1)	49 (2.6)	17 (3.5)
Switzerland	53 (2.0)	70 (1.6)	18 (2.5)
Sweden	46 (2.0)	65 (2.0)	19 (2.7)
Belgium (Fr)	47 (2.6)	66 (2.3)	19 (3.7)
Belgium (Fl)	54 (1.9)	74 (1.7)	19 (2.5)
Portugal	28 (2.7)	48 (2.7)	20 (4.1)
Australia	56 (2.0)	76 (1.3)	21 (2.3)
Korea	28 (1.9)	50 (2.1)	22 (2.9)
New Zealand	45 (2.1)	67 (2.5)	22 (3.4)
Hong Kong	22 (1.4)	46 (2.7)	24 (3.0)
Singapore	33 (1.9)	58 (2.4)	25 (3.3)
Hungary	20 (1.9)	46 (2.9)	26 (3.7)
United States	36 (2.2)	71 (1.6)	35 (2.8)



■ Difference **statistically** significant
□ Difference **not statistically** significant

Significance tests adjusted for multiple comparisons

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

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

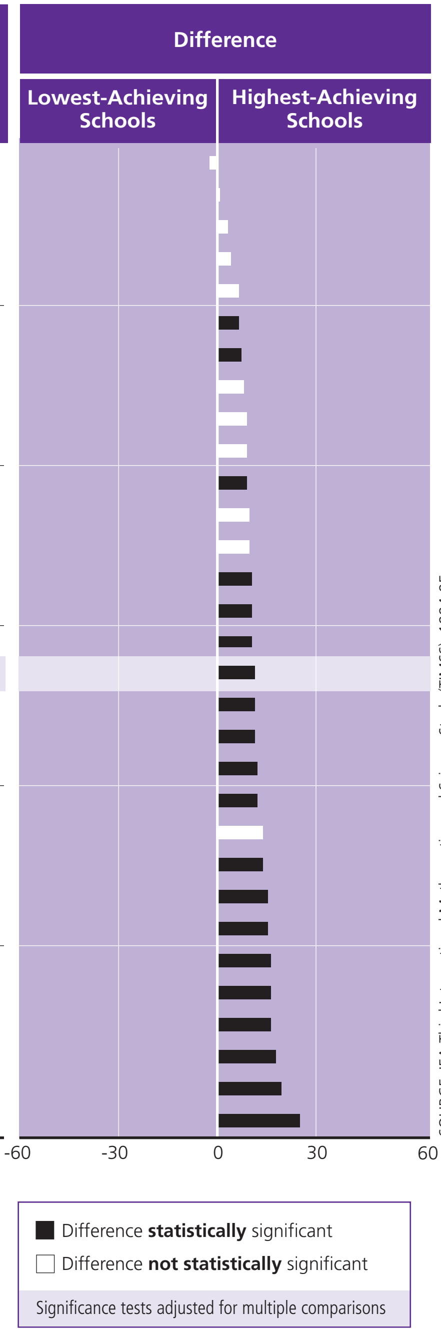
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking classrooms only.

Japan: Question not administered or data not available.

Exhibit 1.7 Students' Report of Possessions in the Home[1]

Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Canada	52 (2.2)	50 (1.7)	-2 (2.7)
Norway	63 (1.8)	63 (1.7)	1 (2.5)
Slovenia	77 (1.9)	80 (2.0)	4 (2.7)
Hong Kong	48 (1.7)	52 (2.6)	4 (3.1)
Czech Republic	22 (2.0)	29 (2.1)	6 (2.9)
Russian Federation	9 (1.0)	15 (1.6)	7 (1.9)
Slovak Republic	79 (1.8)	86 (1.4)	7 (2.3)
Iceland	34 (3.5)	42 (2.7)	8 (4.4)
England	81 (2.3)	89 (1.8)	9 (2.9)
Lithuania	59 (2.8)	68 (2.0)	9 (3.4)
Belgium (Fr)	82 (2.0)	91 (1.1)	9 (2.3)
Latvia (LSS)	66 (2.5)	76 (2.7)	10 (3.7)
Sweden	54 (3.9)	64 (2.2)	10 (4.4)
New Zealand	67 (1.9)	77 (1.7)	10 (2.5)
Ireland	82 (1.8)	93 (1.1)	10 (2.2)
Korea	73 (1.9)	84 (2.1)	10 (2.9)
International Avg.	58 (0.4)	69 (0.4)	11 (0.6)
Austria	53 (2.2)	64 (2.4)	11 (3.2)
Germany	71 (2.2)	82 (1.4)	11 (2.6)
Australia	58 (1.8)	70 (1.7)	12 (2.5)
Netherlands	59 (2.4)	71 (2.9)	13 (3.7)
Romania	60 (4.1)	74 (3.6)	14 (5.5)
Belgium (Fl)	56 (2.5)	70 (1.5)	14 (2.9)
United States	66 (2.0)	81 (1.0)	15 (2.3)
Switzerland	66 (1.9)	82 (1.3)	15 (2.3)
Cyprus	51 (1.6)	67 (1.8)	16 (2.4)
Spain	57 (2.3)	73 (1.4)	16 (2.7)
Portugal	74 (2.2)	90 (1.6)	17 (2.7)
Hungary	53 (2.3)	71 (1.9)	18 (3.0)
Colombia	51 (4.7)	70 (2.2)	19 (5.2)
Singapore	29 (1.7)	54 (3.4)	25 (3.8)



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

1 Each country was given the option of asking students if the family owned certain items. Students with at least 50% of the items on the country-specific list are presented.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

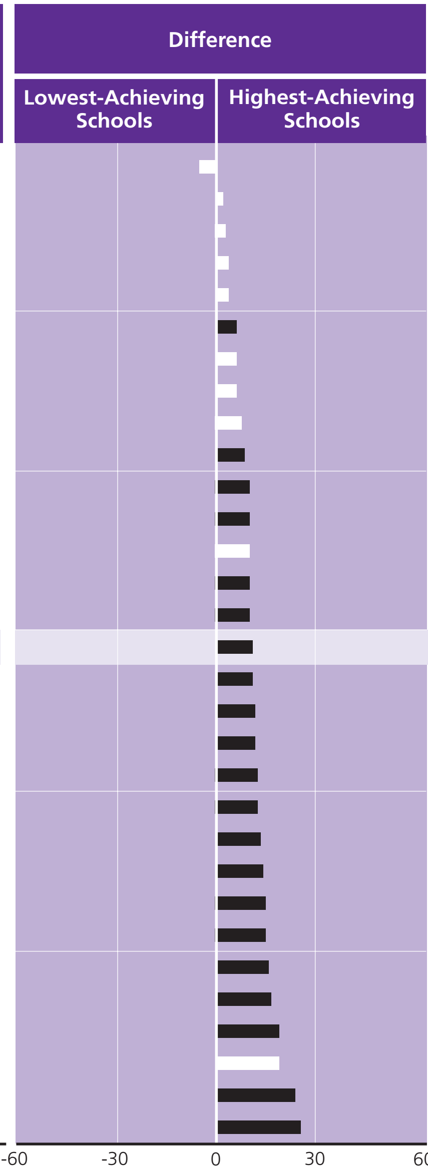
France, Iran, Japan, and Scotland: Question not administered or data not available.

Exhibit 1.8

Students' Report of Possessions in the Home[1]

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Canada	53 (1.7)	49 (1.9)	-5 (2.6)
Slovenia	77 (2.1)	79 (1.9)	2 (3.0)
Iceland	40 (3.9)	43 (3.1)	3 (5.1)
Hong Kong	48 (1.8)	53 (2.8)	4 (3.3)
Norway	60 (1.9)	64 (1.8)	4 (2.6)
Russian Federation	8 (0.9)	14 (1.3)	6 (1.7)
Czech Republic	23 (2.0)	29 (1.8)	6 (2.8)
Slovak Republic	79 (1.8)	86 (1.5)	7 (2.4)
Sweden	55 (3.0)	63 (2.0)	8 (3.5)
New Zealand	67 (1.9)	76 (1.6)	9 (2.7)
Belgium (Fr)	80 (2.5)	91 (1.5)	10 (2.9)
Germany	72 (2.4)	82 (1.4)	10 (2.7)
Lithuania	58 (2.9)	69 (2.1)	11 (3.5)
England	79 (2.3)	90 (1.5)	11 (2.8)
Ireland	82 (1.8)	93 (1.2)	11 (2.2)
International Avg.	58 (0.5)	70 (0.4)	11 (0.6)
Austria	55 (2.8)	66 (2.3)	12 (3.6)
Australia	57 (1.5)	69 (1.4)	12 (2.0)
Netherlands	59 (2.6)	71 (2.8)	12 (3.8)
Cyprus	53 (2.2)	66 (1.9)	13 (2.8)
Portugal	78 (2.1)	91 (1.5)	13 (2.8)
United States	66 (1.9)	80 (1.1)	14 (1.8)
Belgium (Fl)	54 (3.0)	69 (1.6)	15 (3.4)
Spain	58 (2.2)	73 (1.6)	15 (2.6)
Latvia (LSS)	62 (2.6)	77 (2.3)	15 (3.7)
Korea	70 (2.3)	86 (1.3)	16 (2.7)
Switzerland	66 (1.8)	82 (1.1)	17 (2.1)
Hungary	54 (2.2)	73 (2.1)	19 (3.2)
Romania	58 (4.2)	78 (3.8)	20 (6.3)
Colombia	45 (4.6)	69 (2.3)	24 (5.1)
Singapore	29 (2.1)	55 (3.0)	26 (3.7)



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

■ Difference **statistically** significant
□ Difference **not statistically** significant
Significance tests adjusted for multiple comparisons

1 Each country was given the option of asking students if the family owned certain items. Students with at least 50% of the items on the country-specific list are presented.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

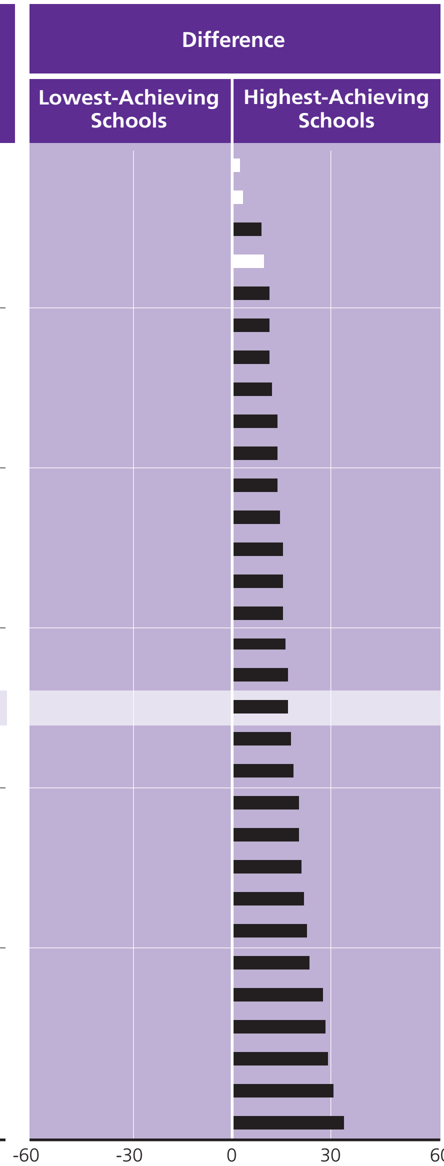
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

France, Iran, Japan, and Scotland: Question not administered or data not available.

Exhibit 1.9

Percent of Students Having at Least One Parent Who Finished University
Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Norway	s 33 (2.4)	s 36 (3.1)	3 (3.9)
Iran, Islamic Rep.	s 3 (0.9)	r 6 (1.3)	3 (1.6)
Hong Kong	r 3 (0.6)	12 (2.6)	9 (2.7)
Iceland	r 26 (2.1)	36 (5.0)	9 (5.4)
Slovenia	15 (1.7)	26 (2.2)	11 (2.8)
Singapore	2 (0.5)	14 (2.2)	12 (2.2)
Romania	r 5 (1.3)	r 17 (3.1)	12 (3.4)
Germany	s 8 (1.8)	r 20 (1.8)	12 (2.6)
Canada	r 34 (3.0)	47 (2.9)	13 (4.2)
Netherlands	s 9 (1.7)	r 22 (3.6)	13 (4.0)
Portugal	3 (0.9)	17 (2.4)	14 (2.6)
Sweden	s 28 (2.8)	s 42 (2.5)	15 (3.7)
Switzerland	r 6 (0.9)	21 (2.2)	15 (2.4)
Czech Republic	16 (1.5)	31 (3.3)	15 (3.6)
Latvia (LSS)	s 25 (2.6)	r 40 (3.3)	16 (4.2)
Ireland	r 12 (1.6)	29 (2.7)	16 (3.1)
Colombia	r 10 (1.6)	r 26 (3.8)	17 (4.1)
International Avg.	15 (0.3)	32 (0.5)	17 (0.6)
Slovak Republic	14 (1.5)	32 (3.3)	18 (3.7)
Korea	16 (1.4)	34 (3.6)	18 (3.9)
Cyprus	s 7 (1.4)	s 27 (1.7)	20 (2.2)
Spain	r 9 (1.2)	29 (3.4)	20 (3.6)
Austria	r 5 (0.9)	26 (2.9)	21 (3.0)
United States	24 (1.5)	46 (2.3)	22 (2.7)
Lithuania	s 32 (3.3)	s 54 (3.6)	23 (4.9)
New Zealand	s 22 (1.9)	r 45 (2.7)	23 (3.3)
Russian Federation	23 (2.2)	51 (3.5)	28 (4.1)
Australia	r 18 (1.6)	47 (2.6)	29 (3.0)
Belgium (Fl)	s 13 (2.8)	r 42 (2.8)	29 (4.0)
Hungary	r 9 (1.4)	r 40 (3.7)	31 (3.9)
Belgium (Fr)	s 21 (2.2)	r 55 (2.9)	34 (3.7)



■ Difference **statistically** significant
□ Difference **not statistically** significant
Significance tests adjusted for multiple comparisons

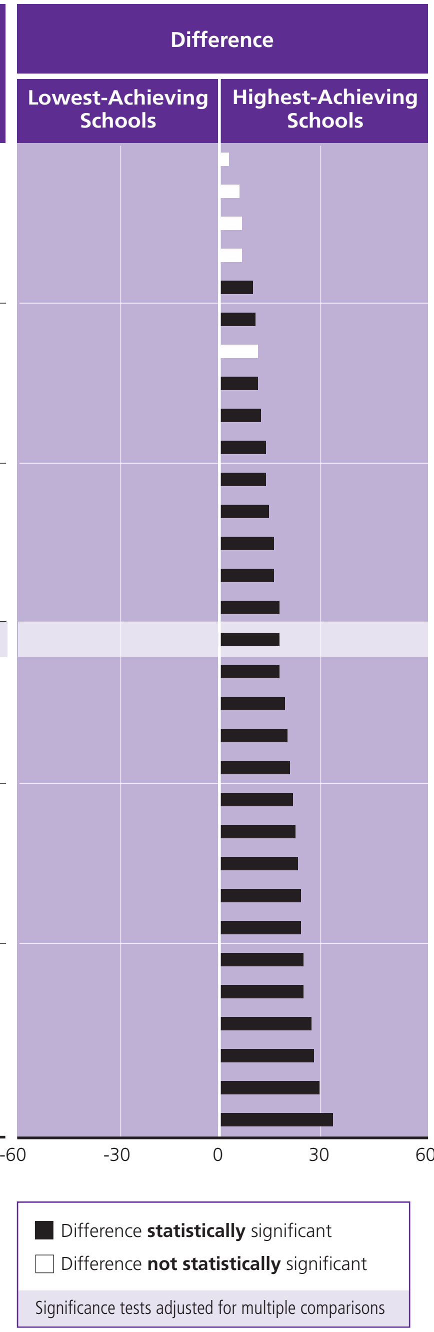
SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.
An "r" indicates response data available for 70-84% of students. An "s" indicates response data available for 50-69% of students.
England, France, Japan and Scotland: Question not administered or data not available.

Exhibit 1.10 Percent of Students Having at Least One Parent Who Finished University

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Iran, Islamic Rep.	s 3 (0.6)	r 6 (1.3)	4 (1.5)
Norway	s 30 (2.1)	s 37 (3.3)	7 (4.0)
Iceland	r 29 (2.8)	r 36 (5.1)	7 (6.0)
Canada	r 34 (3.6)	41 (2.1)	7 (3.9)
Hong Kong	r 3 (0.6)	13 (2.5)	10 (2.7)
Romania	r 5 (1.2)	r 16 (3.0)	11 (3.1)
Netherlands	s 11 (2.3)	r 23 (3.8)	12 (4.4)
Germany	s 9 (2.1)	r 22 (1.7)	12 (2.8)
Singapore	2 (0.4)	14 (2.0)	13 (2.0)
Switzerland	r 6 (1.0)	20 (2.0)	14 (2.2)
Slovenia	13 (1.3)	28 (2.8)	14 (3.0)
Portugal	3 (0.8)	19 (2.4)	15 (2.6)
Ireland	r 11 (1.5)	28 (2.5)	17 (3.1)
Colombia	r 10 (2.1)	r 27 (3.8)	17 (4.3)
Czech Republic	13 (1.3)	31 (3.5)	18 (3.7)
International Avg.	14 (0.3)	32 (0.5)	18 (0.7)
Slovak Republic	14 (1.4)	32 (3.4)	18 (3.8)
Sweden	s 21 (2.2)	s 40 (2.6)	20 (3.1)
Spain	r 9 (1.1)	30 (3.4)	21 (3.7)
Cyprus	s 5 (1.0)	s 27 (2.0)	22 (2.2)
Austria	r 4 (0.8)	27 (2.6)	22 (2.7)
Latvia (LSS)	s 18 (2.1)	r 41 (3.0)	23 (3.7)
Korea	13 (1.2)	36 (3.3)	24 (3.5)
Lithuania	s 29 (3.1)	s 54 (3.4)	25 (4.7)
New Zealand	s 20 (1.8)	r 45 (2.7)	25 (3.5)
United States	23 (1.6)	48 (2.1)	25 (2.7)
Russian Federation	22 (2.0)	48 (4.1)	26 (5.5)
Belgium (Fl)	s 13 (2.8)	r 41 (3.3)	28 (4.4)
Australia	r 18 (1.5)	47 (2.1)	29 (2.5)
Hungary	r 9 (1.4)	r 40 (3.7)	31 (4.0)
Belgium (Fr)	s 17 (1.9)	r 52 (3.2)	34 (3.8)



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

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

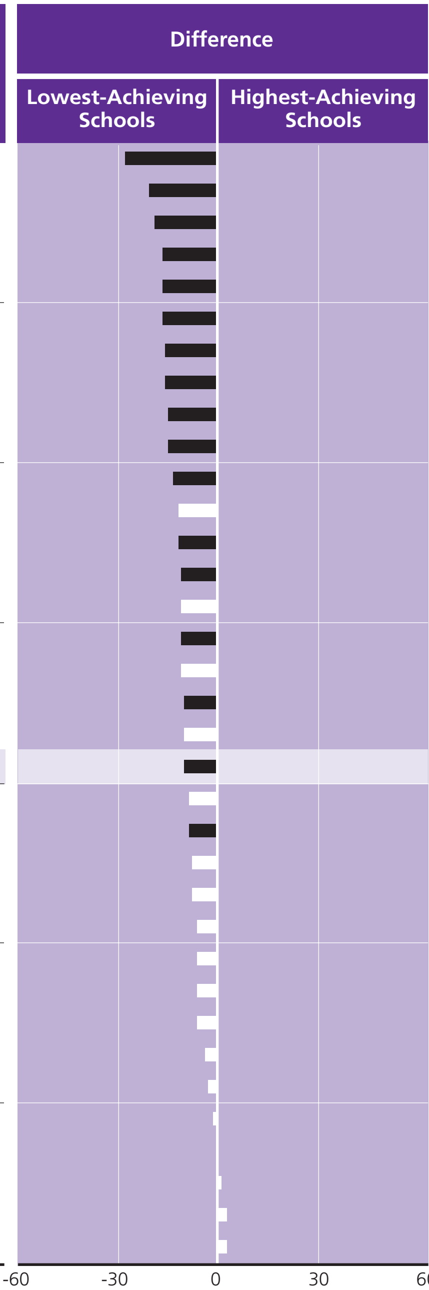
An "r" indicates response data available for 70-84% of students.

England, France, Japan and Scotland: Question not administered or data not available.

Exhibit 1.11 Percent of Students Who Work One or More Hours at Home

Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country		Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Singapore		61 (2.0)	34 (2.0)	-27 (2.9)
Belgium (Fl)		44 (2.0)	24 (1.9)	-20 (2.7)
Switzerland		42 (2.0)	23 (1.4)	-19 (2.4)
Netherlands		29 (2.8)	13 (1.8)	-16 (3.4)
Belgium (Fr)		33 (2.6)	17 (1.4)	-16 (3.0)
Cyprus		43 (1.5)	27 (1.3)	-16 (2.0)
United States		49 (1.8)	34 (1.6)	-15 (2.4)
Hungary		76 (1.7)	61 (1.9)	-15 (2.5)
Austria		29 (2.3)	15 (1.4)	-14 (2.7)
Iran, Islamic Rep.		70 (2.0)	56 (1.8)	-14 (2.7)
Ireland		34 (2.0)	21 (1.8)	-13 (2.7)
Romania		61 (3.3)	50 (3.4)	-11 (4.7)
Korea		20 (1.6)	9 (1.2)	-11 (2.0)
Germany		33 (1.9)	22 (1.4)	-11 (2.4)
Slovak Republic		59 (2.3)	49 (3.0)	-11 (3.8)
New Zealand		35 (1.9)	24 (1.7)	-10 (2.5)
Czech Republic		54 (4.4)	44 (2.6)	-10 (5.1)
Australia		34 (1.6)	25 (1.1)	-10 (2.0)
Slovenia		61 (2.6)	52 (2.4)	-9 (3.5)
International Avg.		42 (0.4)	33 (0.3)	-9 (0.5)
Spain		47 (2.1)	38 (1.9)	-8 (2.8)
Hong Kong		25 (1.6)	17 (1.6)	-8 (2.2)
England		31 (2.6)	24 (2.0)	-7 (3.3)
France		30 (1.6)	23 (1.7)	-7 (2.3)
Portugal		33 (2.1)	27 (2.0)	-6 (2.9)
Lithuania		46 (2.5)	40 (2.1)	-5 (3.2)
Latvia (LSS)		62 (2.4)	57 (2.1)	-5 (3.1)
Sweden		32 (1.8)	27 (1.9)	-5 (2.6)
Canada		38 (1.7)	36 (1.6)	-3 (2.4)
Japan		16 (1.0)	14 (0.9)	-2 (1.4)
Norway		40 (2.0)	39 (1.7)	-1 (2.6)
Russian Federation		58 (2.0)	58 (2.2)	0 (2.9)
Colombia	r	70 (2.4)	72 (2.5)	1 (3.4)
Scotland		21 (2.0)	24 (1.9)	3 (2.8)
Iceland		25 (2.4)	29 (3.1)	3 (3.9)



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

■ Difference **statistically** significant
□ Difference **not statistically** significant
Significance tests adjusted for multiple comparisons

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

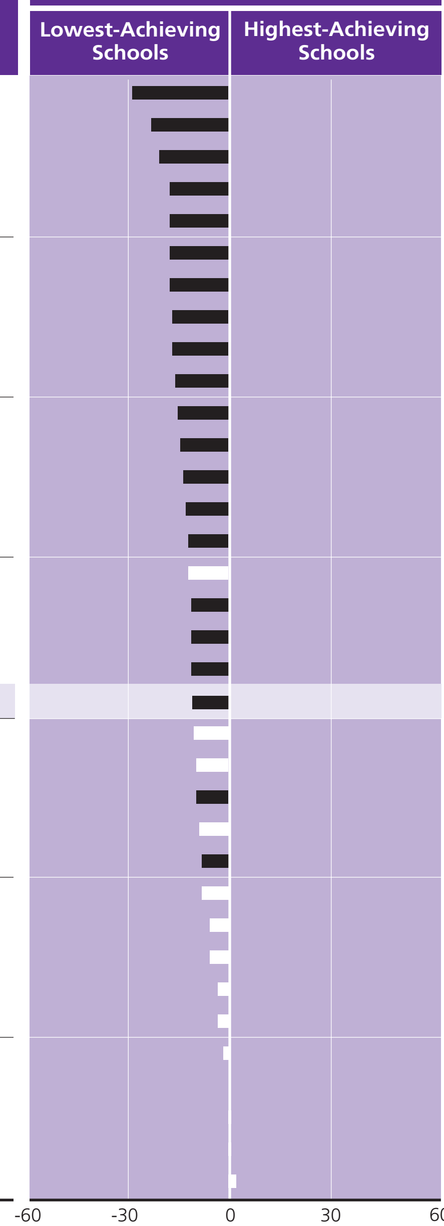
An "r" indicates response data available for 70-84% of students.

Exhibit 1.12 Percent of Students Who Work One or More Hours at Home

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Singapore	62 (2.0)	33 (1.8)	-28 (3.1)
Belgium (Fl)	47 (1.9)	24 (1.9)	-23 (2.7)
Switzerland	43 (1.9)	23 (1.3)	-20 (2.3)
Belgium (Fr)	36 (3.1)	18 (1.4)	-18 (3.4)
Netherlands	31 (2.9)	13 (1.9)	-18 (3.4)
Romania	61 (3.4)	44 (3.2)	-17 (4.9)
Iran, Islamic Rep.	71 (1.9)	54 (1.8)	-17 (2.7)
Cyprus	43 (1.8)	26 (1.2)	-16 (2.2)
Austria	31 (2.0)	15 (1.5)	-16 (2.6)
United States	50 (1.3)	34 (1.7)	-16 (2.3)
Hungary	76 (2.1)	61 (1.7)	-15 (2.9)
Ireland	34 (1.8)	20 (1.6)	-14 (2.6)
Czech Republic	57 (2.9)	44 (2.6)	-13 (3.8)
Germany	33 (2.1)	20 (1.2)	-13 (2.4)
Australia	35 (1.6)	23 (1.1)	-12 (1.8)
Slovak Republic	60 (2.3)	48 (3.1)	-12 (3.9)
Latvia (LSS)	67 (2.5)	55 (2.0)	-11 (3.3)
New Zealand	36 (2.1)	25 (1.5)	-11 (2.6)
Sweden	34 (1.9)	24 (1.3)	-11 (2.2)
International Avg.	44 (0.4)	33 (0.3)	-11 (0.5)
Slovenia	62 (2.6)	52 (2.5)	-10 (3.3)
Lithuania	50 (2.6)	40 (1.8)	-10 (3.3)
Korea	19 (1.7)	10 (1.0)	-9 (1.9)
Portugal	34 (1.7)	26 (1.9)	-8 (2.6)
Hong Kong	25 (1.6)	16 (1.2)	-8 (2.1)
Spain	48 (2.0)	40 (1.7)	-8 (2.6)
England	31 (2.5)	25 (2.1)	-6 (3.3)
France	29 (1.8)	23 (1.6)	-5 (2.4)
Iceland	30 (3.1)	27 (3.1)	-3 (4.4)
Japan	17 (1.1)	14 (0.8)	-3 (1.4)
Canada	38 (2.1)	36 (1.6)	-1 (2.6)
Scotland	23 (2.1)	24 (2.1)	0 (3.1)
Colombia	r 72 (2.4)	73 (2.1)	0 (3.1)
Russian Federation	60 (2.2)	61 (2.6)	1 (3.0)
Norway	38 (2.1)	41 (1.3)	2 (2.3)

Difference



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

■ Difference **statistically** significant
□ Difference **not statistically** significant

Significance tests adjusted for multiple comparisons

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

An "r" indicates response data available for 70-84% of students.

Home-School Interface

Whereas indicators of resources in the home such as those presented in the previous section clearly belong in the home-background category, there are other, often affective, variables that are jointly influenced by both home and school factors. The home-school interface category represents this area of interaction between the home and school. This category includes:

- maternal press for academic success
- student press for academic success
- student aspirations for university education
- homework frequency

Maternal Press for Academic Success

Parents serve as the primary educators of their children. They guide and mold a student's attitudes and work practices, and they inculcate values about school and learning. To probe the influence of maternal press for academic achievement, TIMSS asked eighth-grade students how important their mother thought it was for them to do well in science, mathematics, and language. The percentages of students in the high- and low-performing schools who reported that their mother thought it was important to do well in all three areas are shown in Exhibits 1.13 and 1.14.

Students' reports of maternal press were consistently high in both high- and low-achieving schools, indicating that, almost universally, students thought their mothers wanted them to do well at school. In many countries, more than 90% of students reported this in both groups of schools. Because of the generally high perception of maternal press among students, there was not much scope for differences between the two school types. The countries with the greatest reported difference in both mathematics and science included France, Hong Kong, Hungary, and Ireland. Irish students (16% for science and 14% for mathematics) reported the largest differences.

Student Press for Academic Success

Although maternal press may well be influential in the initial formation of student attitudes, students' own predilections and their experiences in school play a major role also. As students grow older, their own internal press for achievement more and more determines the academic effort they invest and the choices they make. In addition to maternal academic press, therefore, students were asked how important they themselves thought it was to do well in science, mathematics, and language. Exhibits 1.15 and 1.16 present the percentages of students in high- and low-achieving schools in each country that thought it was important to do well in all three areas.

As with maternal academic press, students' reported level of academic press were generally high in both groups of schools, and for most countries the differences between them were not statistically significant. Only in Hong Kong, Ireland, and Singapore were the differences between high- and low-achieving schools significant for both science and mathematics. Although there was a few countries where maternal and student academic press were fairly effective in discriminating between high- and low-achieving schools, in general the level of academic press reported was so high as to leave little scope for differences between schools. Within the home-school interface category, therefore, differences between the top and bottom one-third of schools are better explained by students' aspirations and homework practices than by academic press (see next sections).

Students' University Aspirations

Just as students' attitudes to school are likely to be shaped by a combination of their experience in school and in the home, students' aspirations for further education also are likely to be influenced by both home and school factors. Research shows that effective schools are characterized by high academic expectations for students,[4] and the data in Exhibits 1.17 and 1.18 seem to support this finding. These exhibits show that in most countries, the majority of eighth-grade students in the low-achieving schools do not intend to go to university, while many more in the high-achieving schools have university plans. On average across countries, more than half of the students in high-achieving schools reported that they are planning to attend university, compared with less than one third in low-achieving schools. This difference is even more pronounced in countries such as Belgium (Flemish and French), Ireland, and Singapore, where the percentage in the high-achieving schools was more than twice that in the low-achieving schools. Countries with little or no difference between the two groups of schools in terms of university aspirations included Canada, Colombia, Iceland, Iran, and Norway.

It is likely that students' aspirations for university education are more directly influenced by tracking and streaming than any other variables presented in this report, and yet it is noticeable that in several of the countries where tracking is well established, including Austria, Germany, the Netherlands, and Switzerland, the percentage of students in the high-achieving schools planning to attend university is relatively low. This may reflect the existence of a more differentiated tertiary education system in these countries, and in particular a well-developed system of technical and vocational institutions that attracts a proportion of the more able students.

Students' Homework Practices

The role of homework at the eighth grade varies considerably from country to country. In more than half of the TIMSS countries, very high percentages of students in both high- and low-achieving schools reported doing daily homework in science, mathematics, and other

4 Purkey, S.C., and Smith, M.S. (1982). "Too Soon to Cheer? Synthesis of Research on Effective Schools," *Educational Leadership*, Dec., 64-69.

subjects, and there was little or no difference between the two school types. In Singapore, for example, where average student performance on the TIMSS eighth-grade mathematics and science tests was among the highest, 87% of students in the low-achieving schools reported completing homework daily in all three areas. This percentage was greater than that reported by students in high-achieving schools in many of the other TIMSS countries. By way of contrast, the percentages of students in Japan, also a country with high average student achievement, that reported doing homework in the three subjects was lower than in most countries. Consequently, while doing homework in a range of subjects may be important, the type, efficiency and amount of homework may also be important. Japanese parents frequently provide a specific study area, even when space is limited in the family home, so that the child may complete homework with minimal distractions.[5]

In about one third of the countries, the percentage of students that reported doing daily homework was significantly less in the low-achieving schools (see Exhibits 1.19 and 1.20). In these countries, homework is more characteristic of the high-achieving schools. Countries with the greatest differences in both mathematics and science included Australia, Ireland, Hong Kong, and United States. In these countries, the difference was at least 20 percentage points in each subject.

[5] Stevenson, H. W., and Stigler, J. W. (1992). *The Learning Gap: Why Our Schools Are Failing and What We Can Learn from Japanese and Chinese Education*, New York: Summit Books.

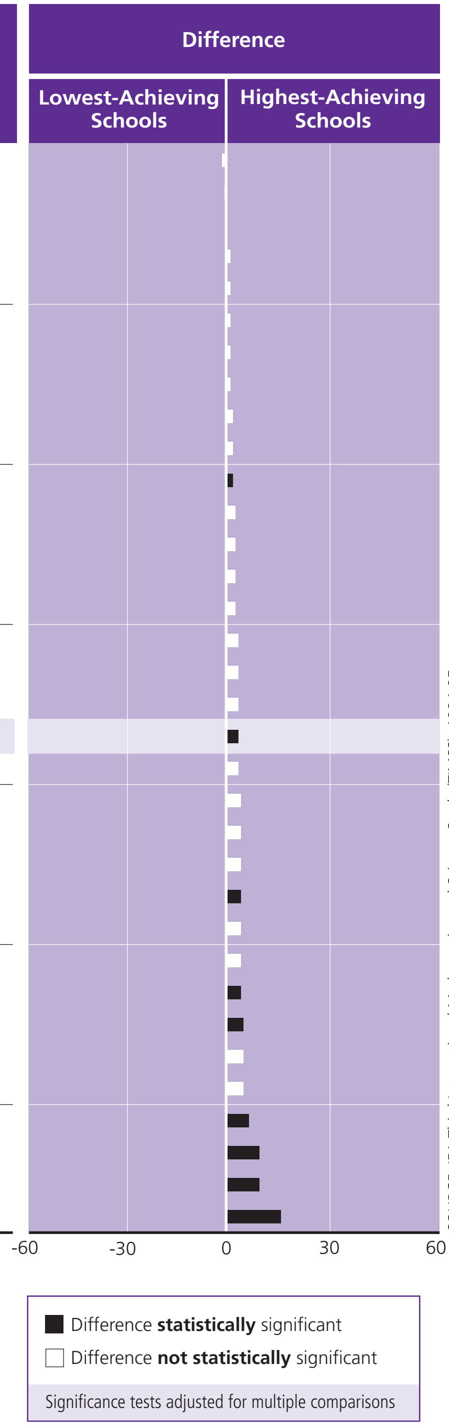
Exhibit 1.13 - 1.20 Overleaf

Exhibit 1.13

Percent of Students Believing That Their Mother Thinks It Is Important to Do Well in Science, Mathematics, and Language

Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Switzerland	68 (2.1)	66 (1.7)	-1 (2.7)
Lithuania	75 (1.8)	74 (1.6)	-1 (2.4)
Austria	77 (1.5)	77 (2.2)	0 (2.7)
Iran, Islamic Rep.	91 (1.4)	91 (0.9)	0 (1.6)
Russian Federation	91 (0.9)	92 (1.1)	1 (1.4)
Latvia (LSS)	82 (2.3)	83 (1.5)	1 (2.8)
Spain	98 (0.5)	99 (0.3)	1 (0.6)
Romania	85 (2.9)	86 (2.7)	1 (4.0)
Slovenia	78 (1.2)	79 (1.5)	2 (2.0)
Colombia	97 (1.1)	99 (0.4)	2 (1.1)
Singapore	98 (0.5)	99 (0.2)	2 (0.5)
England	94 (0.8)	96 (0.9)	2 (1.2)
Belgium (Fl)	90 (1.8)	93 (0.8)	2 (1.9)
Belgium (Fr)	96 (1.0)	98 (0.4)	2 (1.1)
Sweden	89 (1.0)	92 (0.9)	2 (1.3)
Canada	95 (0.9)	98 (0.3)	3 (1.0)
Germany	67 (2.2)	70 (2.5)	3 (3.4)
Portugal	92 (1.0)	95 (0.8)	3 (1.3)
International Avg.	87 (0.3)	90 (0.2)	3 (0.3)
Slovak Republic	91 (0.9)	94 (0.7)	4 (1.2)
Korea	87 (1.1)	91 (0.9)	4 (1.4)
Scotland	90 (1.3)	94 (0.9)	4 (1.6)
Norway	91 (1.3)	95 (0.7)	4 (1.5)
Australia	91 (0.9)	95 (0.6)	4 (1.1)
Cyprus	84 (1.4)	88 (1.1)	4 (1.8)
Netherlands	89 (1.3)	93 (1.0)	4 (1.6)
New Zealand	91 (1.0)	95 (0.6)	4 (1.2)
United States	93 (0.6)	97 (0.4)	4 (0.7)
Iceland	90 (3.8)	95 (0.8)	5 (3.9)
Czech Republic	88 (2.1)	94 (1.1)	5 (2.3)
Hungary	79 (1.4)	85 (1.2)	6 (1.8)
Hong Kong	79 (1.3)	89 (1.4)	9 (2.0)
France	82 (1.7)	92 (1.0)	10 (2.0)
Ireland	79 (2.3)	95 (0.8)	16 (2.4)



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

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

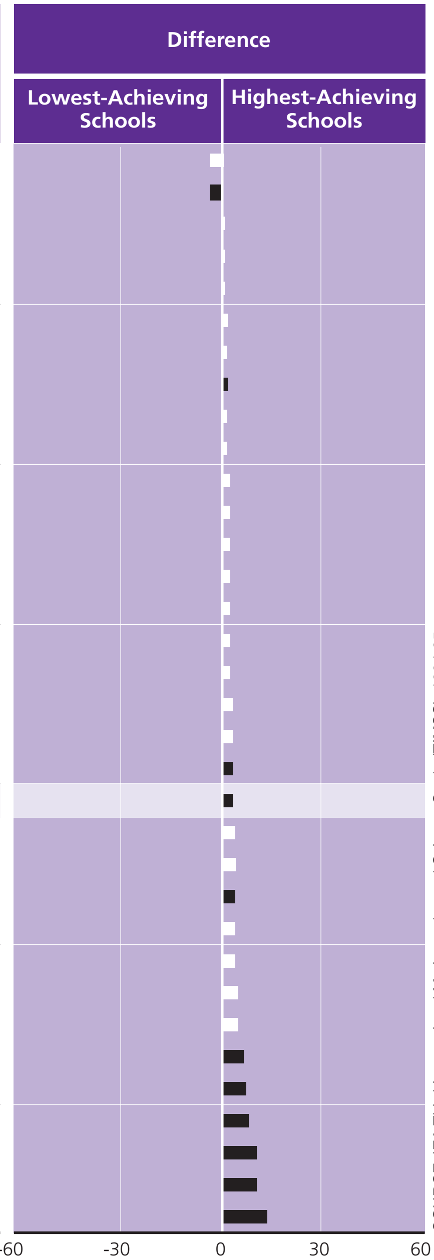
Japan: Question not administered or data not available.

Exhibit 1.14

Percent of Students Believing That Their Mother Thinks It Is Important to Do Well in Science, Mathematics, and Language

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Switzerland	69 (1.6)	65 (1.8)	-4 (2.4)
Austria	78 (1.7)	75 (2.1)	-3 (2.7)
Lithuania	74 (2.1)	75 (1.8)	1 (2.8)
Spain	98 (0.5)	99 (0.2)	1 (0.5)
Romania	85 (3.0)	87 (2.6)	1 (4.5)
Latvia (LSS)	82 (2.2)	84 (1.6)	2 (2.7)
Canada	96 (0.8)	98 (0.3)	2 (0.9)
Singapore	98 (0.5)	99 (0.2)	2 (0.5)
Iran, Islamic Rep.	90 (1.6)	92 (0.9)	2 (1.7)
Belgium (Fl)	90 (1.8)	92 (0.6)	2 (1.8)
Colombia	96 (1.1)	99 (0.3)	2 (1.2)
Slovenia	78 (1.1)	80 (1.5)	2 (1.8)
Russian Federation	90 (1.2)	92 (1.1)	3 (1.8)
Norway	92 (1.2)	95 (0.6)	3 (1.3)
Belgium (Fr)	95 (1.1)	98 (0.4)	3 (1.2)
Slovak Republic	92 (0.8)	95 (0.6)	3 (1.1)
England	94 (1.0)	97 (0.7)	3 (1.4)
Czech Republic	91 (1.6)	94 (1.2)	3 (2.0)
Korea	88 (1.1)	92 (0.9)	4 (1.4)
New Zealand	92 (1.0)	95 (0.4)	4 (1.1)
International Avg.	87 (0.3)	91 (0.2)	4 (0.4)
Netherlands	89 (1.3)	93 (1.2)	4 (1.8)
Germany	65 (2.5)	69 (2.6)	4 (3.6)
Portugal	91 (0.9)	95 (0.8)	4 (1.2)
Sweden	87 (1.1)	92 (1.0)	5 (1.5)
Cyprus	84 (1.7)	89 (1.1)	5 (2.1)
Scotland	90 (1.2)	94 (0.8)	5 (1.5)
Iceland	90 (4.4)	95 (0.8)	5 (4.5)
United States	92 (0.5)	98 (0.3)	6 (0.6)
Australia	88 (0.9)	96 (0.5)	8 (0.9)
Hungary	79 (1.7)	87 (1.2)	8 (2.1)
France	81 (1.8)	92 (1.0)	11 (2.1)
Hong Kong	78 (1.5)	89 (1.1)	11 (2.0)
Ireland	81 (2.3)	95 (1.0)	14 (2.4)



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

■ Difference **statistically** significant

□ Difference **not statistically** significant

Significance tests adjusted for multiple comparisons

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

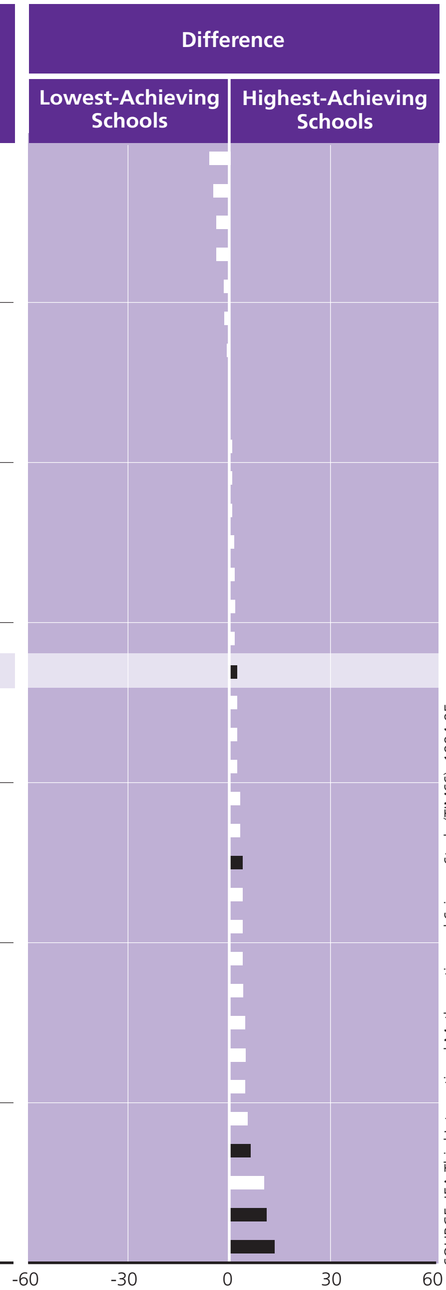
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

Japan: Question not administered or data not available

Exhibit 1.15 Percent of Students Believing That It Is Important to Do Well in Science, Mathematics, and Language

Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Germany	71 (2.1)	65 (2.1)	-6 (3.0)
Austria	77 (2.4)	73 (2.4)	-4 (3.4)
Switzerland	67 (1.9)	63 (2.0)	-4 (2.7)
Slovenia	86 (1.5)	83 (1.6)	-4 (2.2)
Latvia (LSS)	81 (2.0)	80 (1.7)	-2 (2.6)
Iran, Islamic Rep.	95 (0.6)	94 (1.0)	-1 (1.2)
United States	94 (0.6)	94 (1.2)	-1 (1.3)
Spain	98 (0.5)	98 (0.5)	0 (0.7)
Slovak Republic	83 (1.3)	83 (1.6)	0 (2.0)
Belgium (Fl)	92 (1.2)	92 (1.1)	0 (1.6)
England	95 (1.1)	96 (1.0)	1 (1.5)
Japan	83 (1.1)	84 (1.1)	1 (1.6)
Portugal	94 (0.8)	96 (0.7)	1 (1.1)
Colombia	98 (0.6)	99 (0.2)	1 (0.6)
Lithuania	75 (1.9)	77 (1.7)	2 (2.6)
Russian Federation	90 (1.0)	91 (1.1)	2 (1.5)
International Avg.	86 (0.3)	88 (0.2)	2 (0.4)
New Zealand	88 (1.2)	90 (1.0)	2 (1.5)
Netherlands	92 (1.2)	94 (1.2)	2 (1.6)
Sweden	80 (1.4)	83 (1.4)	3 (2.0)
Hungary	81 (1.5)	84 (1.2)	3 (1.9)
Korea	86 (1.2)	89 (1.2)	3 (1.7)
Singapore	96 (0.7)	99 (0.2)	4 (0.7)
Belgium (Fr)	92 (1.1)	95 (1.0)	4 (1.5)
Romania	75 (4.4)	79 (3.7)	4 (5.7)
Norway	88 (1.4)	92 (1.2)	4 (1.9)
Canada	90 (2.6)	94 (0.6)	4 (2.6)
Cyprus	83 (2.4)	87 (1.4)	4 (2.8)
Czech Republic	84 (2.1)	88 (1.2)	4 (2.4)
Iceland	86 (4.1)	91 (1.3)	5 (4.3)
Australia	85 (1.5)	90 (0.9)	5 (1.8)
Scotland	88 (1.7)	94 (0.9)	6 (1.9)
France	75 (2.8)	85 (1.6)	10 (3.2)
Hong Kong	83 (1.8)	94 (1.2)	11 (2.2)
Ireland	77 (2.4)	91 (1.0)	13 (2.6)



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

■ Difference **statistically** significant
□ Difference **not statistically** significant

Significance tests adjusted for multiple comparisons

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

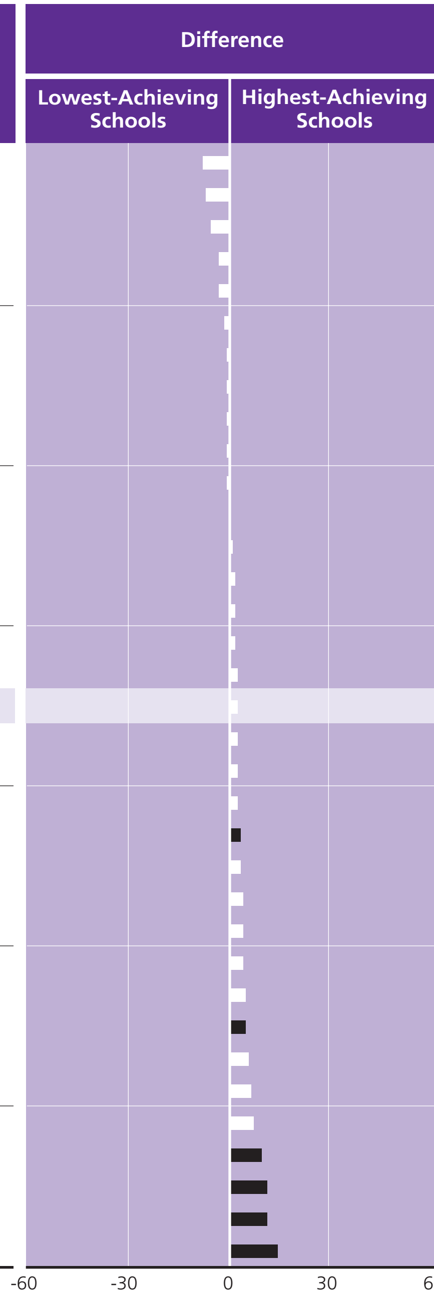
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

Exhibit 1.16 Percent of Students Believing That It Is Important to Do Well in Science, Mathematics, and Language

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Austria	79 (1.9)	71 (2.5)	-8 (3.1)
Switzerland	68 (1.5)	61 (2.1)	-7 (2.5)
Germany	70 (2.0)	65 (2.1)	-5 (3.0)
Latvia (LSS)	82 (2.0)	79 (1.6)	-3 (2.6)
Slovenia	85 (1.8)	82 (1.4)	-2 (2.4)
Iran, Islamic Rep.	95 (0.7)	94 (1.0)	-1 (1.3)
Spain	98 (0.5)	97 (0.6)	-1 (0.8)
Lithuania	77 (2.0)	76 (2.1)	-1 (3.0)
Japan	84 (1.2)	84 (1.2)	0 (1.8)
England	96 (0.9)	96 (0.9)	0 (1.3)
Slovak Republic	84 (1.3)	84 (1.6)	0 (2.0)
Canada	92 (2.0)	93 (0.6)	1 (2.2)
Belgium (Fl)	92 (1.1)	93 (0.8)	1 (1.4)
New Zealand	89 (1.3)	91 (0.9)	2 (1.5)
United States	93 (0.7)	95 (1.1)	2 (1.4)
Portugal	94 (0.9)	96 (0.6)	2 (1.1)
Colombia	97 (0.6)	100 (0.2)	2 (0.6)
International Avg.	85 (0.3)	88 (0.2)	3 (0.4)
Czech Republic	86 (1.6)	88 (1.2)	3 (2.0)
Korea	87 (1.1)	90 (1.2)	3 (1.6)
Netherlands	92 (1.2)	95 (1.2)	3 (1.7)
Singapore	96 (0.7)	99 (0.2)	3 (0.7)
Hungary	81 (1.5)	85 (1.3)	3 (1.8)
Russian Federation	88 (1.2)	92 (1.3)	4 (1.8)
Romania	76 (4.5)	80 (3.6)	4 (6.4)
Cyprus	83 (2.4)	87 (1.4)	5 (2.8)
Belgium (Fr)	90 (1.4)	95 (1.0)	5 (1.7)
Norway	89 (1.1)	94 (1.0)	5 (1.5)
Scotland	88 (1.8)	94 (0.8)	6 (1.9)
Iceland	84 (3.4)	91 (1.4)	6 (3.7)
Sweden	77 (1.8)	84 (1.4)	7 (2.3)
Australia	81 (1.5)	91 (0.7)	10 (1.6)
Hong Kong	83 (1.6)	94 (1.1)	11 (2.0)
Ireland	78 (2.6)	90 (1.2)	12 (2.8)
France	73 (2.9)	87 (1.3)	15 (3.2)



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

■ Difference **statistically** significant
□ Difference **not statistically** significant
Significance tests adjusted for multiple comparisons

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

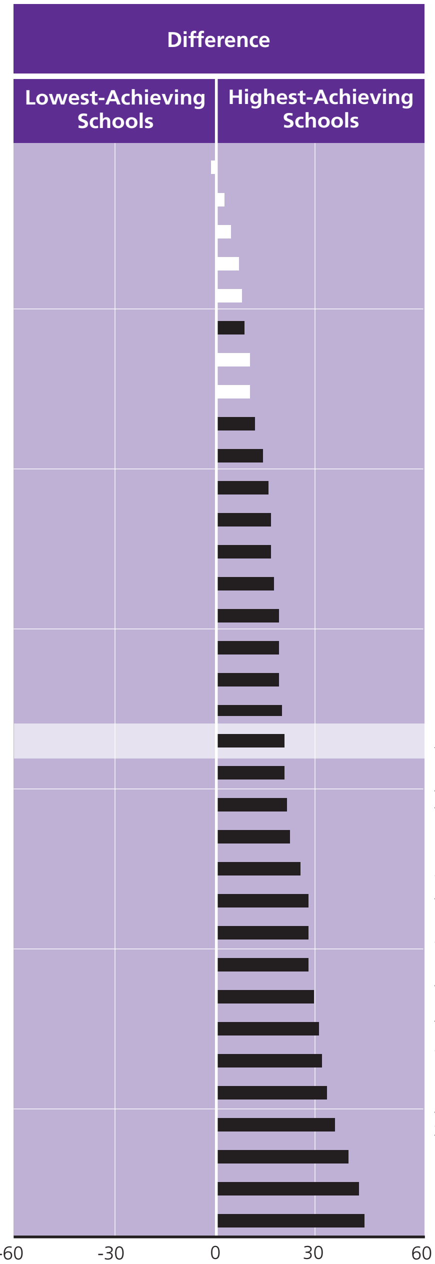
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

Exhibit 1.17

Percent of Students Planning to Attend University
Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Iran, Islamic Rep.	r 40 (3.5)	39 (3.1)	-1 (4.7)
Norway	33 (2.1)	36 (2.3)	3 (3.1)
Iceland	38 (2.1)	44 (2.3)	6 (3.1)
Canada	66 (2.8)	74 (1.8)	7 (3.3)
Korea	58 (1.9)	65 (1.8)	8 (2.6)
Sweden	26 (1.6)	35 (2.1)	9 (2.6)
Latvia (LSS)	s 21 (2.5)	r 32 (2.9)	11 (3.8)
Colombia	37 (9.9)	48 (4.0)	11 (10.7)
Japan	51 (1.5)	63 (1.8)	12 (2.4)
Germany	r 3 (0.9)	18 (1.8)	15 (2.0)
Switzerland	r 3 (0.5)	19 (2.3)	16 (2.4)
United States	54 (2.0)	71 (1.6)	17 (2.5)
Slovenia	31 (2.2)	48 (2.5)	17 (3.3)
Spain	45 (1.5)	63 (2.2)	18 (2.7)
Portugal	r 37 (2.0)	56 (2.4)	19 (3.1)
Slovak Republic	36 (1.8)	55 (3.0)	19 (3.5)
Romania	r 16 (2.4)	r 35 (3.4)	20 (4.2)
Cyprus	s 24 (2.3)	r 44 (2.7)	20 (3.5)
International Avg.	30 (0.5)	51 (0.5)	21 (0.7)
Scotland	r 22 (1.7)	44 (2.2)	21 (2.8)
Lithuania	s 21 (2.2)	r 43 (3.1)	22 (3.8)
Russian Federation	41 (3.0)	64 (3.9)	23 (4.9)
Australia	38 (2.8)	64 (2.2)	26 (3.6)
Netherlands	r 6 (1.4)	34 (4.0)	28 (4.2)
Czech Republic	19 (2.5)	47 (4.1)	29 (4.8)
New Zealand	31 (1.9)	60 (2.0)	29 (2.7)
France	r 30 (2.4)	61 (2.3)	30 (3.3)
Austria	9 (1.2)	41 (3.5)	32 (3.7)
Hong Kong	r 39 (3.2)	71 (2.0)	33 (3.7)
Hungary	s 20 (2.4)	r 54 (3.2)	34 (4.0)
Ireland	25 (3.0)	61 (2.4)	37 (3.8)
Belgium (Fr)	40 (2.7)	80 (2.1)	40 (3.4)
Singapore	22 (1.5)	65 (2.9)	43 (3.3)
Belgium (Fl)	r 14 (2.9)	60 (2.6)	45 (3.9)



Difference **statistically** significant
Difference **not statistically** significant
Significance tests adjusted for multiple comparisons

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

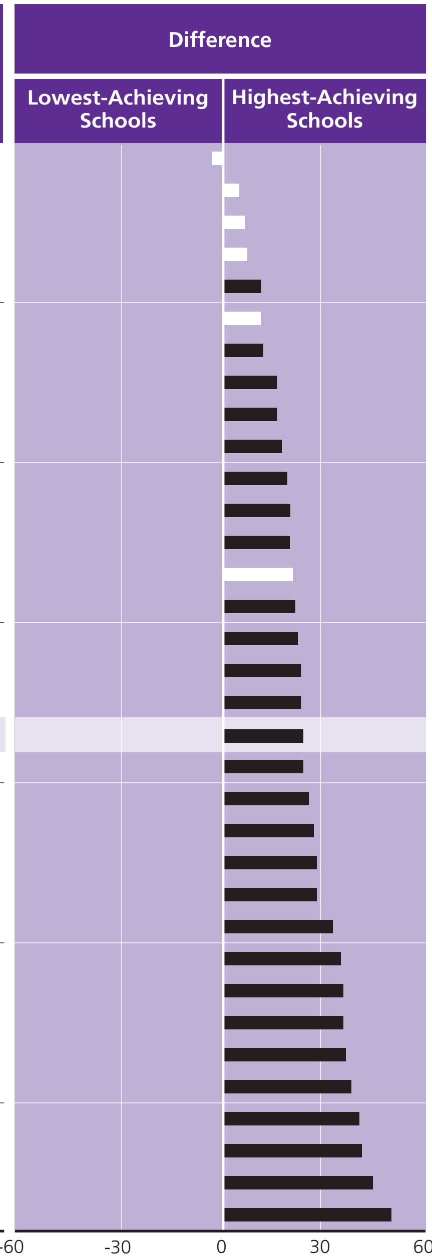
* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.
An "r" indicates response data available for 70-84% of students. An "s" indicates response data available for 50-69% of students.
England: Question not administered or data not available.

Exhibit 1.18

Percent of Students Planning to Attend University

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Iran, Islamic Rep.	r 45 (3.2)	42 (2.9)	-3 (4.4)
Canada	66 (2.3)	71 (1.7)	5 (2.6)
Iceland	38 (2.2)	44 (2.8)	6 (3.6)
Norway	32 (1.9)	39 (2.5)	7 (3.1)
Korea	57 (1.8)	68 (1.7)	11 (2.5)
Colombia	37 (10.2)	48 (4.1)	11 (10.9)
Japan	51 (2.1)	64 (1.7)	12 (2.8)
Germany	r 4 (1.1)	20 (1.9)	16 (2.2)
Switzerland	r 3 (0.4)	r 19 (2.6)	16 (2.7)
Latvia (LSS)	s 15 (1.9)	r 33 (2.8)	18 (3.6)
Sweden	18 (1.5)	37 (2.0)	19 (2.1)
Spain	45 (1.7)	65 (2.2)	20 (2.9)
Slovenia	31 (2.1)	51 (2.5)	20 (3.3)
Russian Federation	39 (2.4)	59 (6.6)	21 (6.9)
Scotland	r 23 (2.1)	45 (2.1)	22 (2.9)
Cyprus	s 24 (3.2)	r 46 (2.5)	23 (4.2)
United States	51 (2.0)	75 (1.8)	23 (2.8)
Lithuania	s 20 (2.4)	r 44 (3.2)	24 (4.0)
International Avg.	28 (0.5)	53 (0.5)	24 (0.7)
Romania	r 11 (2.1)	36 (3.4)	25 (3.9)
Slovak Republic	33 (1.7)	59 (2.9)	26 (3.4)
Netherlands	r 6 (1.4)	34 (4.4)	27 (4.6)
Portugal	r 33 (2.2)	61 (2.6)	28 (3.6)
New Zealand	32 (1.9)	60 (2.0)	28 (2.8)
France	r 30 (2.4)	63 (2.6)	33 (3.7)
Hong Kong	r 37 (3.2)	72 (1.8)	36 (3.9)
Austria	8 (1.2)	44 (2.6)	36 (2.8)
Czech Republic	14 (2.2)	51 (3.6)	37 (4.1)
Hungary	s 20 (2.6)	r 57 (3.3)	37 (4.0)
Ireland	24 (3.0)	62 (2.5)	39 (3.8)
Australia	26 (1.4)	67 (1.7)	41 (2.1)
Singapore	23 (1.5)	64 (2.9)	42 (3.5)
Belgium (Fr)	34 (3.9)	79 (2.2)	45 (4.8)
Belgium (Fl)	r 10 (2.1)	61 (2.5)	50 (3.3)



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

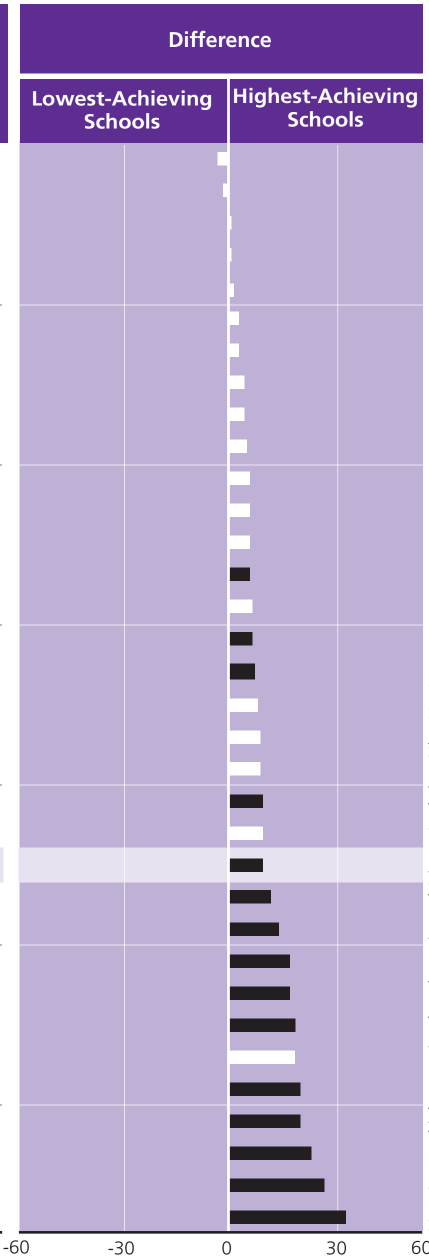
■ Difference **statistically** significant
□ Difference **not statistically** significant
Significance tests adjusted for multiple comparisons

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.
An "r" indicates response data available for 70-84% of students. An "s" indicates response data available for 50-69% of students.
England: Question not administered or data not available.

Exhibit 1.19 Percent of Students Daily Doing Homework in Science, Mathematics, and Other Subjects

Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Slovenia	87 (1.5)	85 (1.5)	-3 (2.2)
Belgium (Fl)	89 (1.5)	88 (1.9)	-1 (2.4)
Korea	64 (2.2)	65 (2.6)	0 (3.4)
Iran, Islamic Rep.	r 95 (0.8)	95 (1.1)	0 (1.4)
Latvia (LSS)	79 (2.4)	79 (2.2)	1 (3.2)
Slovak Republic	81 (1.8)	84 (1.5)	3 (2.4)
Lithuania	80 (2.2)	83 (1.6)	3 (2.7)
Switzerland	86 (1.5)	90 (1.2)	4 (1.9)
Sweden	79 (1.7)	84 (1.3)	5 (2.1)
Spain	89 (1.3)	94 (0.9)	5 (1.6)
Cyprus	72 (1.4)	77 (1.5)	6 (2.1)
Norway	83 (1.8)	89 (1.3)	6 (2.3)
Colombia	r 86 (2.0)	92 (1.4)	6 (2.4)
Portugal	86 (1.5)	92 (0.9)	6 (1.8)
Austria	67 (2.5)	74 (3.4)	7 (4.2)
Russian Federation	81 (1.4)	89 (1.5)	7 (2.0)
Singapore	87 (1.2)	95 (0.5)	8 (1.4)
Netherlands	86 (2.5)	94 (1.0)	8 (2.7)
Canada	66 (5.6)	74 (1.6)	9 (5.8)
Czech Republic	66 (2.8)	75 (2.5)	9 (3.7)
Hungary	83 (1.7)	93 (0.9)	9 (2.0)
Japan	68 (2.3)	77 (2.0)	10 (3.1)
International Avg.	75 (0.4)	85 (0.3)	10 (0.5)
Romania	70 (2.7)	82 (2.4)	12 (3.6)
Belgium (Fr)	80 (2.0)	94 (0.9)	14 (2.2)
Germany	67 (2.4)	85 (1.4)	18 (2.8)
France	69 (2.0)	87 (1.4)	18 (2.4)
New Zealand	66 (2.3)	85 (1.6)	18 (2.8)
Iceland	69 (5.8)	87 (2.2)	19 (6.2)
United States	59 (2.7)	79 (1.8)	20 (3.2)
Scotland	56 (2.9)	76 (2.4)	20 (3.7)
Hong Kong	58 (3.0)	81 (2.0)	23 (3.6)
Australia	58 (2.9)	85 (1.3)	27 (3.1)
Ireland	57 (3.5)	90 (1.4)	33 (3.8)



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

■ Difference **statistically** significant
□ Difference **not statistically** significant
Significance tests adjusted for multiple comparisons

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

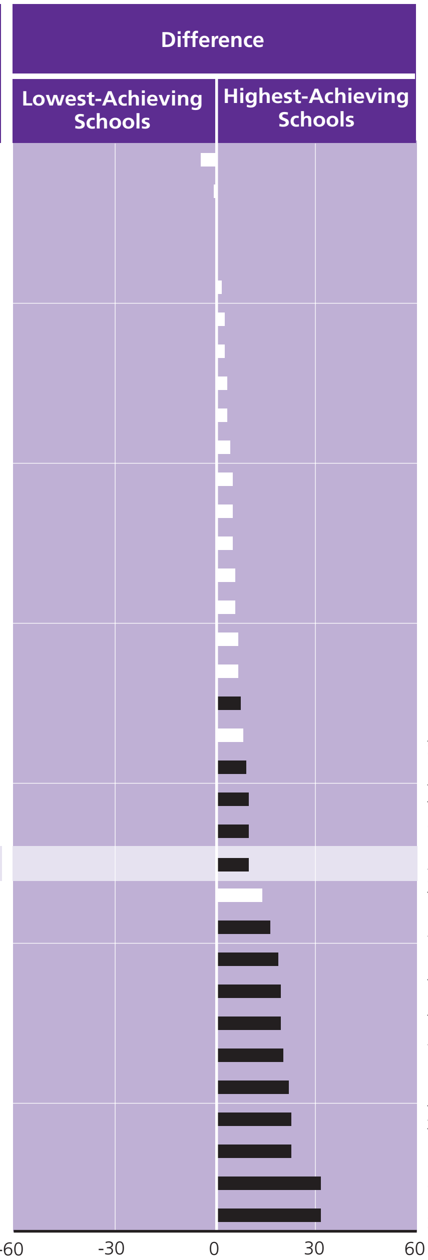
An "r" indicates response data available for 70-84% of students.

England: Question not administered or data not available.

Exhibit 1.20 Percent of Students Daily Doing Homework in Science, Mathematics, and Other Subjects

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country		Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Slovenia		88 (1.6)	84 (1.5)	-4 (2.0)
Belgium (Fl)		88 (1.3)	88 (1.8)	0 (2.2)
Slovak Republic		82 (1.8)	83 (1.9)	0 (2.6)
Latvia (LSS)		80 (2.5)	80 (2.3)	0 (3.4)
Switzerland		85 (1.4)	87 (1.3)	2 (2.0)
Korea		64 (2.7)	67 (1.6)	2 (3.0)
Iran, Islamic Rep.	r	94 (0.7)	97 (0.7)	3 (1.0)
Spain		90 (1.3)	94 (0.9)	4 (1.5)
Colombia	r	89 (1.9)	93 (1.2)	4 (2.5)
Lithuania		80 (2.5)	84 (1.6)	4 (3.0)
Austria		66 (2.3)	71 (2.9)	5 (3.7)
Cyprus		73 (1.7)	78 (1.5)	5 (2.3)
Czech Republic		67 (2.1)	73 (3.6)	6 (4.2)
Portugal		86 (1.6)	92 (1.0)	6 (1.9)
Norway		83 (1.6)	89 (1.3)	6 (2.1)
Canada		66 (3.9)	73 (2.1)	6 (4.6)
Netherlands		86 (2.6)	93 (1.2)	7 (2.8)
Singapore		87 (1.4)	95 (0.6)	8 (1.5)
Japan		69 (2.3)	78 (2.0)	9 (3.4)
Sweden		76 (2.0)	85 (1.5)	9 (2.2)
Hungary		82 (1.9)	92 (1.0)	10 (2.1)
Russian Federation		79 (1.1)	89 (1.0)	10 (1.3)
International Avg.		74 (0.4)	85 (0.3)	10 (0.5)
Romania		69 (2.9)	82 (3.1)	14 (4.7)
Scotland		60 (3.1)	75 (2.5)	16 (4.0)
France		67 (1.9)	86 (1.4)	19 (2.3)
New Zealand		65 (2.4)	85 (1.6)	20 (3.0)
Belgium (Fr)		75 (2.8)	95 (0.7)	20 (2.9)
Germany		64 (2.5)	85 (1.3)	20 (2.8)
United States		57 (2.3)	79 (2.0)	22 (3.8)
Iceland		65 (5.0)	87 (2.2)	23 (5.3)
Hong Kong		57 (3.2)	80 (2.6)	23 (4.2)
Ireland		59 (3.7)	90 (1.4)	31 (4.0)
Australia		51 (2.4)	83 (1.4)	31 (2.5)



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

■ Difference **statistically** significant
□ Difference **not statistically** significant

Significance tests adjusted for multiple comparisons

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

An "r" indicates response data available for 70-84% of students.

England: Question not administered or data not available.

School Location and Size

The school location and size category includes factors that operate at the school level. These are:

- school location
- size of school
- size of class

School Location
At one time, it was accepted that schools located in urban areas, because of their proximity to educational and cultural resources such as libraries and museums, had advantages over those situated in more remote locations. However, with the onset of urban decay in some industrialized countries and the migration of middle-class families to the suburbs, the reputation of urban schools suffered, and often the schools with the best reputation were found in suburban areas. The TIMSS countries vary a great deal in level of urbanization and in the distribution of schools between urban and rural areas, and so the relationship between student achievement and the urbanicity of the school can be expected to vary also.

Principals were asked to indicate the type of community in which the school was located: an isolated area, a village or rural area, the outskirts of a town or city, or close to the center of a town or city. For the purpose of this analysis, the third and fourth categories were combined, and schools in these categories were considered to be in urban areas. Exhibits 1.21 and 1.22 show the percentages of students in high- and low-achieving schools that were located in such an urban area. Although in several countries greater percentages of students in low-achieving schools were located in urban areas, which supports the idea that urban schools are often disadvantaged, only for Scotland in science was the difference statistically significant.[6] In contrast, in seven countries, Austria, Cyprus, Hungary, Iran, Korea (mathematics only), and the Russian Federation, significantly greater percentages of students in the high-achieving schools were in schools located in urban areas. Of these countries, both Iran and the Russian Federation have large tracts of remote areas, and the difference between urban and rural can be very marked.

School Size
Since size is a school characteristic that is directly related to the cost of educational provision, and one that may readily be manipulated by policy makers, it has received a great deal of attention over the years. On one hand, schools must be large enough so that the necessary investment in libraries, laboratories, gymnasia, and the like is economically sound, but on the other hand, schools should not be so large that they

6 School-related variables such as location and size are based on much smaller sample sizes than student-related variables, and so differences in percentages that would be significant in student samples often are not for school variables.

are organizationally cumbersome, or that students feel isolated. To provide an opportunity to study how school size and student achievement are related in TIMSS, school principals were asked to report the number of boys and girls attending their school. Exhibits 1.23 and 1.24 present the percentages of students in the high- and low-achieving schools that were in large schools. Because school size varies greatly from country to country (in TIMSS, average school size for eighth-grade students ranged from about 180 students in Norway to over 1200 in Singapore), for this report the size of a school was defined in relation to the average school size in each country. Large schools were those with student enrollment greater than the average for the country.

It is noteworthy that in Exhibits 1.23 and 1.24, there seems to be a general tendency for greater percentages of students in high-achieving schools to be in the larger schools in each country, although the difference is statistically significant in less than one third of the schools. Countries where school size differentiates most between high- and low-achieving schools include Austria, Germany, Iran, Korea (mathematics only), and Singapore. These schools span almost the full range of school sizes, from 291 in Iran to 1226 in Singapore.

Class Size

Few school characteristics have received as much attention from the research community as class size. Research syntheses based on rigorous experimental work[7] confirm the commonsense view that students should do better in small classes, although the results from large-scale surveys often paint a different picture. For example, the TIMSS data for Korea show that high average achievement in mathematics and science is possible in countries where large classes are the norm. TIMSS also shows that in many countries, average achievement is higher among students in larger classes. This finding may owe less to any possible superiority of large classes for instruction and more to the practice among schools of using smaller classes for weaker students or for remedial classes, but whatever the reason, the relationship seems to be widespread.

Exhibits 1.25 and 1.26 present the percentages of students in the high- and low-achieving schools that are in large classes. Again, because of the wide range of average class sizes across countries (from 15 in Iceland and Lithuania to 46 in Korea), large classes were defined as those above the average in each country. On average, 79 percent of students in high-achieving schools were in larger science classes, compared with 61 percent in low-achieving schools, a difference of 17 percentage points. In mathematics classes, the percentages in high- and low-achieving schools were 80 and 59, respectively, a difference of 21 percentage points. Significantly greater percentages of students in the high-achieving schools were in larger than average mathematics classes in nine countries, and in larger science

7 Glass, G.V. and Smith, M.L. (1978). *Meta-analysis of Research on the Relationship of Class-size and Achievement*, Far West Laboratory for Educational Research and Development, San Francisco, CA.

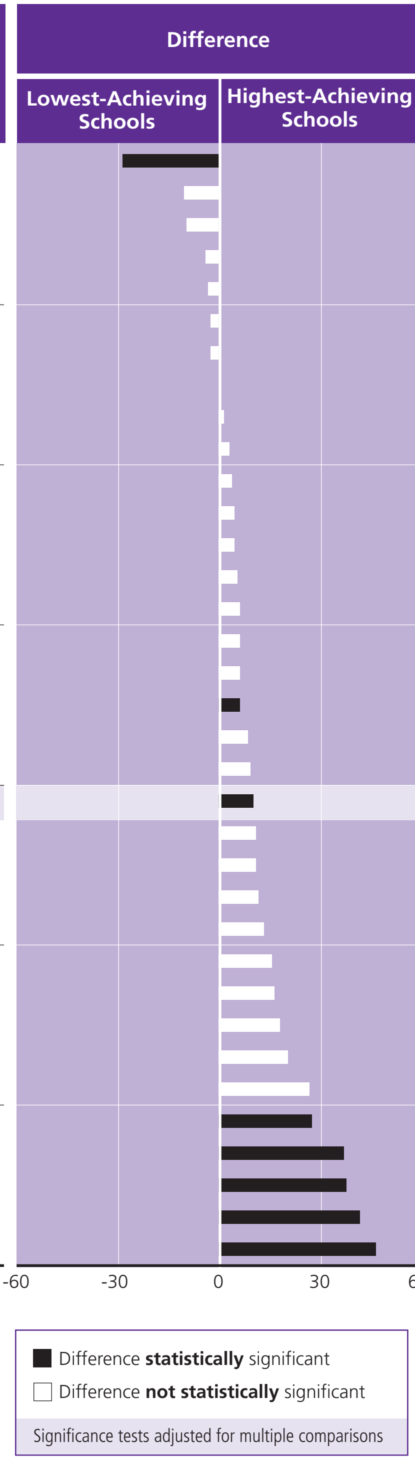
classes in four countries. In Belgium (French), Belgium (Flemish), the Netherlands, and Hong Kong, at least 80% of the students in the high-achieving schools were in larger than average classes, while 50% or less of the students in the low-achieving schools were in large classes. In Lithuania and Korea, all students in the high-achieving schools were in mathematics classes that were larger than average.

Exhibit 1.21 - 1.26 Overleaf

Exhibit 1.21

Percent of Students in Schools Located in Urban Areas[1]
Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Scotland	100 (0.0)	r 71 (8.2)	-29 (8.2)
United States	r 83 (6.2)	73 (6.1)	-11 (8.7)
Norway	46 (8.1)	37 (7.1)	-9 (10.8)
England	92 (4.5)	r 88 (7.5)	-4 (8.7)
New Zealand	86 (4.6)	83 (5.4)	-3 (7.1)
Netherlands	r 63 (14.3)	r 60 (9.0)	-3 (16.9)
Canada	r 86 (4.4)	84 (4.0)	-3 (5.9)
Singapore	100 (0.0)	100 (0.0)	0 (0.0)
France	68 (8.4)	69 (7.6)	1 (11.4)
Germany	s 80 (7.4)	s 83 (6.6)	3 (9.9)
Sweden	85 (6.4)	89 (5.5)	4 (8.5)
Belgium (Fl)	66 (9.0)	71 (6.8)	4 (11.3)
Romania	63 (6.3)	68 (6.2)	5 (8.9)
Ireland	74 (7.0)	79 (6.7)	5 (9.7)
Australia	83 (5.9)	r 89 (5.8)	6 (8.3)
Switzerland	57 (6.5)	r 63 (7.2)	6 (9.7)
Portugal	86 (5.3)	93 (4.1)	7 (6.7)
Hong Kong	93 (1.1)	100 (0.0)	7 (1.1)
Czech Republic	82 (5.6)	91 (4.0)	9 (6.9)
Belgium (Fr)	r 71 (9.9)	r 80 (7.6)	9 (12.5)
International Avg.	70 (1.2)	80 (1.0)	10 (1.5)
Iceland	r 79 (4.4)	90 (2.0)	11 (4.8)
Japan	75 (5.6)	86 (4.2)	11 (7.0)
Slovak Republic	62 (6.2)	74 (7.7)	12 (9.9)
Lithuania	63 (7.0)	77 (6.2)	13 (9.3)
Korea	73 (5.4)	89 (6.0)	16 (8.0)
Latvia (LSS)	43 (7.0)	r 60 (7.4)	17 (10.2)
Slovenia	60 (7.7)	r 79 (5.7)	18 (9.6)
Spain	46 (8.1)	66 (7.7)	21 (11.2)
Colombia	66 (8.4)	92 (4.2)	27 (9.4)
Russian Federation	62 (5.8)	89 (3.4)	28 (6.7)
Cyprus	r 60 (0.8)	s 97 (0.1)	37 (0.8)
Iran, Islamic Rep.	50 (8.4)	88 (5.0)	38 (9.8)
Austria	44 (6.9)	r 86 (5.4)	42 (8.7)
Hungary	43 (5.6)	90 (4.3)	47 (7.1)



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

1 Urban area includes outskirts and areas close to the center of a town/city.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

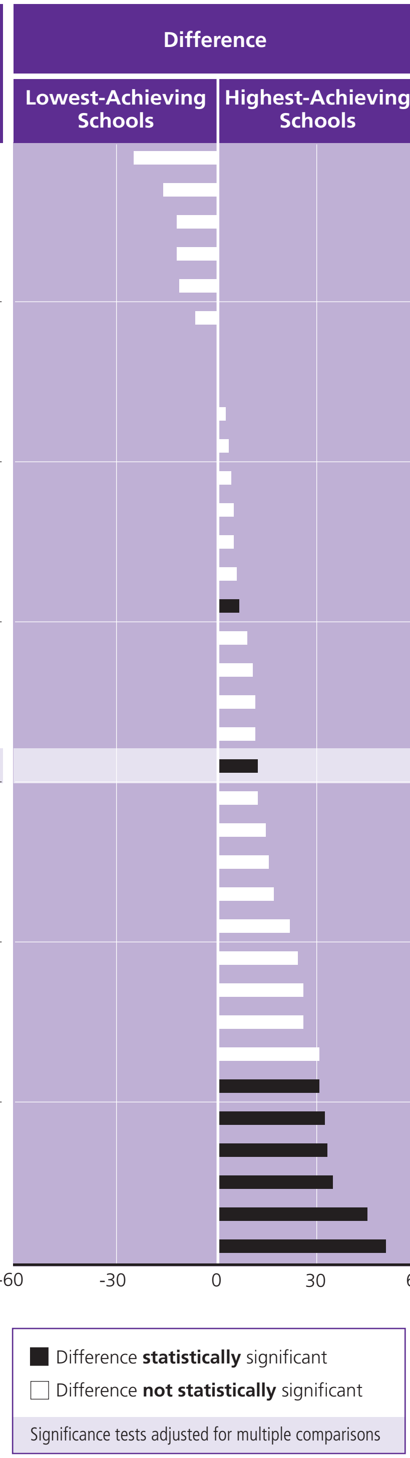
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

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

Exhibit 1.22

Percent of Students in Schools Located in Urban Areas[1]
Schools with the Lowest and Highest Achievement - Eighth Grade* - Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Scotland	97 (3.4)	r 73 (8.2)	-24 (8.8)
France	73 (8.1)	58 (9.5)	-15 (12.9)
England	93 (4.9)	r 81 (7.7)	-12 (9.2)
Norway	49 (7.5)	r 37 (7.3)	-11 (10.6)
Canada	r 88 (3.2)	r 77 (4.9)	-11 (5.9)
United States	r 81 (6.1)	76 (5.2)	-6 (8.3)
Netherlands	r 63 (15.1)	r 63 (9.2)	0 (17.8)
Singapore	100 (0.0)	100 (0.0)	0 (0.0)
Belgium (Fl)	68 (8.2)	71 (6.4)	3 (9.9)
Czech Republic	84 (5.7)	87 (5.2)	3 (8.3)
Portugal	86 (5.1)	91 (4.5)	5 (6.8)
Germany	s 77 (7.8)	s 82 (7.0)	5 (10.5)
Switzerland	61 (7.1)	66 (6.1)	5 (9.3)
Belgium (Fr)	s 73 (10.8)	79 (6.4)	6 (12.2)
Hong Kong	93 (1.1)	100 (0.0)	7 (1.1)
Sweden	77 (5.8)	87 (4.8)	9 (6.6)
New Zealand	79 (5.2)	89 (4.6)	10 (7.5)
Ireland	73 (7.4)	85 (6.0)	11 (10.1)
Australia	76 (6.2)	r 87 (5.0)	11 (6.8)
International Avg.	69 (1.2)	81 (1.0)	12 (1.6)
Iceland	r 79 (4.9)	91 (2.0)	13 (5.7)
Colombia	72 (7.6)	86 (5.5)	14 (9.9)
Slovak Republic	63 (6.5)	78 (7.0)	16 (10.3)
Japan	73 (6.0)	89 (3.6)	17 (6.7)
Lithuania	58 (6.4)	80 (5.7)	22 (9.1)
Romania	57 (6.4)	81 (5.0)	24 (8.6)
Spain	44 (8.0)	70 (7.2)	26 (10.6)
Latvia (LSS)	34 (7.1)	r 60 (6.7)	26 (9.9)
Slovenia	51 (7.8)	r 82 (6.8)	31 (12.1)
Cyprus	65 (5.2)	s 96 (3.1)	31 (6.1)
Austria	54 (7.1)	r 87 (2.6)	32 (7.6)
Hungary	50 (5.7)	83 (5.4)	33 (9.4)
Russian Federation	55 (6.5)	89 (3.8)	34 (7.4)
Korea	55 (7.1)	100 (0.0)	45 (7.1)
Iran, Islamic Rep.	42 (7.6)	93 (4.6)	51 (9.2)



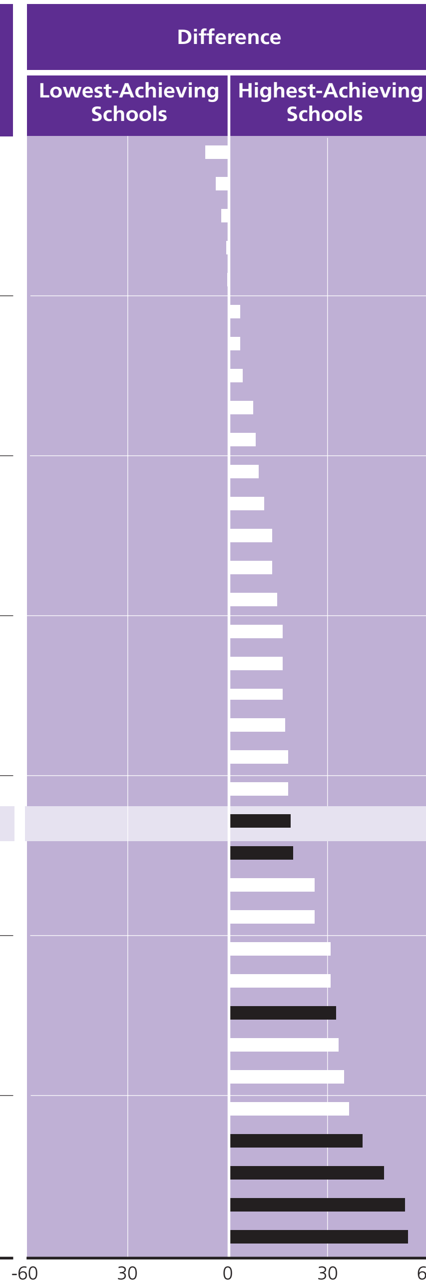
SOURCE: IEA Third International Mathematics and Science Study (TIMSS), 1994-95.

1 Urban area includes outskirts and areas close to the center of a town/city.
* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.
An "r" indicates response data available for 70-84% of students. An "s" indicates response data available for 50-69% of students.

Exhibit 1.23

Percent of Students in Schools with Enrollment Greater Than the Country Mean[1]
Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Mean	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Switzerland	291	48 (7.4)	r 41 (5.3)	-7 (9.1)
Sweden	276	r 88 (5.5)	85 (5.7)	-3 (7.9)
United States	498	s 71 (7.6)	r 68 (6.8)	-2 (10.2)
New Zealand	361	95 (2.7)	95 (2.1)	0 (3.4)
Canada	401	r 61 (8.5)	62 (5.5)	1 (10.1)
Portugal	915	r 65 (7.9)	68 (6.8)	3 (10.4)
Norway	151	r 78 (6.4)	r 81 (6.2)	4 (8.9)
England	639	r 69 (7.6)	r 73 (8.4)	4 (11.3)
France	471	60 (5.9)	67 (7.8)	7 (9.8)
Slovenia	487	62 (7.3)	r 71 (7.9)	9 (10.7)
Czech Republic	464	56 (10.2)	66 (6.9)	9 (12.3)
Romania	393	59 (6.1)	69 (6.0)	10 (8.6)
Iceland	249	r 73 (5.2)	86 (2.7)	13 (5.8)
Japan	461	65 (4.9)	79 (5.0)	13 (7.1)
Scotland	733	62 (6.9)	r 77 (6.6)	15 (9.6)
Spain	413	55 (6.4)	71 (6.3)	16 (9.0)
Ireland	454	s 51 (11.1)	s 67 (8.1)	16 (13.8)
Latvia (LSS)	286	r 58 (7.7)	r 75 (6.3)	17 (10.0)
Slovak Republic	435	58 (5.9)	75 (5.7)	17 (8.2)
Australia	686	63 (7.6)	r 80 (6.9)	18 (10.3)
Russian Federation	663	61 (6.3)	79 (6.9)	18 (9.3)
International Avg.	493	58 (1.3)	77 (1.1)	19 (1.7)
Cyprus	521	r 56 (0.8)	s 75 (0.6)	19 (1.1)
Lithuania	335	64 (6.6)	90 (4.8)	26 (8.1)
Korea	964	63 (6.7)	89 (6.5)	26 (9.4)
Belgium (Fl)	464	43 (8.1)	74 (6.7)	31 (10.6)
Belgium (Fr)	525	r 42 (10.9)	r 73 (8.4)	31 (13.7)
Hungary	368	53 (6.4)	85 (5.1)	32 (8.1)
Netherlands	774	s 53 (14.3)	s 85 (6.6)	33 (15.7)
Colombia	541	r 44 (10.7)	s 79 (6.5)	35 (12.5)
Hong Kong	1056	55 (10.4)	r 91 (5.7)	36 (11.9)
Iran, Islamic Rep.	291	40 (7.4)	80 (5.9)	40 (9.4)
Singapore	1226	37 (7.6)	83 (4.7)	47 (8.9)
Austria	288	r 34 (7.9)	r 87 (7.7)	53 (11.1)
Germany	514	s 26 (10.0)	s 80 (5.5)	54 (11.4)



■ Difference **statistically** significant
□ Difference **not statistically** significant
Significance tests adjusted for multiple comparisons

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

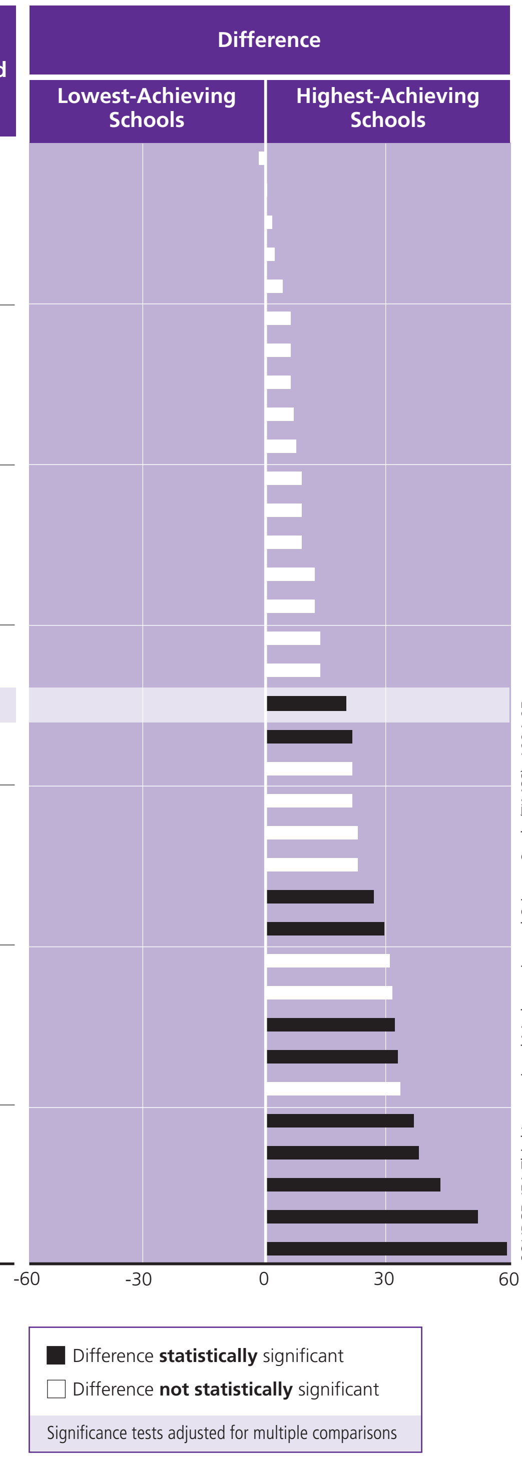
1 The percent of students in schools whose total enrollment is greater than the mean of the country's school enrollment for all participating schools.
* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.
An "r" indicates response data available for 70-84% of students. An "s" indicates response data available for 50-69% of students.

Exhibit 1.24

Percent of Students in Schools with Enrollment Greater Than the Country Mean[1]

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Mean	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Switzerland	291	49 (8.1)	r 47 (5.2)	-2 (9.8)
Norway	151	r 77 (4.6)	r 77 (6.2)	0 (8.0)
United States	498	s 70 (6.6)	r 72 (6.4)	2 (9.2)
England	639	71 (7.6)	r 74 (7.1)	3 (10.5)
Portugal	915	r 64 (8.0)	70 (7.9)	6 (11.6)
Japan	461	67 (6.5)	74 (4.9)	7 (9.5)
New Zealand	361	90 (4.3)	98 (2.1)	8 (4.8)
Spain	413	60 (5.8)	r 68 (4.8)	8 (7.9)
Sweden	276	r 81 (5.9)	89 (4.3)	8 (6.3)
France	471	57 (6.5)	66 (7.2)	9 (10.4)
Slovenia	487	55 (7.3)	r 65 (7.9)	10 (11.8)
Czech Republic	464	55 (8.8)	66 (6.4)	11 (11.8)
Cyprus	521	r 57 (5.7)	s 68 (6.0)	11 (9.4)
Ireland	454	s 51 (10.6)	r 65 (8.1)	14 (14.3)
Slovak Republic	435	60 (5.9)	76 (4.6)	15 (8.3)
Scotland	733	57 (8.4)	r 74 (5.9)	16 (11.2)
Australia	686	63 (7.1)	r 80 (5.0)	17 (8.2)
International Avg.	493	54 (1.4)	78 (1.0)	24 (1.7)
Canada	401	r 55 (6.6)	81 (3.6)	26 (7.6)
Romania	393	53 (5.9)	79 (5.1)	26 (9.0)
Russian Federation	663	56 (6.1)	82 (4.9)	27 (8.5)
Belgium (Fl)	464	44 (8.0)	72 (6.3)	28 (10.3)
Iceland	249	r 54 (10.1)	82 (6.5)	28 (13.8)
Hungary	368	54 (5.7)	87 (4.8)	33 (7.9)
Latvia (LSS)	286	r 41 (8.5)	r 77 (5.6)	36 (10.2)
Colombia	541	r 45 (10.2)	s 82 (6.8)	37 (12.2)
Belgium (Fr)	525	s 38 (11.2)	r 76 (7.4)	38 (13.6)
Lithuania	335	51 (6.2)	90 (4.8)	39 (8.5)
Hong Kong	1056	53 (10.6)	r 93 (5.3)	40 (11.5)
Netherlands	774	s 46 (14.6)	r 87 (6.7)	41 (16.1)
Singapore	1226	39 (7.7)	84 (4.4)	45 (9.1)
Iran, Islamic Rep.	291	35 (6.5)	81 (6.0)	46 (9.3)
Korea	964	45 (8.0)	98 (2.0)	53 (8.2)
Germany	514	s 25 (9.9)	s 89 (3.7)	64 (10.6)
Austria	288	r 25 (7.3)	r 98 (1.5)	73 (7.4)



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

1 The percent of students in schools whose total enrollment is greater than the mean of the country's school enrollment for all participating schools.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

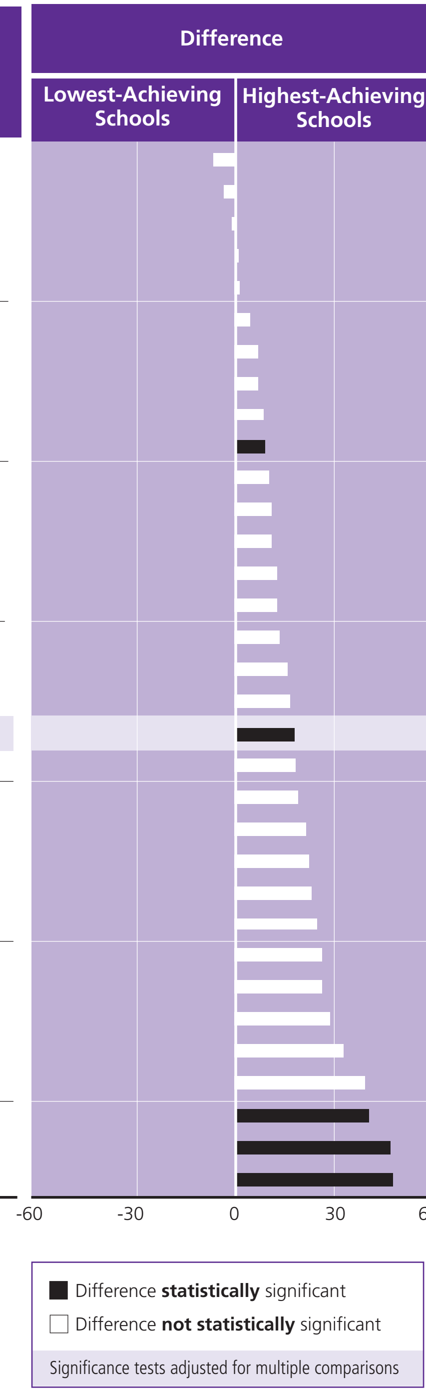
An "r" indicates response data available for 70-84% of students. An "s" indicates response data available for 50-69% of students.

Exhibit 1.25

Percent of Students in Schools with Average Class Sizes Greater Than the Country Mean[1]

Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Mean	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Singapore	36	72 (6.4)	66 (7.4)	-6 (9.8)
United States	24	r 68 (5.4)	64 (6.9)	-3 (8.7)
Romania	19	77 (5.1)	77 (5.3)	-1 (7.3)
Scotland	24	79 (7.3)	s 80 (6.7)	1 (9.9)
Norway	19	82 (5.1)	84 (5.8)	2 (7.7)
Latvia (LSS)	16	r 72 (6.3)	r 77 (5.6)	5 (8.4)
Switzerland	17	79 (5.4)	r 85 (4.2)	7 (6.8)
Portugal	25	68 (7.1)	75 (6.4)	7 (9.5)
Iceland	15	r 82 (4.5)	91 (1.9)	9 (4.9)
Cyprus	30	r 66 (1.2)	s 75 (1.1)	9 (1.6)
Canada	25	r 64 (8.9)	74 (5.9)	10 (10.7)
New Zealand	25	63 (7.1)	75 (6.1)	11 (9.4)
Slovenia	22	71 (7.2)	r 83 (6.5)	12 (9.7)
Iran, Islamic Rep.	31	63 (7.4)	75 (6.9)	13 (10.1)
Korea	46	78 (4.4)	91 (5.8)	13 (7.3)
France	25	49 (6.9)	63 (8.1)	14 (10.6)
Russian Federation	22	65 (6.9)	81 (5.3)	16 (8.7)
Slovak Republic	24	61 (6.4)	78 (6.9)	17 (9.5)
International Avg.	26	61 (1.4)	79 (1.1)	17 (1.8)
Sweden	24	63 (9.0)	82 (5.0)	19 (10.3)
Lithuania	15	76 (5.6)	96 (2.9)	20 (6.4)
Austria	24	s 42 (9.9)	s 64 (10.7)	22 (14.6)
Spain	27	50 (7.3)	73 (6.7)	23 (9.9)
Germany	24	s 59 (9.7)	s 83 (7.1)	24 (12.0)
Australia	26	49 (7.5)	r 74 (7.6)	25 (10.7)
Czech Republic	25	39 (10.8)	66 (8.3)	27 (13.6)
Japan	35	54 (7.7)	81 (4.7)	27 (9.0)
Colombia	33	s 56 (14.1)	s 86 (7.8)	29 (16.1)
Ireland	26	38 (8.3)	71 (7.1)	33 (10.9)
Hong Kong	40	50 (10.7)	90 (6.9)	40 (12.7)
Netherlands	25	s 49 (10.2)	r 90 (6.7)	41 (12.2)
Belgium (Fl)	18	r 39 (9.0)	r 86 (5.4)	47 (10.5)
Belgium (Fr)	19	r 42 (8.9)	r 90 (5.5)	48 (10.5)



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

1 The percent of students in classes whose size is greater than the mean of the country's class size for all participating schools.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

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

England and Hungary: Question not administered or data not available.

Exhibit 1.26

Percent of Students in Schools with Average Class Sizes Greater Than the Country Mean[1]

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Mean	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
United States	24	s 73 (4.3)	r 65 (5.4)	-7 (6.6)
Singapore	36	66 (7.4)	61 (7.8)	-6 (10.7)
Slovak Republic	24	63 (6.2)	67 (7.2)	4 (9.8)
Scotland	24	83 (6.3)	r 87 (4.9)	4 (7.9)
Romania	19	78 (5.3)	82 (5.4)	4 (8.8)
Portugal	25	68 (7.1)	74 (7.4)	5 (10.2)
France	25	53 (6.7)	61 (7.7)	8 (10.2)
Switzerland	17	r 73 (5.6)	r 83 (5.1)	10 (7.6)
Cyprus	30	s 68 (5.8)	s 78 (2.4)	10 (6.7)
Norway	19	76 (5.1)	r 87 (5.3)	10 (7.6)
Sweden	24	r 65 (7.0)	76 (5.2)	11 (7.6)
Iceland	15	r 80 (4.1)	91 (2.1)	11 (5.2)
Latvia (LSS)	16	r 70 (7.2)	r 82 (4.6)	12 (8.9)
Austria	24	s 47 (12.9)	r 60 (10.5)	13 (16.6)
Slovenia	22	58 (7.9)	r 77 (7.6)	19 (11.3)
Russian Federation	22	64 (6.8)	83 (4.7)	19 (7.8)
International Avg.	26	59 (1.4)	80 (1.0)	21 (1.8)
Japan	35	59 (7.5)	81 (4.3)	22 (8.9)
Iran, Islamic Rep.	31	60 (7.3)	82 (5.3)	22 (8.9)
New Zealand	25	53 (7.4)	76 (6.2)	23 (10.7)
Germany	24	s 58 (9.6)	s 82 (7.0)	24 (11.9)
Australia	26	52 (6.9)	r 79 (5.5)	27 (7.9)
Canada	25	r 54 (8.0)	82 (3.3)	28 (8.5)
Colombia	33	s 54 (13.4)	s 84 (7.3)	30 (15.3)
Spain	27	44 (7.8)	r 77 (6.0)	33 (10.4)
Ireland	26	38 (8.2)	70 (6.7)	33 (11.2)
Lithuania	15	66 (5.5)	100 (0.0)	34 (5.5)
Czech Republic	25	32 (8.3)	69 (7.4)	36 (11.2)
Korea	46	63 (7.3)	100 (0.0)	37 (7.3)
Belgium (Fr)	19	s 39 (9.3)	r 81 (8.1)	42 (12.1)
Netherlands	25	s 47 (11.0)	r 89 (6.5)	42 (12.9)
Belgium (Fl)	18	r 38 (8.3)	86 (5.1)	49 (9.9)
Hong Kong	40	44 (10.9)	96 (3.9)	51 (10.9)

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

■ Difference **statistically** significant
□ Difference **not statistically** significant
Significance tests adjusted for multiple comparisons

1 The percent of students in classes whose size is greater than the mean of the country's class size for all participating schools.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

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

England and Hungary: Question not administered or data not available.

School Social Climate

The school-climate literature is concerned with the psychological context in which school behavior is embedded. School climate is considered to be a relatively enduring quality of the school that is experienced by the teachers and students, influences their behavior, and can be described in terms of the shared values of the school community.[8] School climate has many aspects, but there is broad agreement that a positive school climate embodies respect for the individual student and a safe and orderly learning environment. School social climate, as used in this study, focuses on these factors. Research indicates that the safe and orderly learning environment of an effective school has a positive effect on the behavior and academic performance of students.[9] When a school is forced to focus on keeping order, it often fails not only to achieve that goal, but also the more fundamental goal of academic achievement.[10]

The school-social-climate category here consists of two indicators:

- serious student misbehavior
- administrative violations

Serious Student Misbehavior.
Principals were asked to indicate the frequency of inappropriate student behavior that was directed at either another person or the property of others. Such behavior included classroom disturbance, cheating, profanity, vandalism, theft, intimidation or verbal abuse of other students, and physical injury to other students. TIMSS combined these into a single indicator of how often school principals reported having to deal with serious student misbehavior. The percentages of students in schools where such misconduct was reported often are shown in Exhibits 1.27 and 1.28. Although on average more principals in the lowest-achieving schools reported dealing often with serious student misbehavior, the difference was not statistically significant in most countries. For science achievement, the problem of serious student misconduct was reported more frequently in the lower-achieving schools in Canada, Cyprus, and Hong Kong, and for mathematics, in Hong Kong and Singapore.

Administrative Violations
Frequent less serious student misbehavior can also be indicative of a school learning environment that is less than orderly and in which high levels of student achievement may be difficult to sustain. To examine this issue, four violations – arriving late for school, absenteeism, skipping class, and violating the school dress code – were collected into a single index. This index has been labeled "administra-

8 Owens, R. G. (1991). *Organizational Behavior in Education*, Fourth Ed., New Jersey: Prentice-Hall.

9 Witcher, A. E. (1993). "Assessing School Climate: An Important Step for Enhancing School Quality". *NASSP Bulletin*, Vol. 77, No. 554, 1-5

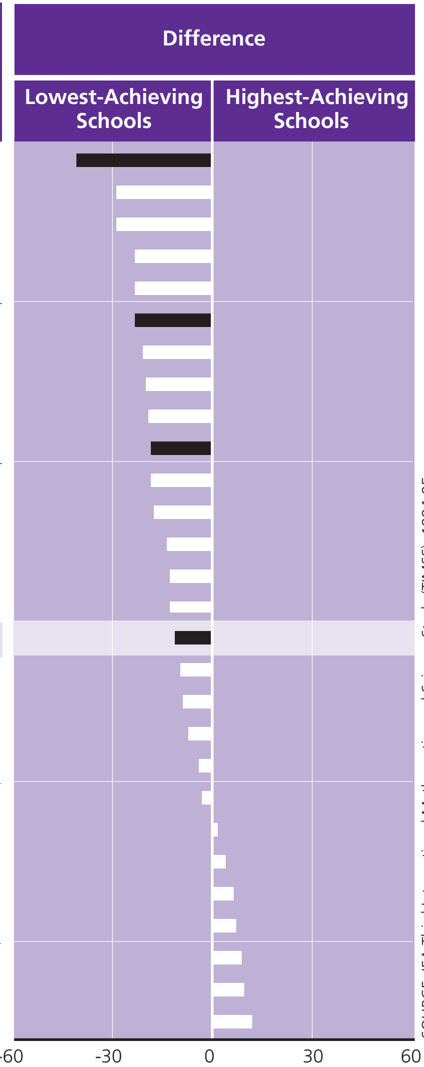
10 Gaddy, G. D. (1988). "High School Order and Academic Achievement." *American Journal of Education*, Vol. 96, No. 4, 496-518.

tive violations." Exhibits 1.29 and 1.30 show the percentages of students who were in schools where principals reported dealing often with such violations. As was the case with serious student misbehavior, on average, more principals in the low-achieving schools reported dealing often with student administrative violations, but again the difference was not statistically significant in most countries. Only in Australia, Canada, Cyprus, and Singapore was there a significant difference for science achievement, and only in Spain and Singapore for mathematics.

Exhibit 1.27 Percent of Students in Schools Reporting Often Dealing with Serious Student Misbehavior[1]

Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Hong Kong	68 (9.0)	27 (8.6)	-41 (12.5)
Netherlands	s 92 (5.7)	r 63 (10.9)	-29 (12.3)
Singapore	49 (7.9)	21 (6.5)	-28 (10.2)
Slovenia	r 69 (9.2)	r 46 (9.9)	-23 (13.5)
Australia	90 (4.7)	r 67 (7.3)	-23 (8.7)
Canada	r 87 (3.4)	r 64 (6.4)	-23 (7.2)
Latvia (LSS)	s 78 (8.5)	s 58 (10.9)	-20 (13.9)
Austria	74 (6.8)	54 (10.1)	-20 (12.1)
Ireland	69 (7.5)	50 (7.9)	-19 (10.9)
Cyprus	r 70 (0.9)	s 52 (1.4)	-19 (1.6)
United States	r 87 (3.8)	69 (6.1)	-18 (7.2)
New Zealand	89 (4.7)	72 (6.5)	-17 (8.1)
Slovak Republic	58 (7.2)	r 45 (9.0)	-13 (11.5)
Portugal	r 51 (8.7)	38 (7.2)	-13 (11.3)
Czech Republic	71 (6.6)	58 (8.3)	-12 (10.6)
International Avg.	63 (1.5)	52 (1.6)	-11 (2.2)
Spain	44 (7.3)	r 35 (8.0)	-9 (10.8)
Iceland	r 57 (8.9)	48 (11.0)	-9 (14.1)
Switzerland	r 76 (7.9)	s 69 (7.2)	-7 (10.7)
Russian Federation	s 25 (8.1)	r 21 (7.0)	-4 (10.7)
Belgium (Fl)	59 (6.7)	56 (8.7)	-3 (10.9)
Belgium (Fr)	r 60 (11.1)	r 62 (9.0)	2 (14.3)
France	56 (7.6)	r 60 (9.6)	5 (12.3)
Colombia	s 45 (11.5)	s 51 (8.7)	7 (14.4)
Iran, Islamic Rep.	s 43 (12.3)	r 51 (9.0)	8 (15.3)
Sweden	59 (7.8)	68 (7.4)	10 (10.7)
Lithuania	s 34 (8.7)	r 44 (8.5)	10 (12.1)
Korea	39 (7.5)	51 (7.3)	12 (10.4)



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

■ Difference **statistically** significant
□ Difference **not statistically** significant
Significance tests adjusted for multiple comparisons

1 Index is based on mean frequency of occurance, as reported by school principals, of the following items: 1) classroom disturbance; 2) cheating; 3) profanity; 4) vandalism; 5) theft; 6) intimidation or verbal abuse of other students; 7) physical injury to other students.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

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

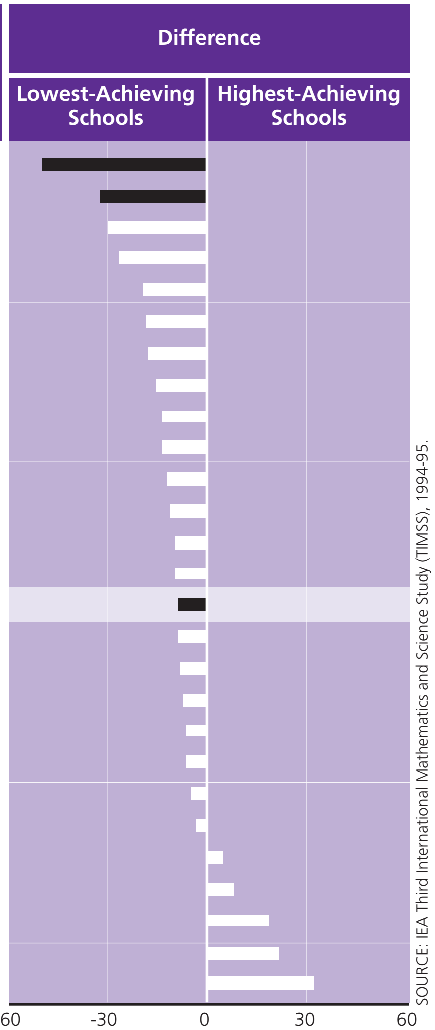
England, Germany, Hungary, Japan, Norway, Romania and Scotland: Question not administered or data not available.

Exhibit 1.28

Percent of Students in Schools Reporting Often Dealing with Serious Student Misbehavior[1]

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Hong Kong	74 (8.3)	25 (8.4)	-50 (12.1)
Singapore	52 (8.0)	20 (6.3)	-32 (9.6)
Portugal	62 (7.2)	r 32 (7.8)	-30 (10.3)
Netherlands	s 85 (8.3)	r 58 (10.5)	-27 (12.9)
Russian Federation	s 33 (8.7)	s 14 (5.4)	-19 (9.6)
Slovak Republic	r 60 (7.6)	42 (7.7)	-18 (10.5)
Australia	90 (4.3)	r 72 (5.8)	-17 (6.5)
Belgium (Fl)	66 (7.0)	51 (7.8)	-15 (10.6)
Ireland	68 (7.6)	54 (8.1)	-14 (10.6)
New Zealand	83 (5.1)	69 (7.0)	-14 (8.8)
Canada	r 83 (4.1)	r 71 (6.4)	-12 (7.6)
Cyprus	66 (5.6)	s 55 (5.9)	-11 (9.2)
Iceland	r 53 (10.1)	43 (12.2)	-10 (17.4)
Switzerland	r 78 (7.5)	s 68 (5.7)	-10 (9.2)
International Avg.	62 (1.5)	52 (1.6)	-9 (2.2)
Austria	69 (6.7)	60 (10.2)	-9 (12.2)
France	60 (7.0)	52 (8.4)	-8 (11.0)
Belgium (Fr)	r 65 (12.4)	r 58 (9.0)	-7 (15.0)
Korea	53 (8.6)	47 (7.5)	-6 (11.4)
Czech Republic	66 (8.1)	60 (7.3)	-6 (11.5)
United States	r 80 (4.9)	74 (5.9)	-5 (6.9)
Spain	48 (7.1)	r 46 (7.6)	-3 (10.3)
Sweden	65 (6.8)	70 (7.4)	5 (8.3)
Colombia	r 40 (10.6)	s 48 (8.5)	8 (13.9)
Iran, Islamic Rep.	s 33 (8.9)	r 51 (10.9)	18 (14.8)
Slovenia	s 45 (10.6)	r 67 (8.1)	22 (13.6)
Lithuania	s 23 (7.8)	r 55 (9.1)	32 (12.4)



■ Difference **statistically** significant
□ Difference **not statistically** significant
Significance tests adjusted for multiple comparisons

1 Index is based on mean frequency of occurance, as reported by school principals, of the following items: 1) classroom disturbance; 2) cheating; 3) profanity; 4) vandalism; 5) theft; 6) intimidation or verbal abuse of other students; 7) physical injury to other students.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

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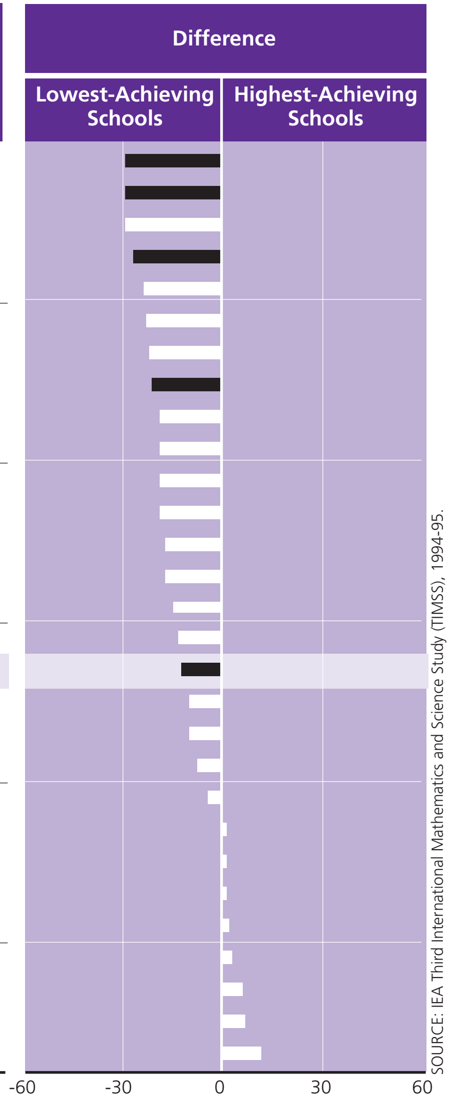
England, Germany, Hungary, Japan, Norway, Romania and Scotland: Question not administered or data not available.

Exhibit 1.29

Percent of Students in Schools Often Reporting Dealing with Student Administrative Violations[1]

Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Canada	r 89 (3.4)	r 60 (5.8)	-29 (6.7)
Singapore	89 (4.7)	60 (7.2)	-29 (8.6)
Spain	r 47 (8.3)	r 18 (6.6)	-29 (10.6)
Cyprus	r 79 (0.9)	s 53 (1.4)	-26 (1.6)
United States	r 84 (5.5)	60 (5.6)	-23 (7.8)
Belgium (Fl)	47 (7.2)	25 (8.5)	-22 (11.2)
Latvia (LSS)	r 73 (7.5)	r 52 (9.2)	-22 (11.9)
Australia	98 (2.0)	r 77 (5.9)	-21 (6.2)
France	50 (9.1)	r 32 (9.0)	-19 (12.8)
Switzerland	r 32 (6.7)	s 13 (5.5)	-18 (8.6)
Belgium (Fr)	r 66 (12.0)	r 48 (9.6)	-18 (15.3)
Netherlands	s 79 (10.6)	r 61 (10.1)	-18 (14.7)
Hong Kong	81 (7.9)	65 (10.4)	-17 (13.1)
Czech Republic	25 (7.3)	9 (3.6)	-16 (8.2)
Slovenia	r 74 (8.3)	r 59 (9.5)	-14 (12.6)
New Zealand	97 (2.2)	85 (5.0)	-12 (5.5)
International Avg.	63 (1.4)	52 (1.4)	-12 (2.0)
Russian Federation	74 (6.4)	64 (8.4)	-10 (10.6)
Sweden	67 (9.0)	58 (7.3)	-9 (11.6)
Ireland	84 (6.4)	77 (6.2)	-7 (8.9)
Portugal	r 33 (8.5)	29 (7.2)	-4 (11.1)
Iceland	r 62 (8.4)	63 (11.8)	2 (14.5)
Romania	51 (6.7)	r 53 (8.1)	2 (10.6)
Austria	34 (5.9)	36 (7.4)	2 (9.5)
Slovak Republic	13 (4.7)	15 (4.8)	2 (6.7)
Iran, Islamic Rep.	s 31 (11.2)	34 (6.7)	3 (13.0)
Colombia	s 71 (13.4)	s 77 (7.0)	6 (15.2)
Korea	67 (7.0)	75 (6.1)	7 (9.3)
Lithuania	73 (6.5)	85 (5.5)	12 (8.5)



■ Difference **statistically** significant
□ Difference **not statistically** significant

Significance tests adjusted for multiple comparisons

1 Index is based on mean frequency of occurrence, as reported by school principals, of the following items: 1) arriving late at school; 2) absenteeism; 3) skipping class; and 4) violating dressing code.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

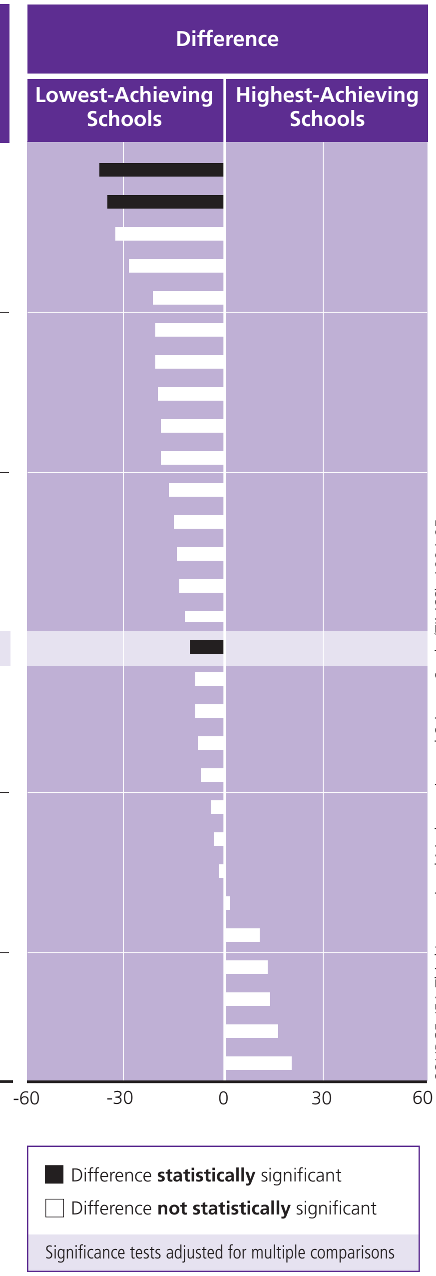
An "r" indicates response data available for 70-84% of students. An "s" indicates response data available for 50-69% of students.

England, Germany, Hungary, Japan, Norway and Scotland: Question not administered or data not available.

Exhibit 1.30 Percent of Students in Schools Reporting Often Dealing with Student Administrative Violations[1]

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Spain	r 54 (8.2)	r 17 (6.0)	-37 (10.1)
Singapore	90 (4.8)	55 (7.5)	-35 (8.5)
Hong Kong	93 (5.4)	61 (9.7)	-32 (10.9)
Belgium (Fr)	r 71 (12.4)	r 42 (8.1)	-28 (14.4)
Cyprus	r 85 (4.1)	s 64 (5.8)	-21 (8.1)
Russian Federation	77 (7.2)	57 (9.3)	-20 (12.4)
Belgium (Fl)	45 (7.6)	25 (8.0)	-20 (11.1)
Czech Republic	24 (7.5)	4 (2.3)	-20 (8.1)
Netherlands	s 79 (10.7)	r 60 (9.7)	-19 (14.9)
France	48 (8.6)	29 (7.1)	-19 (11.2)
United States	r 86 (4.0)	69 (5.4)	-16 (6.7)
Switzerland	r 35 (7.2)	r 20 (4.9)	-15 (8.7)
Canada	r 82 (4.3)	r 68 (4.9)	-14 (6.5)
Portugal	r 33 (8.2)	r 20 (6.8)	-13 (10.7)
Australia	96 (2.8)	r 84 (3.8)	-11 (4.2)
International Avg.	63 (1.4)	53 (1.3)	-10 (2.0)
Ireland	86 (6.0)	78 (6.7)	-9 (8.9)
Latvia (LSS)	70 (7.7)	s 62 (8.7)	-8 (11.6)
Romania	59 (6.8)	51 (8.0)	-8 (10.3)
Slovak Republic	20 (5.3)	13 (3.1)	-7 (5.9)
New Zealand	91 (4.5)	88 (5.0)	-4 (6.7)
Korea	74 (6.9)	71 (6.4)	-3 (9.4)
Austria	32 (7.5)	r 31 (8.6)	-1 (11.4)
Sweden	69 (6.5)	71 (5.9)	2 (7.8)
Slovenia	r 69 (8.8)	r 79 (7.0)	10 (10.6)
Colombia	s 68 (13.5)	s 81 (6.6)	13 (14.9)
Lithuania	73 (6.8)	87 (5.4)	14 (9.3)
Iran, Islamic Rep.	r 19 (6.7)	36 (8.9)	16 (10.8)
Iceland	r 41 (10.7)	61 (10.6)	20 (16.5)



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

[1] Index is based on mean frequency of occurrence, as reported by school principals, of the following items: 1) arriving late at school; 2) absenteeism; 3) skipping class; and 4) violating dressing code.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

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

England, Germany, Hungary, Japan, Norway and Scotland: Question not administered or data not available.

Student Attitudes towards Science and Mathematics

Positive student attitudes towards the subject matter are an important goal of most science and mathematics curricula, both as desirable outcomes in their own right, and because students with positive attitudes are thought more likely to choose further courses in science and mathematics and to seek employment in related fields. The three factors included in this category include:

- student attitudes towards science
- student attitudes towards mathematics
- student belief in the efficacy of science

Student Attitudes towards Science

An index incorporating student responses to questions about their attitude to science was constructed using 14 items from the student questionnaire. Students were asked whether they liked science, and whether they found their science subjects enjoyable or boring. The percentages of students in the high- and low-achieving schools that had a positive attitude towards science are shown in Exhibit 1.31. Among the low-achieving schools, the percentage of students with a positive attitude towards science ranged from a low of 30% in Korea to a high of 84% in both the Russian Federation and Romania, while among the high-achieving schools, it ranged from a low of 37% in Korea to a high of 89% in Romania.

Although in quite a few countries attitudes to science were equally positive in both high- and low-achieving schools, on average a greater percentage of students in the high-achieving schools had a positive attitude towards science. In eleven countries, significantly greater percentages of students in the high-achieving schools reported a positive attitude towards science. The largest differences were found in Belgium (Flemish) and Ireland, where the differences were 20 and 21 percentage points, respectively.

Student Attitudes towards Mathematics

An index of student attitude towards mathematics was constructed by averaging student responses to five questions: (a) I like mathematics, (b) I enjoy mathematics, (c) mathematics is boring, (d) mathematics is important to everyone's life, and (e) I would like a job that involves using mathematics. In general, there was little difference in student attitude between the low-achieving schools and high-achieving schools, with on average about 70% of the students in each group reporting a positive attitude towards mathematics (see Exhibit 1.32). In five countries, Australia, Belgium (Flemish), Hong Kong, Singapore, and Sweden, significantly greater percentages of students in the high-achieving schools reported having a positive attitude towards mathematics.

Student Belief in the Efficacy of Science

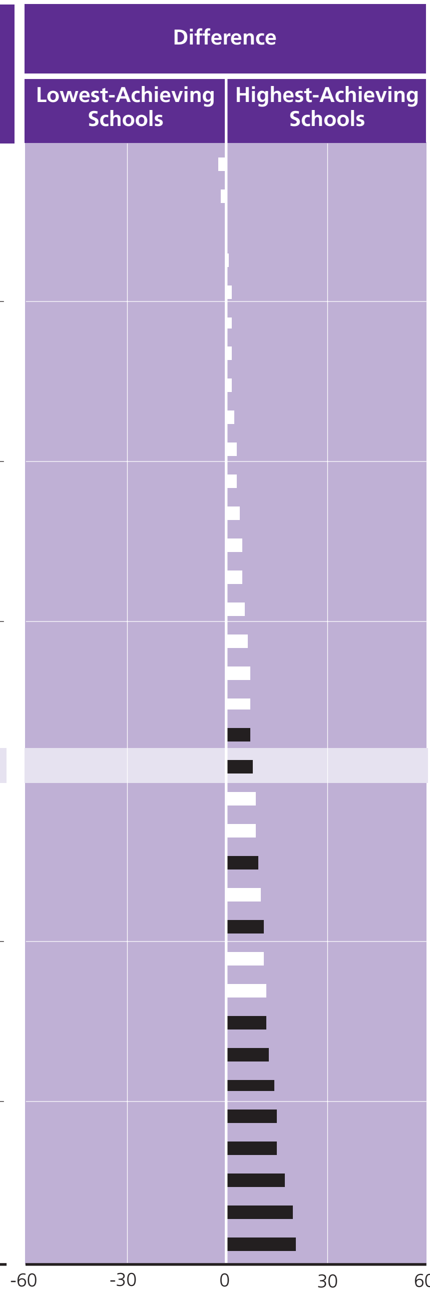
As a further measure of their attitude towards science, TIMSS constructed an index of students' belief in the efficacy of science. The index was based on students' reported beliefs that science could make a contribution to the solution of each of the following problems: air pollution, water pollution, destruction of forests, endangered species, damage to ozone layer, and problems with nuclear power plants.

The percentages of students in the high- and low-achieving schools that reported a belief in the efficacy of science are presented in Exhibit 1.33. On average across countries, greater percentages of students in the high-achieving schools indicated that they thought that science could help solve the world's environmental problems. In ten countries, including Australia, the Czech Republic, Hungary, Iran, New Zealand, Romania, Singapore, the Slovak Republic, Spain, and the United States, students in the high-achieving schools reported greater belief in the efficacy of science. The highest level of belief was expressed by students in the high-achieving schools in the United States (77%), while the lowest level was expressed by students in the low-achieving schools in Iran.

Exhibit 1.31

Percent of Students Having a Positive Attitude Towards Science[1]
Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Slovenia	70 (2.6)	68 (1.9)	-2 (3.2)
Hungary	79 (2.1)	77 (2.0)	-2 (2.9)
Latvia (LSS)	82 (2.1)	82 (2.0)	0 (2.9)
Lithuania	81 (2.2)	82 (2.0)	1 (3.0)
Czech Republic	76 (3.3)	78 (1.9)	1 (3.8)
Slovak Republic	83 (1.8)	84 (1.3)	1 (2.2)
Russian Federation	84 (1.3)	86 (1.3)	2 (1.8)
Netherlands	77 (2.9)	79 (2.3)	2 (3.7)
Iran, Islamic Rep.	69 (2.3)	72 (2.3)	3 (3.3)
Canada	51 (3.7)	53 (1.6)	3 (4.0)
Switzerland	48 (2.6)	51 (2.8)	3 (3.8)
Germany	60 (2.4)	64 (2.3)	4 (3.4)
United States	50 (2.4)	54 (2.8)	5 (3.6)
Romania	84 (1.6)	89 (1.3)	5 (2.0)
Portugal	82 (1.7)	88 (1.3)	6 (2.1)
England	67 (2.4)	74 (2.6)	6 (3.5)
Korea	30 (1.7)	37 (2.7)	7 (3.2)
Austria	41 (2.8)	49 (2.5)	7 (3.7)
Sweden	73 (1.5)	80 (1.8)	8 (2.3)
International Avg.	61 (0.5)	69 (0.4)	8 (0.6)
Cyprus	50 (2.1)	59 (2.2)	9 (3.0)
France	66 (3.8)	76 (2.2)	9 (4.4)
Colombia	r 69 (1.9)	79 (2.0)	9 (2.7)
Spain	49 (2.7)	59 (2.5)	10 (3.7)
Singapore	74 (2.6)	85 (1.5)	11 (3.0)
New Zealand	45 (3.1)	56 (2.2)	11 (3.9)
Iceland	60 (4.7)	71 (2.7)	12 (5.4)
Australia	38 (2.0)	50 (2.2)	12 (3.0)
Belgium (Fr)	55 (2.4)	68 (2.3)	13 (3.3)
Japan	35 (2.0)	49 (2.5)	14 (3.2)
Scotland	61 (2.6)	76 (2.4)	15 (3.5)
Norway	47 (2.2)	63 (2.6)	15 (3.4)
Hong Kong	45 (3.0)	63 (2.6)	17 (3.9)
Belgium (Fl)	56 (4.6)	76 (2.2)	20 (5.1)
Ireland	44 (3.0)	65 (2.7)	21 (4.1)



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

■ Difference **statistically** significant
□ Difference **not statistically** significant
Significance tests adjusted for multiple comparisons

1 Index of attitude towards science is based on 14 statements in 3 subindices: 1) I like science (4 statements for 4 science areas); 2) I enjoy learning science (5 statements for 5 science subjects); 3) Science is boring (reversed scale of 5 statements for 5 science subjects). Then the mean of the 3 subindices is calculated to obtain the measure of positive attitude.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

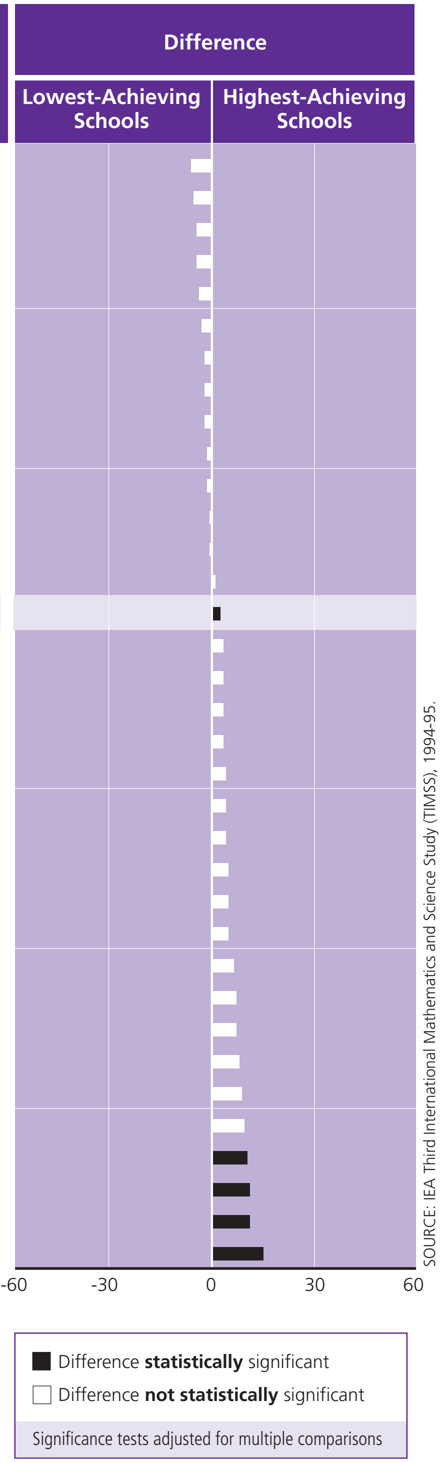
( ) Standard errors appear in parentheses. Because results are rounded to the nearest whole number, some differences may appear inconsistent.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

An "r" indicates response data available for 70-84% of students.

Exhibit 1.32 Percent of Students Having a Positive Attitude Towards Mathematics[1]
Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Lithuania	64 (3.0)	58 (1.8)	-6 (3.5)
Austria	59 (1.8)	54 (2.2)	-5 (2.8)
Slovenia	68 (2.3)	63 (2.3)	-5 (2.9)
Canada	75 (1.9)	70 (1.5)	-4 (2.4)
Switzerland	71 (1.9)	67 (2.4)	-4 (3.1)
Germany	59 (2.3)	56 (2.1)	-3 (3.1)
Czech Republic	60 (2.7)	58 (2.4)	-2 (3.6)
Colombia	89 (1.4)	87 (2.5)	-2 (2.8)
Spain	65 (2.3)	64 (1.9)	-2 (3.0)
England	83 (1.8)	82 (1.9)	-1 (2.7)
New Zealand	77 (1.8)	77 (1.4)	-1 (2.5)
Latvia (LSS)	70 (2.3)	70 (1.9)	-1 (3.0)
Hungary	60 (2.4)	60 (1.8)	-1 (3.0)
Belgium (Fr)	70 (2.8)	71 (2.1)	2 (3.5)
International Avg.	67 (0.4)	70 (0.3)	3 (0.5)
Norway	67 (1.4)	70 (1.7)	3 (2.1)
Japan	50 (2.1)	53 (1.7)	3 (2.5)
Scotland	74 (2.5)	78 (2.1)	4 (3.2)
Iceland	72 (2.2)	76 (2.5)	4 (3.5)
Ireland	70 (2.4)	74 (2.2)	4 (3.4)
United States	68 (1.6)	73 (1.4)	4 (2.1)
Korea	48 (2.2)	52 (1.5)	4 (2.6)
Iran, Islamic Rep.	80 (2.4)	85 (1.5)	5 (3.0)
Netherlands	55 (4.3)	60 (3.5)	5 (5.5)
Romania	74 (2.5)	79 (2.0)	5 (3.4)
France	65 (2.7)	73 (2.2)	7 (3.4)
Cyprus	76 (2.6)	84 (1.2)	7 (2.9)
Slovak Republic	65 (1.8)	73 (1.7)	8 (2.5)
Russian Federation	71 (2.5)	79 (1.9)	9 (3.3)
Portugal	70 (2.3)	79 (1.9)	9 (3.0)
Singapore	77 (1.8)	87 (1.1)	10 (2.0)
Australia	58 (1.6)	68 (1.5)	10 (2.3)
Hong Kong	60 (2.7)	72 (1.8)	12 (3.2)
Sweden	58 (2.2)	70 (1.7)	12 (2.9)
Belgium (Fl)	56 (2.2)	71 (1.6)	15 (2.8)



[1] Index of attitude towards mathematics is based on the average of five questions: 1) I like mathematics; 2) I enjoy learning mathematics; 3) Mathematics is boring; 4) Mathematics is important to everyone's life; 5) I would like a job that involved using mathematics.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

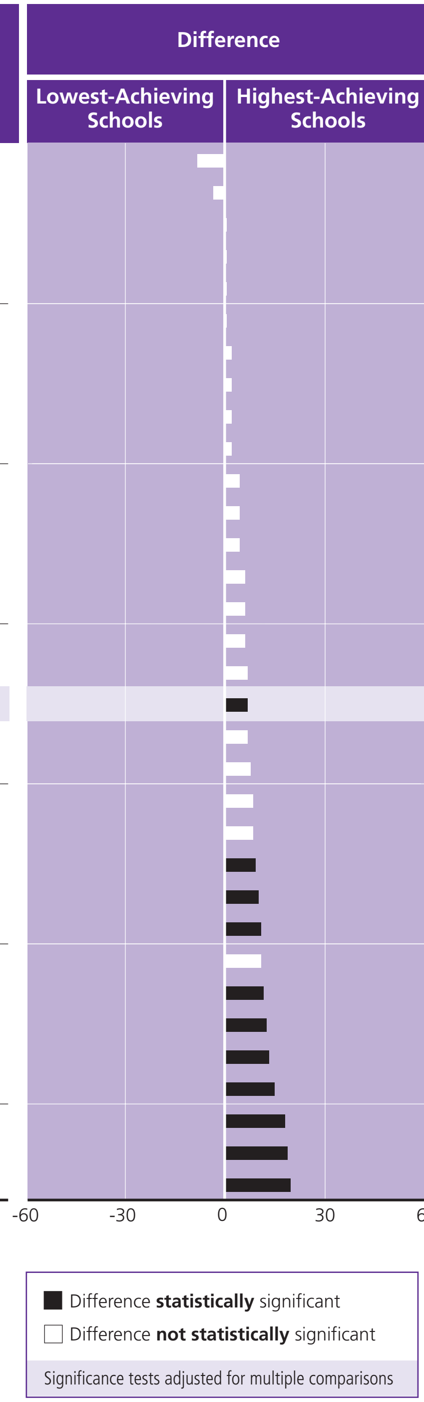
Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

Exhibit 1.33

Percent of Students Believing in the Efficacy of Science[1]

Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Netherlands	39 (3.3)	31 (2.1)	-8 (3.9)
Austria	51 (2.5)	48 (1.8)	-3 (3.1)
Lithuania	46 (2.8)	47 (2.1)	1 (3.6)
Japan	38 (1.7)	39 (1.5)	1 (2.3)
France	36 (2.1)	37 (1.8)	1 (2.8)
Switzerland	46 (1.7)	47 (1.7)	1 (2.4)
Hong Kong	54 (1.6)	56 (1.5)	2 (2.2)
Korea	45 (1.4)	48 (1.5)	3 (2.0)
Canada	57 (1.7)	59 (1.1)	3 (2.0)
Latvia (LSS)	46 (2.0)	49 (2.0)	3 (2.9)
Slovenia	40 (1.9)	45 (1.9)	4 (2.7)
Belgium (Fr)	33 (1.7)	37 (1.7)	5 (2.4)
Germany	43 (2.3)	47 (1.9)	5 (3.0)
Ireland	42 (1.8)	48 (1.9)	6 (2.6)
Russian Federation	42 (1.9)	49 (1.9)	6 (2.7)
Cyprus	27 (1.7)	34 (1.9)	7 (2.6)
Portugal	59 (1.5)	66 (1.8)	7 (2.3)
International Avg.	44 (0.4)	51 (0.3)	7 (0.5)
Sweden	47 (2.0)	54 (1.6)	8 (2.5)
Norway	53 (2.1)	61 (1.6)	8 (2.6)
Iceland	46 (4.1)	55 (1.7)	9 (4.4)
Belgium (Fl)	29 (3.2)	38 (1.6)	9 (3.6)
Hungary	32 (2.0)	41 (2.0)	10 (2.8)
Spain	54 (1.5)	65 (1.6)	10 (2.2)
New Zealand	47 (2.1)	58 (1.7)	11 (2.7)
Colombia	r 47 (3.2)	59 (2.9)	11 (4.3)
Slovak Republic	51 (2.2)	62 (1.9)	12 (2.9)
Iran, Islamic Rep.	26 (1.4)	39 (2.5)	13 (2.9)
Czech Republic	38 (2.1)	52 (2.4)	14 (3.2)
Australia	45 (1.4)	61 (1.4)	15 (2.0)
Romania	31 (3.0)	50 (4.1)	18 (5.1)
Singapore	51 (1.9)	70 (1.5)	19 (2.5)
United States	57 (1.3)	77 (1.1)	20 (1.7)



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

1 Index is based on percent of students responding that Science can help "Somewhat" or "A great deal" in addressing all six of the following environmental problems: 1) air pollution; 2) water pollution; 3) destruction of forests; 4) endangered species; 5) damage to the ozone layer; 6) problems from nuclear power plants.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

England and Scotland: Question not administered or data not internationally comparable.

An "r" indicates response data available for 70-84% of students.

Instructional Activities in Science and Mathematics Class

Of the many instructional activities in mathematics and science that TIMSS asked about, the two most strongly related to student achievement were the reported frequency of doing experiments or practical investigations in science class, and the frequency with which mathematics teachers checked homework in class.

Students Doing Science Experiments

Although large classes and scarcity of resources can limit what can be implemented, many science educators today stress the desirability of teaching science as a discovery activity, with great emphasis on students carrying out experiments and practical investigations. Exhibit 1.34 presents the percentages of students in high- and low-achieving schools in each country that reported doing such activities often in science class. It is clear from this exhibit that although there are countries where many "hands-on" activities take place – for example England, Scotland, and Sweden, where more than 80% of students in both groups of schools reported doing experiments often – in many countries practical work in science class is relatively rare. In Austria, Belgium (French), Hungary, Iran, Korea, and Spain, less than 40% of students in either group of schools reported conducting practical work often in science class. These differences suggest that the way science is taught in the classroom varies considerably around the world. Apart from the two extremes noted above – countries where everybody does a lot of practical work in science classes and countries were nobody does a lot – there were countries such as Australia, France, Hong Kong, Netherlands, New Zealand, Scotland, and Singapore, where doing experiments or practical work often was more frequently reported by students in the high-achieving schools.

Teacher Frequently Checks Mathematics Homework in Class

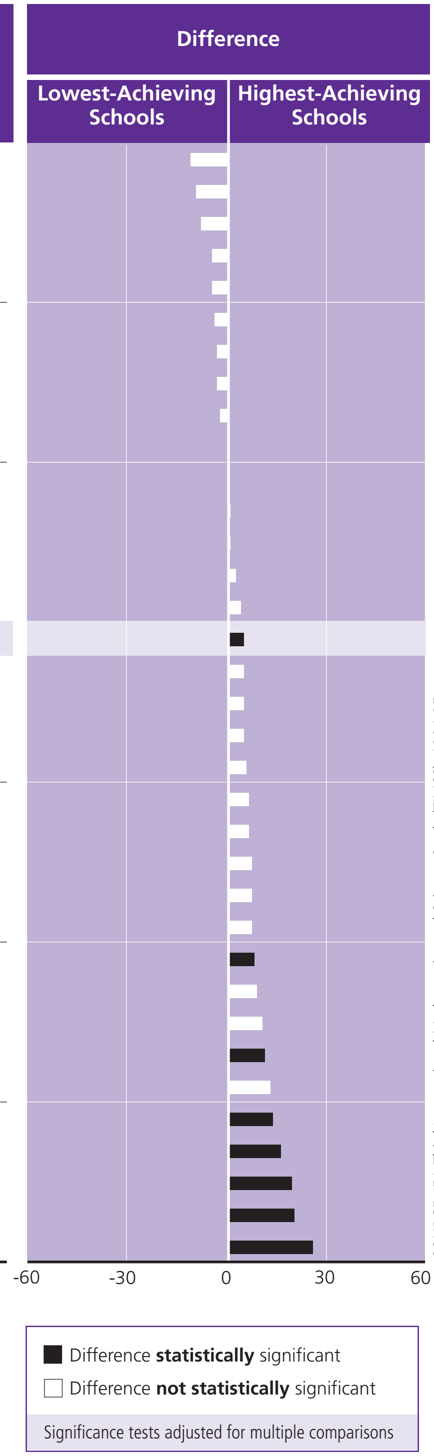
The practice of giving homework and subsequently checking it in class was reported to be widespread. In eight countries, Austria, Belgium (Flemish), the Czech Republic, England, Ireland, Latvia(LSS), Scotland and Singapore, more than 80% of students in both high- and low-achieving schools reported that the teacher always or almost always checks homework in mathematics class. Only in Japan and Korea, two of the countries with the highest average achievement, did less than half of the students in both groups of schools report that the mathematics teacher usually checks homework. In several countries, including the Netherlands, Australia, Switzerland, and the United States, the practice of checking homework in mathematics class was more frequently reported by students of low-achieving schools (see Exhibit 1.35).

Exhibit 1.34

Percent of Students Frequently Doing Experiments or Practical Investigations in Class[1]

Schools with the Lowest and Highest Achievement – Eighth Grade* – Science

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Lithuania	52 (3.3)	42 (2.9)	-10 (4.4)
Iran, Islamic Rep.	39 (2.5)	29 (2.8)	-9 (3.7)
Cyprus	41 (1.8)	34 (1.7)	-8 (2.5)
Colombia	r 50 (3.3)	46 (3.9)	-4 (5.1)
Austria	30 (2.6)	26 (3.3)	-4 (4.2)
Spain	25 (2.9)	21 (2.3)	-4 (3.7)
Romania	75 (2.6)	72 (3.3)	-3 (4.2)
Hungary	36 (2.8)	34 (3.0)	-2 (4.1)
Belgium (Fl)	58 (2.8)	57 (4.1)	-2 (5.0)
Iceland	67 (3.5)	67 (8.2)	0 (8.9)
Germany	55 (2.8)	55 (3.6)	0 (4.5)
Belgium (Fr)	38 (2.6)	39 (3.7)	1 (4.5)
Slovak Republic	46 (2.0)	47 (2.7)	1 (3.3)
Slovenia	44 (2.8)	47 (3.5)	3 (4.5)
England	89 (1.4)	94 (1.1)	4 (1.8)
International Avg.	56 (0.5)	61 (0.5)	5 (0.8)
Korea	32 (3.4)	37 (2.5)	5 (4.2)
Norway	63 (4.0)	68 (3.7)	5 (5.5)
Czech Republic	48 (3.3)	53 (3.6)	5 (4.8)
Sweden	88 (1.9)	94 (0.9)	6 (2.1)
Russian Federation	57 (2.1)	63 (2.4)	6 (3.2)
Latvia (LSS)	65 (3.7)	72 (2.6)	7 (4.5)
Portugal	40 (2.8)	47 (2.4)	7 (3.7)
United States	59 (2.3)	66 (3.1)	7 (3.9)
Japan	72 (3.6)	80 (1.7)	8 (4.0)
Scotland	82 (1.7)	90 (1.2)	8 (2.0)
Ireland	r 55 (4.3)	64 (4.9)	9 (6.6)
Canada	62 (4.7)	72 (2.4)	10 (5.2)
Singapore	77 (2.7)	89 (1.3)	12 (3.0)
Switzerland	r 31 (3.0)	44 (3.4)	13 (4.5)
Australia	70 (2.9)	84 (1.7)	14 (3.3)
New Zealand	72 (2.2)	88 (2.1)	16 (3.0)
France	66 (4.3)	86 (2.1)	20 (4.7)
Hong Kong	74 (3.4)	94 (1.1)	20 (3.5)
Netherlands	41 (4.2)	66 (4.0)	26 (5.8)



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

[1] Index is based on the percentage of students who report that thay "Almost always" or "Pretty often" do experiments or practical investigations in at least one of the following 5 science lessons: 1) science (integrated) lessons; 2) biology lessons; 3) chemistry lessons; 4) earth science lessions; 5) physics lessons.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

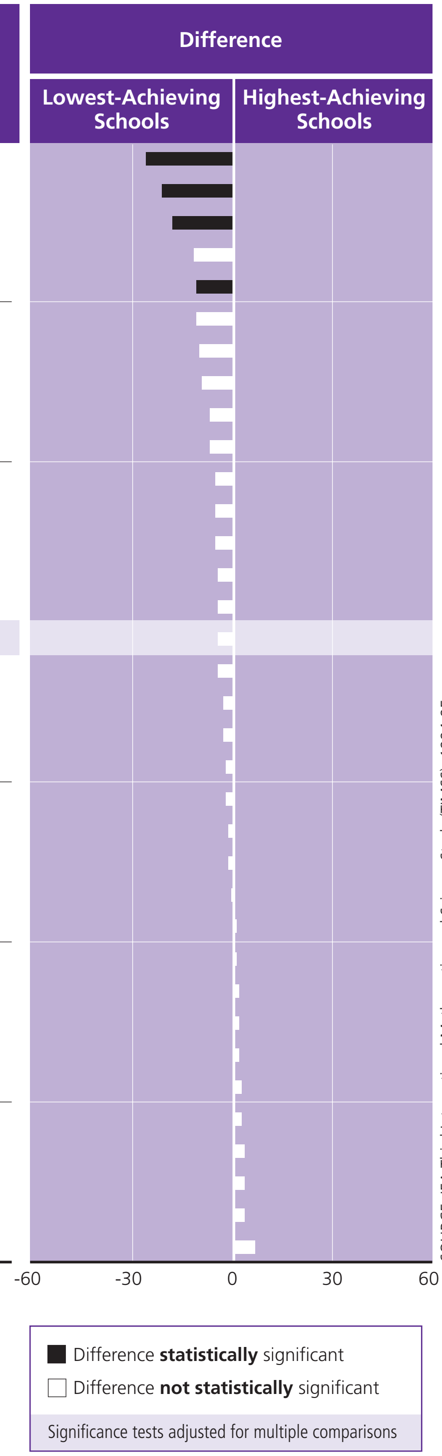
An "r" indicates response data available for 70-84% of students.

Exhibit 1.35

Percent of Students in Mathematics Classrooms Where the Teacher Frequently Checks Homework During Lessons[1]

Schools with the Lowest and Highest Achievement – Eighth Grade* – Mathematics

Country	Lowest-Achieving Third of Schools	Highest-Achieving Third of Schools	Difference Between Highest and Lowest Schools
Netherlands	52 (5.0)	26 (4.3)	-26 (6.6)
Australia	57 (2.8)	36 (2.8)	-21 (3.5)
Switzerland	73 (3.3)	55 (2.8)	-18 (4.3)
Germany	73 (2.4)	62 (3.2)	-12 (4.2)
United States	82 (1.4)	72 (3.1)	-11 (2.9)
Spain	68 (3.1)	57 (3.6)	-11 (4.9)
Slovak Republic	66 (3.5)	56 (5.0)	-10 (6.1)
Austria	93 (1.3)	84 (3.5)	-9 (3.7)
Norway	69 (3.4)	62 (4.1)	-7 (5.1)
Japan	42 (4.9)	35 (3.0)	-7 (5.6)
Iceland	59 (4.6)	54 (7.4)	-5 (8.8)
Colombia	r 75 (3.5)	70 (3.2)	-5 (4.6)
Lithuania	62 (3.8)	57 (4.0)	-5 (5.3)
Romania	62 (3.1)	58 (3.3)	-4 (4.5)
Latvia (LSS)	94 (1.3)	90 (1.6)	-4 (1.9)
International Avg.	71 (0.6)	67 (0.6)	-4 (0.8)
Czech Republic	88 (2.5)	84 (4.6)	-4 (5.3)
Scotland	84 (2.7)	81 (3.8)	-3 (4.6)
Hungary	70 (2.8)	68 (3.2)	-2 (4.0)
Russian Federation	74 (2.9)	73 (3.8)	-2 (4.9)
Sweden	74 (3.1)	72 (4.2)	-2 (4.9)
Cyprus	74 (2.6)	72 (3.1)	-1 (4.0)
Ireland	84 (3.0)	83 (2.2)	-1 (3.7)
France	57 (3.6)	57 (3.9)	-1 (5.5)
Korea	44 (3.3)	45 (3.8)	1 (4.9)
Slovenia	58 (4.5)	59 (4.1)	1 (5.8)
England	85 (2.0)	86 (2.2)	2 (3.0)
Hong Kong	72 (3.8)	74 (3.3)	2 (5.0)
Portugal	73 (3.0)	75 (3.1)	2 (4.4)
Iran, Islamic Rep.	72 (3.3)	75 (3.4)	3 (4.7)
Canada	60 (3.6)	63 (2.4)	3 (4.7)
New Zealand	72 (2.6)	76 (3.8)	4 (4.7)
Singapore	91 (1.7)	94 (0.7)	4 (1.8)
Belgium (Fl)	84 (2.9)	88 (2.6)	4 (3.9)
Belgium (Fr)	61 (4.0)	67 (3.0)	7 (5.0)



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

1 Percent of students reporting that the teacher "Always" or "Almost always" checks homework in class.

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom sampling procedures (see Exhibit A.1). Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

An "r" indicates response data available for 70-84% of students.

Summary

The contrast between the highest- and lowest-achieving schools in science and mathematics in each country points to a number of factors that distinguish between the two groups of schools. Most prominent of these, and most consistent across countries, were the home background indicators of socioeconomic status and of parental support for academic achievement. In almost all countries, students in the high-achieving schools had higher levels of book ownership, study aids, possessions in the home, and parental education, and spent less time working in the home. Another distinguishing factor related to the home was student aspirations for higher education. In most countries, plans to attend university after secondary school were much more frequently reported by students in the high-achieving schools. In this regard, the TIMSS results support earlier studies that found a close relationship between the composition of the student body and student achievement.

Unlike student background, factors more directly related to the school were less uniformly effective in distinguishing between the high- and low-achieving schools. Although school size and location, school social climate, students' attitude to science and mathematics, and instructional activities in science and mathematics class did discriminate between the high- and low-achieving schools in various countries, few school variables worked consistently across all countries. This indicates that analyses of characteristics of effective schools are likely to involve different variables in different countries, or groups of countries, rather than common variables that operate in the same way across all countries.

The next chapter in this report provides a start to the examination of characteristics of effective schools in the TIMSS data. For the countries with large differences between the average achievement levels of their schools, a series of analyses were conducted that explored the influence of a range of school, teacher, class, and student variables on student achievement in science and mathematics, while controlling statistically for differences between schools in student home background.

2

Factors Associated with School Effectiveness in Science and Mathematics

Overview

The analyses presented in the previous chapter confirm that student home background indicators of socioeconomic status and of parental support for academic work are major correlates of average school achievement in mathematics and science, and reinforce the need to account for such variables in any study of how school factors relate to that achievement. In this chapter, hierarchical linear modeling (HLM) techniques are used to adjust statistically for differences between schools in home background, so as to examine the relationship between a range of school factors and the adjusted average school achievement. This approach has the potential to disentangle, at least in an exploratory way, the relative influence of home and school factors.

What Was the Analytic Approach?

The hierarchical analyses for this chapter were conducted in two stages. In the first stage the analyses quantified across countries the extent to which schools differ in the average achievement of their students, and the extent to which these differences may be due to the home background of the student body. This information provides an overview of the global relationship between home background, schooling, and student achievement, and was helpful in identifying the countries that would be most fruitful for further study. This information also shows the extent to which schools internationally are segregated by home background factors, by describing how much they vary in the home background composition of the student body. The second, more detailed, analyses explored the relationship of student, teacher, and school factors to average school achievement, while adjusting for characteristics of the students' home background. This stage involved constructing seven hierarchical models for both science and mathematics in each of the countries included in the analyses.

The analyses reported in this chapter required a valid measure of the socioeconomic and educational background of the students. To that end, a single composite index of home background was created from variables considered to relate to this construct, and found to relate to each other and to student achievement. The home background index was based upon students' reports on the following:

- number of books in the home
- availability of a study desk
- presence of a computer in the home
- education of each natural parent

- number of natural parents in the home
- number of persons in the family home
- possessions in the home

The home background index was used to make a statistical adjustment to each school's average achievement in science and mathematics to control for differences in student home background. School-level factors were then examined as predictors of adjusted school achievement. Also, the school average home background was used as an important school-level predictor of average school achievement.

How Much Does Achievement Vary Between Schools Across Countries?

As was shown in chapter 1, the extent to which schools in a country differ among themselves in their average achievement limits the potential for school factors to explain between-school differences in student achievement. It is more likely that attributes of the school that co-vary with student achievement will be identified in countries where average school achievement varies a lot than in countries where it varies very little. In short, exploratory studies of school effectiveness are likely to be most fruitful when concentrated on countries with large between-school achievement differences.

Exhibits 2.1 and 2.2 show how the difference between students' achievement scores (the "variance") can be divided into differences between schools and differences between students within schools. The first column of the exhibits presents the variance between schools as a percentage of the total variance in achievement in each country for science and mathematics, respectively. A high percentage implies that the differences between average school scores are large compared with the differences between student scores within schools. This might be expected, for example, in a country with a well-established system of school tracking, with different school types catering to students of different levels of ability. A low percentage for a country implies that average school achievement is very similar from school to school.

The results presented in Exhibits 2.1 and 2.2 support the finding from the previous chapter that countries are not the same in the way that student achievement is distributed across schools. In countries such as Cyprus, Iceland, Japan, Korea, Norway, and Slovenia, average student achievement in science was fairly uniform across schools, with less than 10% of the total variance in student science achievement attributable to differences between school average scores. In contrast, large differences between schools (40% or more of the total variance) were found in Germany, Romania, Singapore, and the United States. In mathematics, the differences between schools were much more pronounced, with just three countries (Cyprus, Japan, and Korea) showing less than 10% of the variance between schools. Many more countries had large differences between schools, with 13 countries – including Australia, Belgium (both French and Flemish), Germany, Hong Kong, Ireland, Lithuania, the Netherlands, New Zealand, Romania, the Russian Federation, Switzerland, and the United States (Exhibit 2.2) – having at least 40% of variance between schools.

In all but two of the participating countries, the differences between schools were greater in mathematics than in science. This probably reflects a real difference between the two subjects, but it is undoubtedly also partly an artifact of the TIMSS sampling design, which was based on sampling a single intact mathematics class.[1] Since in most countries, each school is represented by a single mathematics class, the between-school differences presented in Exhibits 2.1 and 2.2 also include differences between classes within schools. In countries such as Ireland and Singapore that employ some form of streaming, the figures in the exhibits will overestimate the differences between schools.

The second column in Exhibits 2.1 and 2.2 shows the result of taking the percentage of variance that is between schools (column 1) and partitioning it to show what percentage of it can be attributed to differences between schools with respect to the home background of the students. It is clear from these results that home background is a major correlate of average school achievement in most countries, although, of course, the impact is greater in countries with large between-school differences in achievement. For example, although 88% of the between-school variance in mathematics achievement in Korea was attributable to home background differences, only 9% of the total variance was between schools, so this is not a large effect. However, in Belgium (French), Cyprus, England, Germany, Hungary, Ireland, Korea, the Netherlands, New Zealand, Portugal, Scotland, Singapore and the United States more than half of the difference between schools in both science and mathematics achievement could be attributed to differences in the home background of their students.

[1] In Australia, Cyprus, Sweden, and the United States, two mathematics classes were sampled from each participating school. So that the data from these countries could be treated as much as possible like those from other countries, each class was treated as if it came from a separate school.

Exhibit 2.1 Partitioning the School Variance in Eighth Grade* Science Achievement

Country	Percent of Variance in Science Achievement that is Between Schools	Percent of Between-School Variance Attributable to Home Background Index**
Australia	22	47
Austria	30	40
Belgium (Fl)	18	48
Belgium (Fr)	20	71
Canada	18	27
Colombia	27	58
Cyprus	7	79
Czech Republic	13	32
England	21	58
France	19	37
Germany	41	50
Hong Kong	29	47
Hungary	17	70
Iceland	9	13
Iran	14	20
Ireland	38	52
Japan	7	–
Korea	7	73
Latvia (LSS)	16	11
Lithuania	35	23
Netherlands	39	54
New Zealand	35	57
Norway	7	27
Portugal	14	56
Romania	51	18
Russian Federation	31	23
Scotland	25	67
Singapore	40	62
Slovak Republic	19	29
Slovenia	7	28
Spain	11	50
Sweden	10	54
Switzerland	38	48
United States	40	64

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

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

** Home Background Index: Average of the following nationally standardized variables: number of people in family home, number of natural parents in home, number of books in home, percentage of possessions from international options list, study desk in home, computer in home, highest level of education of mother and highest level of education of father.

Japan: Questions not administered. England and Scotland: Restricted number of variables in Home Background Index.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom see Exhibit A.1. Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

Exhibit 2.2 Partitioning the School Variance in Eighth Grade* Mathematics Achievement

Country	Percent of Variance in Science Achievement that is Between Schools	Percent of Between-School Variance Attributable to Home Background Index**
Australia	49	46
Austria	36	46
Belgium (Fl)	60	46
Belgium (Fr)	52	70
Canada	25	9
Colombia	39	48
Cyprus	8	74
Czech Republic	22	29
England	24	55
France	33	31
Germany	51	53
Hong Kong	48	46
Hungary	23	67
Iceland	10	14
Iran	16	20
Ireland	50	51
Japan	7	–
Korea	9	88
Latvia (LSS)	27	27
Lithuania	43	29
Netherlands	60	55
New Zealand	46	54
Norway	10	29
Portugal	19	52
Romania	55	24
Russian Federation	40	34
Scotland	36	53
Singapore	39	56
Slovak Republic	23	36
Slovenia	11	34
Spain	19	37
Sweden	34	45
Switzerland	58	43
United States	64	61

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

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

** Home Background Index: Average of the following nationally standardized variables: number of people in family home, number of natural parents in home, number of books in home, percentage of possessions from international options list, study desk in home, computer in home, highest level of education of mother and highest level of education of father.

Japan: Questions not administered. England and Scotland: Restricted number of variables in Home Background Index.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom see Exhibit A.1. Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

How Much Does Home Background Vary Across Schools?

Implicit in the foregoing presentation is the idea that schools differ in the home backgrounds of their students. Exhibit 2.3 quantifies these differences in terms of the percentage of variance in student home background that can be attributed to differences between schools in each of the participating countries. In countries with low percentages, schools are fairly similar to each other in the aggregate home background characteristics of their students, but there may be quite a range within a school. In countries with high percentages in this exhibit, schools tend to vary greatly in the home backgrounds of their students.

The difference between schools in student home background was roughly similar to that in science achievement (Exhibit 2.1) in more than half of the countries. However, in five countries, Germany, Ireland, the Netherlands, Singapore, and Switzerland, the differences in science achievement were considerably larger (at least 10 percentage points) than the differences in student home background. It may be significant that all of these countries make differential provision for students of different ability levels through some form of tracking or streaming. Apparently, this has the effect of separating schools or classes by achievement much more than would occur on the basis of student home background alone. In contrast, there was also a range of countries, including Colombia, Hungary, Iran, Korea, Latvia(LSS), Portugal, Romania, Slovenia, and Spain, where the differences between schools in science achievement were much less than in student home background. In these countries, schooling (or at least science education) may have the effect of mitigating the influence of home background on achievement.

Exhibit 2.3 Partitioning the School Variance in Home Background* at Eighth Grade**

Country	Percent of Variance in Home Background Index that is Between Schools
Australia	21
Austria	24
Belgium (Fl)	14
Belgium (Fr)	23
Canada	23
Colombia	44
Cyprus	16
Czech Republic	17
England	18
France	21
Germany	21
Hong Kong	22
Hungary	33
Iceland	6
Iran	30
Ireland	27
Korea	30
Latvia (LSS)	26
Lithuania	32
Netherlands	20
New Zealand	30
Norway	12
Portugal	36
Romania	73
Russian Federation	29
Scotland	18
Singapore	24
Slovak Republic	24
Slovenia	17
Spain	30
Sweden	12
Switzerland	28
United States	42

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

* Home Background Index: Average of the following nationally standardized variables: number of people in family home, number of natural parents in home, number of books in home, percentage of possessions from international options list, study desk in home, computer in home, highest level of education of mother and highest level of education of father.

** Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

England: Mathematics classrooms not directly sampled, mathematics results presented are at the school level; England and Scotland: Restricted number of variables in Home Background Index.

Countries shown in italics did not satisfy one or more guidelines for sample participation rates, age/grade specifications, or classroom see Exhibit A.1. Because coverage falls below 65%, Latvia is annoted LSS for Latvian Speaking Schools only.

How Were the Analyses Organized?

The selection of explanatory variables for the more detailed study of school effectiveness was based primarily on the results of the previous chapter. That is, the variables that were found to discriminate between high- and low-achieving schools were the main focus of interest. However, because the statistical technique used in this chapter is more refined, it was expected that some variables that did not discriminate greatly between the two school types might still play a role in a multi-variable approach. Consequently, a second review was conducted of the variables in the TIMSS database, and a number of variables were added to the list of potential explanatory variables, primarily teacher characteristics and aspects of classroom instruction. The explanatory variables were grouped into the following categories: classroom practices, teacher characteristics, school climate, school location and size, and home-school interface.

The results of the previous chapter, and the between-school analyses at the beginning of this chapter, confirm that home background and schooling are related both to each other and to student achievement. These relationships are impossible to disentangle with survey data such as TIMSS', but it is possible to organize the analysis of data so that the effect of school organizational and instructional variables may be seen both independently of and in conjunction with the school's general level of student home advantage. This approach lessens the temptation to conclude that differences between schools in organizational and instructional variables are "nothing but" differences in student home background.

To guide the analysis, and to keep the primary focus on classroom instruction and other school factors, the following questions were posed, separately for science and for mathematics:

1. Once average achievement in the school has been adjusted for the effects of students' home background, what classroom practices are associated with science and mathematics achievement?

2. Do teacher characteristics relate to the adjusted school science and mathematics achievement when examined alongside classroom practices?

3. What is the relationship of school social climate factors to the adjusted science and mathematics achievement when classroom practices and teacher experience are also considered?

4. Does school location and size relate to adjusted school achievement when considered in conjunction with classroom activities, teacher characteristics, and school social climate?

5. What is the relationship of factors representing student attitude or motivation (mother's press, self press, and students' aspirations) to adjusted school achievement when the other four categories of school-related factors are considered at the same time?

6. Is the average home background of the students in a school related to adjusted school achievement when considered in conjunction with all five categories of variables above?

7. Is adjusted school achievement more strongly related to the combination of average home background and the five categories of variables than average home background alone?

Answering these questions involved building six hierarchical linear models for each country for science and mathematics achievement. The first model examined the relationship of classroom characteristics to school achievement after considering the home background of students. Each successive model added another set of explanatory factors to the previous model. Together, these models provided an analysis of the effects of the various categories of school and classroom variables on school achievement while adjusting for student home background.[2] The relationship of the average home background to science and mathematics achievement was also considered independently of the other exploratory factors for comparative purposes.

The results of these analyses are summarized in Exhibits 2.4 and 2.5 for science and mathematics respectively. The first column in each exhibit shows the percentages of the total variance in student achievement in each country that can be attributed to differences between schools.[3] Since the percentages in the first column include all of the variance in student achievement that exists between schools, they represent the upper limit on the amount of between-school variance that can be accounted for by school or classroom variables. The remaining columns of Exhibits 2.4 and 2.5 display the percentage of the between-school variance that may be explained by the variables in each model. It is important to realize that the percentages in columns 2 to 7 take as their base the percentage shown in the first column. For example, in Exhibit 2.4, the 74% shown for Australia in column two refers to 74% of the between-school variance for Australia, which is itself just 23% of the total student variance. Therefore, although school-to-school differences in "Model 1: Classroom Characteristics" can account for 74% of the total school-to-school differences in student science achievement, this represents just 17% (23% of 74%) of the total student-to-student differences in science achievement.

2 See Appendix A for a description of the hierarchical analysis.

3 The percentages in the first columns of Exhibits 2.4 and 2.5 should ideally be identical to those in the first columns of Exhibits 2.1 and 2.2, respectively. However, since data records with incomplete data were eliminated from the analyses for Exhibits 2.4 and 2.5, the analyses were based on somewhat different datasets, with differences in the percentages as a result. See Appendix A for further information.

Further summaries of the results are presented in Exhibits 2.6 through 2.9. Exhibits 2.6 and 2.7 list the explanatory variables for science and mathematics, respectively, and enumerate the countries in which the variables played a statistically significant[4] role in each of the hierarchical models. These exhibits provide one view of the relative importance of each variable in each model. Exhibits 2.8 and 2.9 give another view by showing, for each country, the variables that were significant predictors of adjusted school achievement in science and mathematics in a model that included all of the explanatory variables (except school average home background). Exhibits displaying more detailed information for each country can be found for science in Appendix B and for mathematics in Appendix C.

Criteria for Inclusion in the Analyses

Although the TIMSS database contains a large array of information from students, teachers, and school principals, not every country asked all questions in the questionnaires, and not every respondent provided data on all questions that were asked. In choosing the factors to be examined in the hierarchical analyses the need to include the factors most relevant to achievement therefore had to be balanced with the availability of data in each of the countries. As the home background index was an essential component of the analyses, only countries that asked the questions used to build this index could be included. Similarly, only countries that asked questions of their teachers or principals that were central to the analyses, and had sufficiently high response rates for these questions, could be included.

Furthermore, since the purpose of the hierarchical analyses was to examine factors related to average school achievement in science and mathematics, attention focused on countries where school-to-school differences in achievement were large (at least 10%), and where the effects of such factors were likely to be most apparent. A third criterion for inclusion in the analyses was that countries had met the TIMSS standards for data quality and have relatively high achievement levels. Such countries should provide the best opportunity to examine factors associated with high student achievement. Countries with average achievement close to or above the international mean in either science or mathematics were included in the analyses.

Based on these criteria, 14 countries in science and 18 countries in mathematics were selected for further analysis. Countries included in both sets of analyses were Australia, Belgium (Flemish), Belgium (French), Canada, Czech Republic, France, Hong Kong, Ireland, New Zealand, Singapore, Slovak Republic, Sweden, and the United States. The science analyses also included Austria. In mathematics, findings are also presented for Germany, Iceland, the Netherlands, the Russian Federation, and Slovenia.

4 Since the emphasis in this study was on an exploratory approach, a significance level of 0.10 was adopted as the criterion for significance, in preference to the more stringent 0.05.

Exhibit 2.4 Percent of Between School Variance in Eighth Grade* Science Achievement Explained by Each Hierarchical Linear Model

Country	Percent of Variance in Science Achievement that is Between Schools[1]	Percentage of Between-School Variance Explained by a Series of Models						
		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
		Classroom Characteristics	Model 1 with Teacher Characteristics	Model 2 with School Climate	Model 3 with School Location and Size	Model 4 with Home – School Interaction	Model 5 with Average Home Background	Average Home Background Only
Australia	23	74	74	74	74	75	75	48
Austria	22	33	37	36	42	51	54	46
Belgium (Fl)	18	40	38	42	51	68	72	46
Belgium (Fr)	20	52	54	56	64	82	85	75
Canada	15	27	28	30	31	35	37	30
Czech Republic	12	43	44	49	51	75	75	32
France	15	38	43	48	50	60	60	31
Hong Kong	30	65	64	65	66	68	75	44
Ireland	36	61	61	61	61	67	72	49
New Zealand	35	56	55	55	56	68	72	58
Singapore	41	64	63	66	66	82	83	62
Slovak Republic	15	39	38	37	38	48	47	32
Sweden	11	53	54	52	52	62	68	54
United States	34	73	73	73	74	76	78	66
Average	23	51	52	53	55	66	68	48

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

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

1 Results differ from Exhibit 2.1 because of missing data on predictor variables.

Classroom Characteristics: homework in three subjects; amount of science homework; efficacy of science; attitude to science; experiments

Teacher Characteristics: years of teaching experience; confidence to teach a general science course

School Climate: student administrative violations; serious student misbehavior

Home-School Interaction: future aspirations for education; mother's academic press; self academic press

Exhibit 2.5

Percent of Between School Variance in Eighth Grade* Mathematics Achievement Explained by Each Hierarchical Linear Model

Country	Percent of Variance in Science Achievement that is Between Schools[1]	Percentage of Between-School Variance Explained by a Series of Models						
		Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
		Classroom Characteristics	Model 1 with Teacher Characteristics	Model 2 with School Climate	Model 3 with School Location and Size	Model 4 with Home – School Interaction	Model 5 with Average Home Background	Average Home Background Only
Australia	50	71	71	71	71	81	81	50
Belgium (Fl)	53	46	45	44	43	66	69	38
Belgium (Fr)	32	42	41	44	47	78	81	59
Canada	20	25	25	27	29	39	39	8
Czech Republic	21	43	43	43	43	71	71	29
Germany	49	41	40	46	44	71	77	63
France	29	43	42	50	52	57	56	24
Hong Kong	47	64	64	66	67	69	78	42
Iceland	15	54	52	49	52	67	70	31
Ireland	51	67	67	67	67	76	80	52
Netherlands	54	62	61	66	65	79	83	54
New Zealand	48	52	52	53	53	65	69	53
Russian Federation	39	35	34	34	35	37	45	34
Singapore	39	52	53	56	56	79	82	57
Slovak Republic	20	32	32	34	32	54	55	32
Slovenia	12	42	40	38	36	51	51	32
Sweden	31	48	47	47	47	53	68	48
United States	52	52	55	54	54	61	73	64
Average	37	48	48	49	50	64	68	43

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

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

1 Results different from Exhibit 2.2 because of missing data on predictor variables.

Classroom Characteristics: homework in three subjects; amount of mathematics homework; checking homework in class; attitude to mathematics, mathematics class size

Teacher Characteristics: years of teaching experience

School Climate: student administrative violations; serious student misbehavior

Home-School Interaction: future aspirations for education, mother's academic press; self academic press

Exhibit 2.6

Number of Countries with Significant Predictors of School Effectiveness in Eighth Grade* Science (14 Countries)

Predictors	Base Model	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
	Between School Model	Classroom Characteristics	Model 1 with Teacher Characteristics	Model 2 with School Climate	Model 3 with School Location and Size	Model 4 with Home – School Interaction	Model 5 with Home Background	Home Background Only
Intercept	14	10	10	10	9	5	9	14
Homework (3 Subjects)		12	13	12	13	12	11	
Homework (Amount Sci.)		7	8	9	9	6	5	
Attitude to Science		3	4	3	3	3	4	
Efficacy of Science		10	9	9	9	8	6	
Experiments		3	2	3	2	1	2	
Teaching Experience			2	1	3	0	2	
Readiness to Teach Gen. Sci.			1	1	2	0	0	
Administrative Violations				3	3	2	1	
Serious Misbehavior				2	1	3	3	
Urban Location					3	2	3	
Class Size					5	2	2	
Future Aspirations						11	10	
Self Press						5	3	
Mother's Press						2	1	
Home Background Index							10	14

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

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

The countries were: Australia, Austria, Belgium (Fl), Belgium (Fr), Canada, Czech Republic, France, Hong Kong, Ireland, New Zealand, Singapore, Slovak Republic, Sweden, and United States. Count represents the number of countries for which the predictor was significant (P<.1)

Exhibit 2.7 Number of Countries with Significant Predictors of School Effectiveness in Eighth Grade* Mathematics (18 Countries)

Predictors	Base Model: Between School Model	Model 1: Classroom Characteristics	Model 2: Model 1 with Teacher Characteristics	Model 3: Model 2 with School Climate	Model 4: Model 3 with School Location and Size	Model 5: Model 4 with Home – School Interaction	Model 6: Model 5 with Home Background	Model 7: Home Background
Intercept	18	15	14	14	14	9	11	18
Homework (3 Subjects)		17	17	16	16	13	12	
Homework (Amount)		11	11	11	11	9	9	
Homework (In Class Checking)		3	3	4	4	2	3	
Attitude to Mathematics		5	5	5	4	4	4	
Classroom Environment		9	9	9	10	8	9	
Mathematics Class Size		12	12	11	9	8	7	
Teaching Experience			1	2	2	2	2	
Student Admin. Violations				7	7	4	6	
Serious Student Misbehavior				4	3	4	5	
Urban Location					0	2	1	
Class Size					2	3	3	
Future Aspirations						17	15	
Self Press						3	1	
Mother's Press						2	1	
Home Background Index							13	18

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

* Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

The countries were: Australia, Belgium (Fl), Belgium (Fr), Canada, Czech Republic, Germany, France, Hong Kong, Iceland, Ireland, Netherlands, New Zealand, Russian Federation,Singapore, Slovak Republic, Slovenia, Sweden, and United States

Count represents the number of countries for which the predictor was significant (P<.1)

Exhibit 2.8 Summary of Predictors of Grade 8* Science Achievement in Model 5

	Homework (3 Subjects)	Homework (Amount)	Attitude to Science	Efficacy of Science	Experiment	Teaching Experience	Readiness to Teach Gen. Sci.	Student Admin. Violations	Serious Student Misbehavior	Urban Location	Class Size	Future Aspirations	Self Press	Mother's Press	Count
Australia	■	■		■									■	■	5
Austria	■	■										■			3
Belgium (Fl)			■	■							■	■			4
Belgium (Fr)	■							■	■			■	■		5
Canada			■	■									■	■	4
Czech Republic	■			■					■		■	■	■		6
France	■							■	■			■			4
Hong Kong	■														1
Ireland	■											■			2
New Zealand	■	■		■						■		■			5
Singapore	■	■	■	■	■							■			6
Slovak Republic	■											■			2
Sweden	■	■		■								■			4
United States	■	■		■						■		■	■		6
Count	12	6	3	8	1	0	0	2	3	2	2	11	5	2	

■ **Predictor significant at .1 level**

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit 2.9 Summary of Predictors of Grade 8* Mathematics Achievement in Model 5

	Homework (3 Subjects)	Homework (Amount)	Homework (In Class Checking)	Attitude to Mathematics	Classroom Environment	Math Class Size	Teaching Experience	Student Admin. Violations	Serious Student Misbehavior	Urban Location	Class Size	Future Aspirations	Self Press	Mother's Press	Count
Australia	■	■	■		■	■		■	■	■		■			9
Belgium (Fl)					■	■						■			3
Belgium (Fr)		■			■						■	■	■		5
Canada		■		■	■				■		■	■	■	■	8
Czech Republic	■	■			■							■			4
Germany	■							■				■	■		4
France	■				■	■		■		■		■			6
Hong Kong	■														1
Iceland	■					■						■			3
Ireland	■					■					■	■			4
Netherlands	■	■		■		■		■				■			6
New Zealand	■	■				■						■			4
Russian Federation	■											■			2
Singapore	■	■			■		■		■			■			6
Slovak Republic				■					■			■			3
Slovenia		■										■			2
Sweden	■	■		■		■						■			5
United States	■		■		■		■					■		■	6
Count	13	9	2	4	8	8	2	4	4	2	3	17	3	2	

■ Predictor significant at .1 level

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

What Classroom Characteristics Were Associated with Science and Mathematics Achievement?

In both science and mathematics, the first analysis considered variables that directly relate to classroom experiences. In science, the explanatory variables were: time spent on homework in general, time spent on science homework, students' attitude to science, perceived efficacy of science, and frequency of conducting science experiments in class. In mathematics the variables were: time spent on homework in general, time spent on mathematics homework, checking mathematics homework in class, students' attitude to mathematics, an orderly classroom environment, and size of the class. Beginning with a model that included just these classroom variables provided the best opportunity to examine the relationship between these variables and adjusted school achievement in isolation from other variables.

As may be seen from the second column of percentages in Exhibits 2.4 and 2.5 (headed "Model 1: Classroom Characteristics"), characteristics of the class accounted for a substantial percentage of the differences between schools in both science and mathematics achievement. In science, the percentage ranged from 74% in Australia to 33% in Austria, while in mathematics the range was from 71% in Australia to 25% in Canada.

From Exhibit 2.6 it is apparent that not all of the classroom explanatory variables in science were equally effective in all countries. Of the five variables, the three that were significant in most countries were:

- daily doing homework in a range of subjects (language, science and mathematics)
- time spent on homework in science
- a belief in the efficacy of science

These variables were significant components not just of the model consisting of class variables only ("Model 1: Classroom Characteristics"), but also of Models 2 through 5 where the other school-related variables are added.

In the same way, Exhibit 2.7 shows that not all of the explanatory variables in mathematics were equally effective. Of the six mathematics variables, the four that were significant in most countries were:

- daily doing homework in a range of subjects (language, science and mathematics)
- time spent on homework in mathematics

- size of the mathematics classroom
- an orderly classroom environment

Again, these variables were significant components not just of the model consisting of class variables only, but also of the models containing the other school-related variables.

Daily Doing Homework in a Range of Subjects

The most consistently significant variable for both science and mathematics was whether the student had completed homework, on a daily basis, in language, science, and mathematics. In science, this variable was a significant component of the model containing only the classroom-related variables in 12 of the 14 countries (Exhibit 2.6). Even when combined in a more general model that consisted of all of the other school-related explanatory variables (Model 5), amount of time spent on homework was a significant independent component in 12 countries. These were Australia, Austria, Belgium (French), Czech Republic, France, Hong Kong, Ireland, New Zealand, Singapore, Slovak Republic, Sweden, and the United States (Exhibit 2.8).

In mathematics the results were even more striking. The general homework variable proved a significant component of the classroom characteristics model in 17 of 18 countries, and was significant in 13 countries in Model 5: Australia, Czech Republic, Germany, France, Hong Kong, Iceland, Ireland, Netherlands, New Zealand, Russian Federation, Singapore, Sweden, and the United States (Exhibit 2.9). Taken together, these results suggest that in most countries, even adjusting for the home background of the students and for the other school and classroom variables included in this study, schools where eighth-grade students are expected to spend time on homework in a range of subjects have higher average achievement in both science and mathematics.

Time Spent on Science or Mathematics Homework

The questionnaire item asking students about the amount of time that they spend specifically on science or mathematics homework provides a different perspective on the homework issue. The amount of time spent doing science homework was a significant component of the model containing class variables only in 7 of the 14 countries in the science analyses, and the time spent doing mathematics homework was a significant component in 11 of 18 countries. However, in most of the countries, time spent on homework in science and on homework in mathematics were negative predictors of adjusted school achievement, which implies that higher achievement was associated with less time spent on homework specifically in mathematics and science. (See Appendix B and Appendix C for individual country results). A likely reason for this result is that more talented students need less time to complete their homework, and that large amounts of time spent on science or mathematics homework are more characteristic of students struggling to keep up.

The three additional classroom-related variables, one for science and two for the mathematics analysis, were significant predictors of adjusted school achievement in a number of the participating countries.

Efficacy of Science

In most countries, a belief in the contribution science could make to solving environmental problems was associated with higher adjusted school science achievement. The same pattern persisted across all other analyses, with the variable remaining significant in 8 countries even when all 5 categories of explanatory variables were considered. The countries were Australia, Belgium (Flemish), Canada, Czech Republic, New Zealand, Singapore, Sweden, and the United States.

Mathematics Class Size

The number of students in the mathematics class as reported by the teacher was a significant component of the classroom characteristics model (Model 1) in 12 of the 18 countries in the mathematics analysis. Even when included in a model with all of the other school-related explanatory variables, mathematics class size was a significant component of the model in 8 of the 18 countries – Australia, Belgium (Flemish), France, Iceland, Ireland, the Netherlands, New Zealand, and Sweden. In each of these countries, class size was positively related to adjusted school achievement, meaning that higher mathematics achievement was associated with larger class sizes. This may be due to a tendency for schools to assign weaker students to smaller classes.

Orderly Classroom Environment

The classroom environment variable, derived from students' agreement with three statements about student behavior in their mathematics class (students are orderly and quiet during lessons; students do as the teacher says; and students rarely neglect their work), is an indicator of the orderliness of the mathematics class. It was a significant predictor of adjusted school achievement in about half of the countries and remained significant even when all of the other explanatory variables were included in the model. These results indicate that more orderly mathematics classroom sessions tend to be associated with higher achievement regardless of the background of students.

How Do Teacher Characteristics Add to the Explanation of School Effectiveness?

The "teacher characteristic" variables that were combined with the classroom variables to constitute Model 2 consisted of years of teacher experience (science and mathematics) and preparedness to teach a range of science topics (science only). When considered in conjunction with the classroom variables, the teacher characteristics were not effective predictors of adjusted school science or mathematics achievement. From the third column of percentages in Exhibits 2.4 and 2.5 (labeled "Model 2: Model 1 with Teacher Characteristics"), it is apparent that the model containing both teacher characteristics and classroom variables accounts for little more between-school variance than a model containing just the classroom variables.[5]

Teaching Experience

From Exhibit 2.6 it can be seen that teacher experience was a significant component of the classroom/teacher model in just two of the participating countries for science, while in the more general model containing all school variables (Model 5) it was not significant in any country (Exhibit 2.8). In mathematics, teacher experience was a significant component of the classroom/teacher model in just two countries: Singapore and the United States.

Readiness to Teach a Range of Science Topics

The science teacher's reported readiness to teach a range of science topics was a significant component of the classroom/teacher model in just one country, the Czech Republic. However, when combined with all of the school variables in Model 5 it was not significant in any country.

How Does School Climate Add to the Explanation of School Effectiveness?

As discussed in the previous chapter, the idea of a positive school social climate as used in this study embodies respect for the individual student and a safe orderly environment for learning. Considerable research over the past four decades has shown the importance of the school climate in fostering an environment conducive to learning. A school with such a social climate, for example, would be marked by relatively few discipline problems. In Model 3, two indicators based upon principals' reports, administrative violations and serious misconduct, were combined with classroom and

5 In several countries, including Belgium(Flemish), Hong Kong, and New Zealand, the percentage of variance accounted for by Model 2 was actually less than that accounted for by Model 1. This apparent anomaly is because the explanatory power introduced by the extra variables in Model 2 was not worth the degrees of freedom lost in fitting them.

teacher characteristics for science and for mathematics. Generally, school climates that foster learning and achievement were less likely to be prone to either administrative or serious violations even when considering student home background.

Student Administrative Violations

Student misbehaviors that interfere with the orderly running of the school, such as lateness for class and violations of school dress codes, were labeled "Student administrative violations". While in some cases such behavior may be seen as merely expressions of the developing adolescent psyche, it can disrupt school routine and detract from the school's focus upon learning.

In science, three countries showed a significant negative relationship between student administrative violations and achievement when the school climate variables were introduced in Model 3 (Exhibit 2.6). When combined with all of the school variables in Model 5, the relationship was significant in just two countries, Belgium (French) and France (Exhibit 2.8).

The link between student administrative violations and school effectiveness was stronger with respect to mathematics, with seven countries showing adjusted mathematics achievement to be negatively related to such student misbehavior (Exhibit 2.7). Four countries continued to show a significant relationship between student administrative violations and mathematics achievement when all explanatory school variables were considered together (Model 5). These countries were Australia, France, Germany, and the Netherlands (Exhibit 2.9).

Serious Student Misbehavior

The serious student misbehavior index consisted of frequency of inappropriate student behavior directed at other persons or the property of others, including harm to a member of the school community and theft. It is reasonable to assume that environments where this type of behavior is common would not be conducive to student learning. In science, when school climate was combined with classroom and teacher characteristics (Model 3), the serious student misbehavior variable was a significant predictor in two countries (Exhibit 2.6). However, when combined with all of the school variables in Model 5, it was a significant predictor in three countries, Belgium (French), the Czech Republic, and France (Exhibit 2.8). In mathematics, the variable was a significant predictor in four countries when combined with classroom and teacher characteristics in Model 3, and was still a significant predictor when combined in Model 5 with all of the school variables. The four countries were Australia, Canada, Singapore and the Slovak Republic. In three of these countries, a higher incidence of serious misbehavior was associated with higher average achievement when considered in conjunction with other variables.

How Do School Location and Size Add to the Explanation of School Effectiveness?

Model 4 for science and mathematics included not only classroom, teacher, and school climate factors, but also school location and average class size, as reported by school principals.

School Location

In science, when combined with classroom and teacher characteristics, and school climate in Model 4, school location was a significant predictor of adjusted school achievement in three countries (Exhibit 2.6). In Model 5, with all of the school variables, school location was significant in just two countries, New Zealand and the United States. In both countries, schools located outside urban areas performed better than those in urban centers. In mathematics, school location was not significant in any country for Model 4, and only in Australia and France when combined with all school factors in Model 5.

Average Class Size

Five countries showed average class size to be a significant predictor of school science achievement when combined in Model 4 with classroom and teacher characteristics and school climate. These were Belgium (Flemish), Belgium (French), the Czech Republic, New Zealand, and the Slovak Republic. When all of the science factors were considered together (Model 5), this was reduced to two countries, Belgium (Flemish) and Czech Republic (Exhibit 2.8). In mathematics, average class size in Model 4 was significant in only two countries, Belgium (French) and Canada. In Model 5, with all of the school factors combined, average class size was also a significant predictor in Ireland (Exhibit 2.9).

How Do Factors at the Home-School Interface Add to the Explanation of School Effectiveness?

Variables at the home-school interface that were selected for study in the hierarchical analyses included the level of education the student expected to attain, the student's press for academic success, and maternal press for academic success. The model that included these variables (Model 5) also included all of the other school factors: classroom and teacher characteristics, school climate, and school location and class size. This model had considerably greater explanatory power than models without the home-school interface variables. In science, on average 66% of the between-school variance was accounted for by the variables in Model 5, compared with 55% by the variables in Model 4. In mathematics the situation was similar, with 64% of the variance accounted for by Model 5 compared with 50% by Model 4.

Educational Aspirations
In both science and mathematics, the student's aspirations for future education was the strongest predictor in the home-school interface category and one of the strongest school-level predictors of achievement overall. As can be seen from Exhibits 2.6 and 2.7, this variable was a significant predictor in 11 countries in science and 17 in mathematics. In science, these countries were Austria, Belgium (Flemish), Belgium (French), the Czech Republic, France, Ireland, New Zealand, Singapore, the Slovak Republic, Sweden, and the United States (Exhibit 2.8). In mathematics this variable was a significant predictor in every country except Hong Kong (Exhibit 2.9). Even when taking into account home background factors, students who expect to attend a university attain higher levels of achievement in both science and mathematics.

Self Academic Press
A student's academic press to do well in a range of subjects including science and mathematics was also measured. In science, this variable was a significant predictor in five countries: Australia, Belgium (French), Canada, Czech Republic and the United States. In mathematics, student's academic press was found to be a significant predictor in Belgium (French), Canada, and Germany. In these few countries, higher self academic press was associated with lower overall achievement.

Mother's Academic Press
Parents can exert considerable influence over their children's attitudes towards education and their aspirations. Maternal academic press was found to be significant in two countries, with higher press generally being found in the higher-achieving schools. The countries were Australia and Canada for science and Canada and the United States for mathematics.

How Does the Average Level of Student Home Background Add to the Explanation of School Effectiveness?

While all of the between-school analyses presented in this chapter control statistically for differences in the home background characteristics of the students *within* the school, they do not address differences *between* schools in the average level of the home background index. This average has the potential to represent characteristics of the school and its community that are not captured at the individual student level. A school with a high average on the home background index, for example, would likely be located in an affluent community, with all of the advantages that that implies, whereas a school with a low average would likely be less advantageously situated.

In Model 6, average home background of the students was combined with all of the other school variables to see whether this aspect of the school offered any further explanatory information beyond that provided by the school variables. In science, the increase in the percentage of between-school variance explained was small, from 66% to 68% (Exhibit 2.4), but nonetheless average home background was a significant predictor in 10 of the 14 science countries, even after the effects of all of the other school variables are taken into account (Exhibit 2.6). In mathematics the increase in the percentage explained was slightly greater, from 64% to 68% (Exhibit 2.5). Average home background was a significant predictor in 13 of the 18 mathematics countries after controlling for the effects of the other school variables (Exhibit 2.7).

Does the Average Level of Student Home Background Provide a Sufficient Explanation for all Differences Between Schools?

Since in almost all countries, for both science and mathematics, a high school average on the home background index was associated with high average student achievement, it is reasonable to ask what extent the school variables accounted for differences between schools once the effect of average school background has been controlled. The final model in these analyses, Model 7, uses just the school average on the home background index as a predictor; as can be seen from Exhibits 2.6 and 2.7, it is significant in all of the countries for both science and mathematics. Comparing Model 6, which contains average school background and all of the other school variables, with Model 7, which contains just average home background, shows how much of the difference between schools can be attributed to the school variables once average school background has been taken into account.

In science, average home background alone accounted for 48% of the between-school variance (on average across countries), compared with 68% for average home background and school variables combined (Exhibit 2.6). Therefore, an additional 20% of the between-school variance was accounted for by taking all of the school variables together. In mathematics, the difference in the percentage of variance explained was a little greater, up from 43% for average home background alone to 68% for all school variables together (Exhibit 2.7). In this case an additional 25% was accounted for by taking all school variables together.

Summary and Conclusion

The results presented in this chapter show that the extent to which achievement in science and mathematics can be related to school factors varies considerably from country to country. In countries such as Cyprus, Japan, and Korea, average student achievement in science and mathematics was very similar from school to school, implying that the search for factors related to differential school effectiveness in these countries would not be fruitful. More common, especially in mathematics, were countries with substantial differences between schools in student achievement, and these were chosen for further analysis. The results also displayed considerable variation across countries in the extent to which schools differed in the home background of their students, and showed that the relationship between home and school factors and student achievement is not the same in all countries. It is clear that the way student home background relates to student achievement, and the way the school system moderates or magnifies this relationship, are closely linked to societal and school organizational factors unique to each country, and any cross-national analytic efforts should take this into account.

As a contribution to such an effort, the chapter went on to summarize across countries the relationship between a small set of home and school factors and school achievement, while controlling statistically for the home background of the students. The analyses were organized to focus first on classroom factors and teacher characteristics, to illustrate the extent to which such factors were related to school achievement. The classroom variables, while constituting a less than exhaustive list of classroom-related practices, nonetheless accounted for a substantial amount of the variation that exists between schools for both science and mathematics. This not only supports the view that classroom practices may influence achievement, but also indicates that properly tailored classroom practices can be made to address differences in ability. Other school and teacher variables were less consistent predictors of achievement across countries. The home-school interface factors, however, proved more consistent. Of particular note was the strong association between students' educational aspirations and achievement in both science and mathematics.

The results serve to illustrate vividly how home and school influences on student achievement are closely interwoven. The school average on an index of home background is almost as effective a predictor of average school achievement as the whole set of home and school factors used in this study, partly because all of these factors are interrelated in reality. Schools located in and drawing their students from affluent communities not only have a more advantaged student body, but also are likely to enjoy small classes, well-trained and well-paid teachers, a safe and educationally supportive environment, and the support of well-educated and affluent parents. All of these factors serve to support student learning, even though it may not be possible to disentangle completely their relative effects. The home background of students and the affluence of the communities in which they reside remain powerful predictors of science and mathematics achievement. This relationship is pronounced and persists across international contexts. More work needs to be done to identify the most fruitful variables to capture the dynamic processes that take place within schools and to understand how national and cultural contexts interact with other factors to influence how education is transmitted and received.

Appendix A

Overview of Procedures and Methods

The TIMSS Assessment

TIMSS in 1995-96 tested students in primary school (third and fourth grades – Population 1) and middle school (seventh and eighth grades – Population 2) in mathematics and science, and final-year high-school students (Population 3) in mathematics and science literacy, advanced mathematics, and physics. The data used in this study were from the upper grade of Population 2, which was eighth grade in most countries. Six content areas were covered by the mathematics tests taken by the eighth-grade students. These areas, and the percentage of test items devoted to each, include fractions and number sense (34%); measurement (12%); proportionality (7%); data representation, analysis, and probability (14%); geometry (15%); and algebra (18%). The eighth-grade science test consisted of just five content areas: earth science (16%); life science (30%); physics (30%); chemistry (14%); and environmental issues and the nature of science (10%). There were 151 mathematics items and 135 science items in the eighth-grade TIMSS assessment.

To maximize the content coverage of the TIMSS tests, yet minimize the burden on individual students, TIMSS used a multiple matrix sampling design whereby each student responded to just a subset of the total item pool.[1] By combining student responses across the item pool using sophisticated scaling techniques, TIMSS was able to derive estimates of average mathematics and science achievement for the entire population of eighth-grade students in each country.

In each subject, approximately one-quarter of the items were in the free-response format, requiring students to generate and write their own answers. Designed to take up about one-third of students' response time, some of these questions asked for short answers while others required extended responses in which students needed to show their work. The remaining questions were in multiple-choice format. In scoring the tests, correct answers to most questions were worth one point. Consistent with the approach of allotting longer response times for constructed-response questions than for multiple-choice questions, responses to some of these questions (particularly those requiring extended responses) could earn partial credit, with a fully correct answer being awarded two or three points.

Target Population

The target population (internationally desired population in IEA parlance) for Population 2 was the two adjacent grades that contained the largest proportion of 13-year-old students at the time of testing. These were the seventh and eighth grade in most countries. In a few situations where TIMSS testing could not be done for the

1 The TIMSS test design is fully described in Adams, R.J., and Gonzalez, E.J. (1996); "TIMSS Test Design," in M.O. Martin and D.L. Kelly (eds.), *Third International Mathematics and Science Study Technical Report, Volume I*, Chestnut Hill, MA: Boston College.

entire internationally desired population, countries were permitted to define a national desired population that excluded part of the internationally desired population. The results for such countries were annotated in international reports. Because coverage fell below 65% for Latvia, the Latvian results have been labeled "Latvia (LSS)," for Latvian-Speaking Schools, throughout the report.

School and Student Sampling

Within countries, TIMSS used a two-stage sample design, where the first stage involved selecting 150 public and private schools within each country. Within each school, each country was required to use a random sampling procedure to select one mathematics class at the eighth grade and one at the seventh grade (or the corresponding upper and lower grades in that country). All of the students in those two classes were to participate in the TIMSS testing. This approach was designed to yield, for each population, a representative sample of at least 7,500 students per country, with approximately half students at each grade. Countries were, however, permitted to extend the basic sampling design to meet domestic concerns, provided they complied with TIMSS standards for population coverage and sampling precision. For example, four countries, Australia, Cyprus, Sweden and the United States, sampled two intact mathematics classes in each sampled school. Korea sampled students within the sampled mathematics classes, and England used within-school sampling.

Indicating Compliance with Sampling Guidelines[2]

In Exhibit A.1, countries are grouped by how they met the TIMSS sampling requirements. Countries that achieved acceptable participation rates – 85% of both the schools and students, or a combined rate (the product of school and student participation) of 75%, with or without replacement schools – and that complied with the TIMSS guidelines for grade selection and classroom sampling are shown in the first panel of the exhibit. Countries that met the guidelines only after including replacement schools are annotated in international reports.

Countries not reaching at least 50% school participation without the use of replacement schools, or that failed to reach the participation standard even with the inclusion of replacement schools, are shown in the second panel of the figure.

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

Exhibit A.1 Countries Grouped for Reporting According to Their Compliance with Guidelines for Sample Implementation and Participation Rates

Countries satisfying guidelines for sample participation rates, grade selection and sampling procedures	† Belgium (Fl) Canada Cyprus Czech Republic †2 England France Hong Kong Hungary Iceland Iran, Islamic Republic Ireland Japan Korea 1 Latvia 1 Lithuania New Zealand Norway Portugal Russian Federation Singapore Slovak Republic Spain Sweden 1 Switzerland † United States
Countries not satisfying guidelines for sample participation	Australia Austria Belgium (Fr) Netherlands Scotland
Countries not meeting age/grade specifications (high percentage of older students)	Colombia †1 Germany Romania Slovenia

† Met guidelines for sample participation rates only after replacement schools were included.

1 National Desired Population does not cover all of the International Desired Population. 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.

Data Collection Procedures

Each participating country was responsible for carrying out all aspects of the data collection, using standardized procedures developed for the study. International quality control monitors interviewed the National Research Coordinator (NRC) in each country about data collection plans and procedures. They also selected about ten schools to visit, where they observed testing sessions and interviewed school coordinators.[3] The results indicate that, in general, NRCs were well prepared for data collection and that the TIMSS tests were administered in compliance with international specifications and guidelines.

Scoring the Free-Response Items

Because about one-third of the written test time was devoted to free-response items, TIMSS developed procedures for reliably evaluating student responses within and across countries. The scoring used a system of two-digit codes with rubrics specific to each item.

To gather and document empirical information about the within-country agreement among scorers, TIMSS had systematic subsamples of some 10% of the students' responses coded independently by two scorers. The percentage of exact agreement between scorers was computed for each free-response item. A very high percentage of exact agreement at the score level was observed for the free-response items on all TIMSS tests.[4]

Data Processing

To ensure the availability of comparable, high-quality data for analysis, TIMSS undertook a set of rigorous quality control steps to create the international database.[5] TIMSS prepared manuals and software for countries to use in recording their data on computer files so that the information would be in a standard international format before being forwarded to the IEA Data Processing Center in Hamburg. Upon arrival at the Center, the data from each country underwent an exhaustive cleaning process designed to identify, document, and correct deviations from the international instruments, file structures,

[3] The results of the interviews and observations by the quality control monitors are presented in Martin, M.O., Hoyle, C.D., and Gregory, K.D. (1996), "Monitoring the TIMSS Data Collection" and "Observing the TIMSS Test Administration," both in M.O. Martin and I.V.S. Mullis (eds.), *Third International Mathematics and Science Study: Quality Assurance in Data Collection*, Chestnut Hill, MA: Boston College.

[4] Summaries of the scoring reliability data for each test are included in the appendices of the international reports (see Appendix A in Beaton, A. E., Martin, M . O., Mullis, I. V. S., Gonzalez, E. J., Smith, T. A. and Kelly, D. L. (1996a); *Science Achievement in the Middle Years: IEA's Third International Mathematics and Science Study*, Chestnut Hill, MA: Boston College, and in Beaton, A. E., Mullis, I. V. S., Martin, M . O., Gonzalez, E. J., Kelly, D. L. and Smith, T. A. (1996b); *Mathematics Achievement in the Middle Years: IEA's Third International Mathematics and Science Study*, Chestnut Hill, MA: Boston College.)

[5] These steps are detailed in Jungclaus, H., and Bruneforth, M. (1996), "Data Consistency Checking Across Countries," in M.O. Martin and D.L. Kelly (eds.), *Third International Mathematics and Science Study Technical Report, Volume I*, Chestnut Hill, MA: Boston College.

and coding schemes. The process also ensured consistency of information within national data sets and appropriate linking among the many student, teacher, and school data files. Throughout the data-cleaning process, the data were checked and double-checked by the IEA Data Processing Center, the International Study Center, and the national centers. The national centers were in constant contact with the DPC and had multiple opportunities to review their data.

IRT Scaling and Data Analysis

The mathematics and science achievement results were summarized using an item response theory (IRT) scaling method based on the Rasch one-parameter model.[6] This method produces a test score by averaging the responses to the items each student took in a way that takes into account the difficulty of each item. The method used in TIMSS includes refinements that enable reliable scores to be produced even though individual students responded to only subsets of the total item pool. Analyses of the response patterns of students from participating countries indicated that, although the items in each TIMSS test address a wide range of mathematics or science content, the performance of the students across the items was consistent enough that it could usefully be summarized in a single score per test. The IRT method was preferred for developing comparable estimates of performance for all students, since students answered different test items depending upon which test booklet they received. The IRT analysis provides a common scale on which performance can be compared across countries.

Estimating Sampling Error

Because the statistics presented in this report are national estimates based on samples of schools and students rather than the values that could be calculated if every school and student in a country answered every question, it is important to have measures of the degree of uncertainty of the estimates. The jackknife procedure was used to estimate the standard error associated with each statistic presented in chapter 1.[7] The use of confidence intervals based on the standard errors allows inferences to be made about the population means and proportions in a manner that reflects the uncertainty associated with the sample estimates. An estimated sample statistic plus or minus two standard errors represents a 95% confidence interval for the corresponding population result.

6 The TIMSS scaling model is fully documented in Adams, R.J., Wu, M.L., and Macaskill, G. (1997), "Scaling Methodology and Procedures for the Mathematics and Science Scales," in M.O. Martin and D.L. Kelly (eds.), *Third International Mathematics and Science Study Technical Report, Volume II*, Chestnut Hill, MA: Boston College.

7 The jackknife repeated replication technique for estimating sampling errors is documented in Gonzalez, E.J., and Foy, P. (1997), "Estimation of Sampling Variability, Design Effects, and Effective Sample Sizes," in M.O. Martin and D.L. Kelly (eds.), *Third International Mathematics and Science Study Technical Report, Volume II*, Chestnut Hill, MA: Boston College.

Comparing High- and Low-Performing Schools

The purpose of the analyses reported in Chapter 1 of this report was to contrast schools with high and low average student performance in mathematics and science in terms of student, teacher, classroom, and school characteristics, with a view to identifying characteristics associated with high performing schools.

To identify the schools for the high- and low-performing groups, schools were first ranked by average achievement. Schools in the top third were assigned to the high-achieving group, and those in the bottom third to the low-achieving group. The one-third of schools in the middle of the distribution were not used in these analyses (they were, however, used in the analyses reported in Chapter 2). This procedure was followed separately for mathematics achievement and science achievement. Since the TIMSS sampling procedure was based on intact mathematics classes, in most cases the average achievement for a school was based on the students from a single class. Differences between schools therefore also reflect differences between classes, and probably overestimate the actual difference between schools. In countries where two classes were sampled, each class was treated separately for the purpose of these analyses. For the science analyses, the school mean was computed across all students in the school, regardless of the class to which they belonged.

The variables examined in the contrast between the high- and low-achieving schools were drawn from the student, teacher, and school questionnaires that were administered as part of the TIMSS assessment. TIMSS researchers reviewed the questionnaires in the light of the effective-schools literature to identify variables that were likely to characterize effective schools. These variables were correlated with student achievement in science and mathematics in an extensive exploratory analysis. Variables that were significantly related to achievement were retained for the contrast study. Where possible, individual variables were combined to form an index that was more global and more stable than the original variables.

Each variable and index was dichotomized at a point that seemed to maximally discriminate between schools in the high-achieving group and those in the low-achieving group. A t-test was applied to the data from each country to determine whether there was a significant difference between the two groups in the frequency of occurrence of the dichotomized variable. Variables and indices that showed significant differences in most of the participating countries, or that showed particularly big differences in a few countries, were included in this report. For example, students were asked how many books they had in their homes, and could respond "none or very few (0-100 books)," "about one shelf (11-25 books)," "about one bookcase (26-

100 books)," "about two bookcases (101-200 books)," or "three or more bookcases (more than 200 books)." The dichotomous version of this variable was "having at least 100 books". The analysis for Chapter 1 then contrasted the percentage of students in the low-achieving schools having at least 100 books with the percentage in high-achieving schools, showing the difference between them and presenting it graphically. The presentation also included the jack-knife standard errors of the percentages and of the difference between the percentages. Since each exhibit in Chapter 1 contains a statistical test for all of the countries, a Bonferroni correction for multiple a priori comparisons (the number of countries minus one) was applied to the results of the t-tests for each of the exhibits reported in this chapter.

Hierarchical Analyses

The hierarchical nature of the TIMSS data, where students are nested within schools, readily lends itself to analysis with hierarchical linear models (HLM). The analyses reported in Chapter 2 were conducted by fitting a series of two-level models (school and student) and summarizing the results across countries.

For the analyses presented in this report, three types of two-level HLMs were constructed. The **between-schools** model was used to examine how student achievement differed between schools across countries. The **home background** model was used to examine how much of the difference between schools in average student achievement could be attributed to differences in the home background of the students. The **exploratory** models examined how home and school factors related to differences between schools in science and mathematics achievement after controlling for the home background of the students.

The Hierarchical Linear Models

Between-Schools Model
This HLM is similar to a one-way analysis of variance in that variation in the dependent variable (student achievement) is partitioned into two components: between schools and within the school. This model also was used for analyzing between-school differences in student home background (Exhibit 2.3)

Within School

$$Y_{ij} = \beta_{oj} + e_{ik}$$

The score Yij of student i in school j is expressed in terms of the school mean β_{oj} for school j plus a deviation for student i.

Y_{ij}	is the achievement score (or home background index) for student i in school j,
β_{oj}	represents the mean of each school,
e_{ik}	is a random error assumed normally distributed with a variance that is constant across individuals and schools.

School Level

$$\beta_{oj} = \gamma_{oo} + U_{oj}$$

where:

β_{oj}	is the school mean for school j,
γ_{oo}	is the grand mean (mean of β_{oj}'s),
Uoj	is a normally distributed random error with variance τ^2. This variance is constant across schools and is independent of the first-level error term.

Home Background Model
This model further decomposes the between-school variance in achievement into that which is due to differences in average home background and that which is not. The intercept term represents the school/classroom mean adjusted for students' home background.

Within School

$$Y_{ij} = \beta_{oj} + \beta_{1j}\mathrm{HBI}_{ij} + \mathrm{e}_{ik}$$

Here, the relationship between home background and student achievement in each school is represented by a linear regression equation for that school,

where:

β_{oj}	is the intercept of the regression line,

β_{1j} is the slope of the regression line relating student home background to achievement,

HBI_{ij} is the home background index for student i in school j.

School Level

$$\beta_{oj} = \gamma_{oo} + \gamma_{1j} W_{1j} + U_{oj}$$

Here, differences between schools are modeled in terms of differences between the school mean (represented by the intercept in the linear equation) and the overall (grand) mean.

γ_{1j} is the school-level regression coefficient,

W_{1j} is the school mean (the intercept) of the student home background index.

Exploratory Models

The exploratory analyses make use of a generalized form of the home background model to study the relationship between a range of home and school variables and average school achievement while controlling for average student home background. In all, seven variations on the model were used in these analyses. The between-schools model was used as a baseline for evaluating the utility of the other, more complex, models.

- Model 1: Classroom Characteristics. In modeling science achievement, five classroom characteristics variables were used as school level predictors: daily doing homework in three subjects, amount of science homework, liking science, belief in the efficacy of science, and frequency of experiments. The corresponding predictors for the mathematics model were daily doing homework in three subjects, amount of mathematics homework, checking of homework in class, liking mathematics, classroom environment, and mathematics class size.

- Model 2: Model 1 with Teacher Characteristics. Model 2 combines the classroom characteristics of Model 1 with a set of teacher characteristics. For science, teaching experience and the ability to teach a general science course were the new predictors. Mathematics used teaching experience only.

- Model 3: Model 2 with School Climate. The third exploratory model was constructed by adding two school climate variables to Model 2 for both science and mathematics. The two new predictors were administrative violations and serious misbehavior.

- Model 4: Model 3 with School Location and Size. Two additional predictors, urban location and class size, were added to Model 3 for both science and mathematics.

- Model 5: Model 4 with Home-School Interaction. The fifth model was constructed by including variables for aspirations for future education, self press, and maternal press with the Model 4 variables.

- Model 6: Model 5 with Home Background Index. The most complex model was constructed by combining the school average on the home background index with the predictors in Model 5.

- Model 7: Home Background Index Only. The final model, designed to show the explanatory power of home background at the school level, was constructed using the school mean on the home background index as the sole predictor for both science and mathematics.

Since each model was unique, seven separate analyses were conducted for each of the fourteen countries included in the science analyses and the sixteen countries included in the mathematics analyses. The common structure of models 1 through 7 was the following.

Within School

$$Y_{ij} = \beta_{oj} + \beta_{1j} HBI_{ij} + e_{ik}.$$

This is identical to the home background model.

School Level

$$\beta_{oj} = \gamma_{oo} + \gamma_{1j} W_{1j} + \gamma_{2j} W_{2j} \ldots . U_{oj}$$

$$\beta_{1j} = \gamma_{1o}$$

where:

$\gamma_{1j}, \gamma_{2j}..$ are the school-level regression coefficients,

W_{1j}, W_{2j}...are the school means of the predictor variables.

Data for Hierarchical Analyses

The procedure when conducting the hierarchical analyses involved fitting a linear regression model within each school or classroom to adjust for students' home background. A requirement of the HLM program used for these analyses was that there be no missing data at the second level of the model. This necessitated the exclusion of a number of variables from the final hierarchical analyses and effectively reduced final sample sizes. To ensure the stability of the estimates, a minimum sample size of at least ten students per school/classroom was used. Therefore, schools in the science analyses and classes in the mathematics analyses with fewer than ten students remaining after other cases had been removed were deleted from the exploratory analysis sample.

In producing measures of student achievement in science and mathematics for use in secondary analysis, TIMSS made use of imputed score or "plausible value" technology.[8] Student achievement scores were represented by random draws from achievement-score distributions the parameters of which were estimated from student responses to achievement items and from student background data. To capture the uncertainty due to the imputation process, each student has five imputed scores for science and five for mathematics. The version of the HLM program used for the analyses in this report combined the results from all five imputed scores to give the most appropriate results.

Sampling Weights in Hierarchical Analyses

Given the complexities of the sampling design employed by TIMSS, appropriate sampling weights were applied to obtain unbiased results. The weighting for each country reflected the probability of selection for each student in each school and had to account for non-participation.[9] For the Chapter 1 analysis, a single weighing variable was used. Since the hierarchical analyses reported in Chapter 2 consist of two levels, a student level and a school level, appropriate weights had to be applied for each level. The school sampling weight was the inverse of the probability of selection for the school, adjusted for non-participating schools in the sample. The weight applied at the student level for the science and mathematics analyses consisted of the inverse of the probability of selection of students within each selected school, and also was adjusted to account for non-participating students.

Derived Variables for Comparison of High- and Low-Achieving Schools

In the upper versus lower one-third analyses, and the hierarchical analyses, variables were derived from student, teacher, and school questionnaire data. These derived variables and the procedures used to construct them are described in the following sections.

8 Adams, R.J., Wu, M.L., and Macaskill, G. (1997), "Scaling Methodology and Procedures for the Mathematics and Science Scales," in M.O. Martin and D.L. Kelly (eds.), *Third International Mathematics and Science Study Technical Report, Volume II*, Chestnut Hill, MA: Boston College.

9 Detailed information about applying sampling weights to TIMSS data can be found in Gonzalez, E.J., and Smith, T. A. (1997)., "Users' Guide to the TIMSS International Database: Primary and Middle School Assessment," Chestnut Hill, MA: Boston College.

At least 100 Books in Family Home (Science, Mathematics)
Derived from the number of books in the family home, this variable was coded to 1 if students reported having 100 or more books in the home and 0 if they reported having fewer than 100 books.

Having a Study Desk, Dictionary, and Computer in Family Home (Science, Mathematics)
This variable was derived from three items on the student questionnaire asking each student whether he or she had a study desk, a dictionary, and a computer in the home. This variable was coded 1 if all three items were present and 0 if the student reported having fewer than all three items.

Number of Possessions in the Family Home (Science, Mathematics)
The index of possessions in the home is based on the ratio of the student's reported number of possessions to the total number of possible possessions in each country. Students who reported having over half of the possible number of home possessions in that country were coded as 1. Students with less than half of the total number of possible possessions were coded as 0.

At Least One Parent Reported to Have Finished University (Science, Mathematics)
As part of the student questionnaire, students were asked to report the highest level of education attained by each parent. In the TIMSS database, a single variable was derived to capture the educational status of both parents. For this analysis the variable was recoded to 1 if at least one parent had finished university and to 0 if neither parent had done so.

Student Works One or More Hours at Home (Science, Mathematics)
On the student questionnaire, students were asked how many hours they worked at home. If a student reported doing jobs at home for one or more hours each day, he or she was given a code of 1. Less was coded as 0.

Student Thinks that it is Important to do Well in Mathematics, Science, and Language (Science, Mathematics)
This indicator was constructed out of three variables from the student questionnaire that asked the student how important it was to do well in mathematics, science, and the language of the test. The new variable representing students' press was coded as 1 in cases where students agreed that it was important to do well in all three areas, and 0 if they did not.

Mother Thinks that it is Important to do Well in Mathematics, Science, and Language (Science, Mathematics)

This variable was constructed using three variables asking the student to report whether his or her mother thinks it important to do well in science, mathematics, and the language of the test. The new variable representing mother's press was coded as a 1 in cases where students agreed that their mothers thought it important to do well in all three areas and 0 if they did not.

Student Plans to Attend University (Science, Mathematics)

Students reported how much education they anticipate receiving. For the purposes of this report, educational aspirations were coded as 1 if the student expected to attain at least some university education and 0 otherwise.

Student Daily Works on Homework in Mathematics, Science, and Other Subjects (Science, Mathematics)

The student questionnaire asked students to report how much homework they do daily in mathematics, science, and other subjects. For this report, the three variables were combined into an index that was coded as 1 only if students reported doing at least some homework in all three subjects daily. If a student had missing data on any of the variables, the case was coded as missing.

School Located in Urban Area (Science, Mathematics)

In the school questionnaire, each principal was asked to identify the type of community in which the school was located. For these analyses, cases where principals reported that their schools were located either in or on the outskirts of a major town or city were coded as 1. If the school was reported to be in a geographically isolated area, a village, or a rural (farm) area it was coded as 0.

School Enrollment Greater than the Country Mean (Science, Mathematics)

This variable was coded as 1 when the principal reported school enrollment to be in excess of the computed average for that country and as 0 if it was less than that average.

Average Class Size Greater than the Country Mean (Science, Mathematics)

To construct this variable, the principal's report of average class size was compared with the average class size for that country. If the average class size reported was greater than that of the country involved, then the new variable was coded as 1. If less, it was coded to 0.

Student Administrative Violations (Science, Mathematics)
The administrative violations index was created by taking the mean of principals' reports of student tardiness at school, unjustifiable absenteeism, skipping class, and violation of dress code. The occurrence of each item was rated on a four-point scale from "rarely" to "daily." If no more than one of these variables was found to be missing and the mean was greater than 1.5, then the student misbehavior variable was coded as 1. If the mean was less than or equal to 1.5 it was coded as 0. Cases for which more than one of the component variables was missing were coded as missing.

Serious Student Misbehavior (Science, Mathematics)
The creation of the serious student misbehavior variable involved taking the mean of principals' reports of serious problem behavior among students. Such behavior included disrupting the work of other students, cheating, profanity, vandalism, and intimidation. The occurrence of each behavior was rated on a four-point scale from "rarely" to "daily." If the mean value was greater than 1.5, the new variable was coded as 1. If the mean was less than or equal to 1.5, it was coded as 0. At least five of the component items had to be present or the variable would be coded as missing.

Positive Attitude towards Science (Science only)
The index of attitude towards science was only based on three statements: I like science; I enjoy learning science; and science is boring. In countries where science subjects are taught separately, students were asked about earth science, life science, physics, and chemistry individually. Each of the statements was rated by students on a five-point scale. If a student reported liking, and enjoying, any of the subject areas and found at least one area interesting, his or her attitude was considered to be positive and coded as 1.

Positive Attitude towards Mathematics (Mathematics only)
The item used to measure student attitude towards only mathematics was based upon 5 items from the student questionnaire: How much do you like mathematics; I enjoy learning mathematics (reversed); Mathematics is boring; Mathematics is important to everyone's life (reversed); and I would like a job that involves using mathematics (reversed). Where the mean of these items was 2.5 or higher, a student's attitude towards mathematics was considered to be positive, and the new variable was coded 1. If the mean was less then 2.5, it was coded to 0.

Belief in the Efficacy of Science (Science only)
The index was based on responses to questions about the following environmental problems: air pollution; water pollution; destruction of forests; endangered species; damage to the ozone layer; problems

from nuclear power plants. The students who reported believing that science application can help "somewhat" or "a great deal" in addressing all six problems were given a code of 1. Students that did not believe that science could help "somewhat" or "a great deal" to address all six problems were given a 0 on the efficacy of science variable.

Doing Experiments or Practical Investigations in Class (Science only)
This index was based on student reports of doing experiments in the following five areas: science (integrated) lessons; biology lessons; chemistry lessons; earth science lessons; physics lessons. Students who report they "almost always" or "pretty often" do experiments in these areas were coded as 1 on this variable.

Derived Variables for Hierarchical Analyses

A number of the variables in the upper versus lower third analyses also were used in the HLM analyses.

The Home Background Index
The Home Background Index (HBI) was constructed by standardizing each component variable and then taking the mean of all non-missing variables. The component variables were: number of people in the family home, number of natural parents in the family home, books in the home, percentage of possessions from the international option list of items, study desk in home, computer in home, highest level of education of father, and highest level of education of mother.

Homework in Mathematics, Science, and Other Subjects (Science, Mathematics)
For the hierarchical analyses, this variable was constructed in three stages. First, three variables were made indicating whether or not students' questionnaire replies reported doing any homework in math, science, and other subjects on a daily basis. Next, the three variables were summed for each student, creating one general homework variable that could range from 0 to 3. A 0 indicated that a student reported not doing homework in the three subject areas on a daily basis. A 3 indicated that a student did homework in all three areas on a daily basis. Finally, the school average was computed for the science analyses and the classroom average was computed for mathematics analyses.

Amount of Science Homework (Science only)
For the hierarchical analyses, the amount of time doing science homework was computed as the school average of the amount of time students reported spending doing science homework on a daily basis. The response options provided to students were no time; less than 1 hour; 1-2 hours; 3-5 hours; and more than 5 hours.

Efficacy of Science (Science only)
The hierarchical analysis version of this variable was formed by summing each student's response to the following environmental problems: air pollution, water pollution, destruction of forests, endangered species, damage to the ozone layer, and problems from nuclear power plants, and then calculating the school mean.

Attitude to Science (Science only)
Attitude to science was based on three statements: I like science, I enjoy learning science, and science is boring (reversed). In countries where science subjects are taught separately, students were asked about earth science, life science, physics, and chemistry individually. Each of the statements was rated by students on a five-point scale ranging from "strongly disagree" to "strongly agree." The variable used in the hierarchical analyses was the school average of this composite student variable.

Experiments (Science only)
The index of students doing experiments used in the hierarchical analyses was based on student reports of doing experiments in the following 5 areas: science (integrated) lessons; biology lessons; chemistry lessons; earth science lessons; physics lessons. Each of the items was based upon a 4-point scale ranging from "never" to "almost always" that assessed how often students did experiments or practical investigations in the given area. The maximum value attained by a student in any of these areas was taken as the value of the experiments variable for that student. The school average of this variable was then computed for the hierarchical analyses.

Checking Homework in Class (Mathematics only)
This variable represented how often the teacher checked mathematics homework in class. It was constructed by taking the classroom average of students' reports of the amount of time spent checking mathematics homework. The initial item appears in the student questionnaire as a 4-point scale with responses ranging from "never" to "almost always."

Amount of Mathematics Homework (Mathematics only)
The amount of mathematics homework variable consisted of the classroom mean of students' reports of the amount of time they spend doing mathematics homework. The student variable was measured on a 5-point scale with options ranging from "no time" to "more than 5 hours."

Attitude to Mathematics (Mathematics only)
Attitude to mathematics was derived from 5 items from the student questionnaire: How much do you like mathematics, I enjoy learning mathematics (reversed), mathematics is boring, mathematics is important to everyone's life (reversed), and I would like a job that

involves using mathematics (reversed). Each of the statements was rated by students on a 5-point scale ranging from "strongly disagree" to "strongly agree." The variable used in the hierarchical analyses was the school average of this composite student variable.

Classroom Behavior (Mathematics only)
The classroom behavior index used in the mathematics hierarchical analyses was constructed from student agreement to three statements: students often neglect their work (reversed), students are orderly and quiet during lessons (reversed), and students do exactly as the teacher says. Each of the statements was rated by students on a 4-point scale ranging from "strongly disagree" to "strongly agree." The variable used in the hierarchical analyses was the school average of this composite student variable.

Mathematics Class Size (Mathematics only)
In the mathematics analyses the size of the classroom was determined by adding the number of boys to the number of girls reported in each mathematics class.

Teaching Experience in Science (Science, Mathematics)
The number of years the teacher has been teaching is used in the mathematics hierarchical analyses as a proxy for teaching experience. In science, the school mean of the variable was used, as the TIMSS sampling design allowed for more than one science teacher to be represented in each intact mathematics classroom at the grade tested.

Readiness to Teach General Science (Science only)
This index was created from a series of items from the teacher questionnaire that asked teachers to report their readiness to teach earth features, energy, light, human tissues and organs, metabolism, reproduction, genetics, measurement, and data organization. Readiness to teach each subject area was rated on a 3-point scale ranging from "not well prepared" to "confident teaching this topic." The mean of each of these items was computed. School means were then calculated.

Student Administrative Violations (Science, Mathematics)
The variable representing administrative violations was computed as the mean of principals' reports of students arriving late at school, unjustifiable absenteeism, students skipping class, and violation of dress code. The occurrence of each item was rated on a 4-point scale from "rarely" to "daily."

Serious Student Misbehavior (Science, Mathematics)
For the hierarchical analyses this variable was computed as the mean of principals' reports of serious problem behavior among students. Such behavior included disrupting the work of other students, cheating, profanity, vandalism, and intimidation. The occurrence of each item was rated on a four-point scale from "rarely" to "daily."

School Location (Science, Mathematics)
The school location variable used in the hierarchical analyses was the principal's report of the type of community in which the school was located. The response options were a geographically isolated area; village or rural (farm) area; on the outskirts of a town/city; close to the center of a town/city. Higher numbers indicated generally greater urbanization.

Average Class Size (Science, Mathematics)
Average class size was as reported by principals on the school questionnaire. It does not refer specifically either to science or mathematics classes in the school.

Aspirations for Future Education (Science, Mathematics)
In the student questionnaire, each student was asked to identify the level of education that he or she expected to receive, with "finished university" being the highest option available. The school mean was used to represent this variable in the hierarchical analyses.

Mother's Press (Science, Mathematics)
The mother's press variable in the hierarchical analyses was derived by first taking for each student the mean of the three variables asking the student to report whether his or her mother thinks it is important to do well in science, mathematics, and the language of the test. Responses were on a 4-point scale ranging from "strongly agree" to "strongly disagree." The school average was used in the hierarchical analyses.

Self Press (Science, Mathematics)
The self press variable in the hierarchical analyses was derived by first taking for each student the mean of the three variables asking the student to report whether his or her mother thinks it is important to do well in science, mathematics, and the language of the test. Responses were on a 4-point scale ranging from "strongly agree" to "strongly disagree." The school average was used in the hierarchical analyses.

School Average Home Background Index (Science, Mathematics)
The school average on the home background index was used as a school-level variable in some of the hierarchical analyses.

Appendix B

Predictors of School Effectiveness in Science

Exhibit B.1 Predictors of School Effectiveness in Science, Eighth Grade*, Australia

Variance Decomposition: Between Schools 23%; Within Schools 77%; Total 100%	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	74%		74%		74%		74%		75%		75%		48%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	76	0.25	2	0.76	27	0.75	25	0.76	13	0.92	32	0.80	548	0.00
Homework (3 Subjects)	48	0.00	5	0.00	49	0.00	48	0.00	38	0.01	37	0.01		
Homework (Amount Sci.)	-62	0.00	-65	0.00	-63	0.00	-63	0.00	-68	0.00	-62	0.01		
Attitude to Science	-1	0.96	-2	0.85	-2	0.89	-1	0.92	-8	0.58	-8	0.61		
Efficacy of Science	125	0.00	13	0.00	130	0.00	129	0.00	119	0.00	115	0.00		
Experiments	-5	0.61	-3	0.76	-2	0.81	-3	0.79	0	0.99	0	0.97		
Teaching Experience			-1	0.06	-1	0.06	-1	0.06	-1	0.11	-1	0.09		
Readiness to Teach Gen. Sci.			1	0.25	17	0.20	18	0.19	18	0.18	19	0.17		
Student Admin. Violations					-5	0.27	-5	0.26	-4	0.38	-3	0.50		
Serious Student Misbehavior					4	0.44	5	0.43	3	0.64	3	0.63		
Urban Location							-2	0.72	0	0.92	-1	0.90		
Class Size							0	0.68	1	0.55	0	0.60		
Future Aspirations									10	0.22	7	0.39		
Self Press									-74	0.07	-77	0.06		
Mother's Press									95	0.02	100	0.02		
Home Background Index											16	0.45	100	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.2 Predictors of School Effectiveness in Science, Eighth Grade*, Austria

Variance Decomposition		Models of School Effectiveness													
Between Schools	22%	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
Within Schools	78%	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Total	100%														
Percentage of Between School Variance Explained by Model		33%		37%		36%		42%		51%		54%		46%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)		Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept		497	0.00	409	0.00	392	0.00	337	0.01	229	0.11	283	0.05	569	0.00
Homework (3 Subjects)		61	0.02	63	0.02	67	0.01	68	0.01	55	0.03	61	0.01		
Homework (Amount Sci.)		-58	0.01	-59	0.01	-65	0.01	-63	0.01	-54	0.02	-57	0.01		
Attitude to Science		31	0.16	28	0.20	27	0.21	23	0.27	28	0.18	30	0.14		
Efficacy of Science		-48	0.05	-35	0.16	-36	0.16	-32	0.20	-22	0.37	-22	0.36		
Experiments		5	0.63	4	0.69	1	0.93	6	0.62	9	0.45	6	0.59		
Teaching Experience				-2	0.12	-2	0.11	-2	0.04	-1	0.37	-1	0.50		
Readiness to Teach Gen. Sci.				38	0.11	37	0.13	41	0.10	28	0.25	25	0.30		
Student Admin. Violations						12	0.37	1	0.96	-6	0.65	-11	0.38		
Serious Student Misbehaviors						6	0.73	13	0.44	10	0.50	17	0.27		
Urban Location								12	0.02	5	0.33	2	0.72		
Class Size								0	0.40	0	0.21	0	0.37		
Future Aspirations										25	0.02	8	0.52		
Self Press										18	0.65	17	0.66		
Mother's Press										1	0.98	5	0.92		
Home Background Index												63	0.06	96	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.3 Predictors of School Effectiveness in Science, Eighth Grade*, Belgium (Flemish)

Variance Decomposition			Models of School Effectiveness													
			Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
Between Schools		18%	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Within Schools		82%														
	Total	100%														
Percentage of Between School Variance Explained by Model			40%		38%		42%		51%		68%		72%		46%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)			Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept			197	0.02	198	0.02	233	0.01	174	0.05	262	0.02	284	0.01	560	0.00
Homework (3 Subjects)			49	0.02	47	0.02	40	0.05	35	0.08	7	0.71	7	0.71		
Homework (Amount Sci.)			-41	0.00	-40	0.00	-42	0.00	-36	0.00	-19	0.12	-11	0.36		
Attitude to Science			33	0.01	33	0.01	38	0.00	35	0.00	25	0.04	25	0.03		
Efficacy of Science			45	0.01	47	0.01	44	0.01	46	0.01	32	0.06	33	0.04		
Experiments			7	0.53	8	0.50	7	0.53	7	0.52	-4	0.72	-8	0.43		
Teaching Experience					0	0.43	0	0.38	0	0.16	0	0.47	0	0.27		
Readiness to Teach Gen. Sci.					-5	0.59	-3	0.71	0	0.98	7	0.36	8	0.29		
Student Admin. Violations							-5	0.55	-6	0.41	-5	0.45	-3	0.64		
Serious Student Misbehavior							-9	0.14	-3	0.65	3	0.62	1	0.91		
Urban Location									-1	0.88	-1	0.84	-4	0.28		
Class Size									3	0.00	2	0.01	1	0.08		
Future Aspirations											14	0.00	11	0.00		
Self Press											6	0.78	14	0.51		
Mother's Press											11	0.69	12	0.63		
Home Background Index													51	0.02	102	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.4 Predictors of School Effectiveness in Science, Eighth Grade*, Belgium (French)

Variance Decomposition		
Between Schools	20%	
Within Schools	80%	
Total	100%	

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	52%		54%		56%		64%		82%		85%		75%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	256	0.00	221	0.01	190	0.05	168	0.08	31	0.76	159	0.16	477	0.00
Homework (3 Subjects)	71	0.00	70	0.00	77	0.00	66	0.00	33	0.06	24	0.17		
Homework (Amount Sci.)	-29	0.11	-27	0.13	-35	0.06	-36	0.04	-13	0.40	-15	0.34		
Attitude to Science	4	0.75	5	0.68	7	0.55	10	0.42	14	0.24	10	0.36		
Efficacy of Science	24	0.22	21	0.27	23	0.25	19	0.31	16	0.33	13	0.43		
Experiments	-10	0.15	-8	0.27	-6	0.43	-7	0.32	-4	0.55	-4	0.54		
Teaching Experience			0	0.50	0	0.62	0	0.77	0	0.19	0	0.38		
Readiness to Teach Gen. Sci.			16	0.11	15	0.14	13	0.19	11	0.22	11	0.21		
Student Admin. Violations					-8	0.08	-9	0.05	-6	0.09	-6	0.12		
Serious Student Misbehaviors					9	0.14	10	0.10	9	0.08	7	0.14		
Urban Location							-1	0.83	-2	0.71	0	0.91		
Class Size							3	0.03	2	0.10	2	0.15		
Future Aspirations									28	0.00	18	0.02		
Self Press									64	0.07	32	0.41		
Mother's Press									-7	0.86	2	0.96		
Home Background Index											39	0.07	102	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.5 Predictors of School Effectiveness in Science, Eighth Grade*, Canada

Variance Decomposition: Between Schools 15%; Within Schools 85%; Total 100%	Models of School Effectiveness: Model 1 – Classroom Characteristics		Model 2 – Model 1 with Teacher Characteristics		Model 3 – Model 2 with School Climate		Model 4 – Model 3 with School Location and Size		Model 5 – Model 4 with Home – School Interaction		Model 6 – Model 5 with Home Background Index		Model 7 – Home Background Index Only	
Percentage of Between School Variance Explained by Model	27%		28%		30%		31%		35%		37%		30%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	411	0.00	373	0.00	395	0.00	419	0.00	334	0.00	406	0.00	533	0.00
Homework (3 Subjects)	12	0.28	13	0.21	11	0.32	13	0.24	15	0.17	10	0.39		
Homework (Amount Sci.)	-25	0.11	-30	0.06	-30	0.06	-30	0.06	-24	0.14	-21	0.19		
Attitude to Science	8	0.45	8	0.43	8	0.42	6	0.54	18	0.09	18	0.09		
Efficacy of Science	32	0.02	37	0.01	36	0.01	36	0.01	35	0.02	24	0.13		
Experiments	-8	0.14	-5	0.35	-6	0.34	-6	0.27	-7	0.21	-7	0.22		
Teaching Experience			0	0.23	0	0.34	0	0.37	0	0.28	0	0.39		
Readiness to Teach Gen. Sci.			8	0.27	8	0.26	8	0.27	5	0.47	6	0.42		
Student Admin. Violations					0	0.91	0	0.89	-1	0.80	0	0.93		
Serious Student Misbehaviors					-8	0.10	-7	0.13	-5	0.29	-5	0.28		
Urban Location							-3	0.41	-3	0.33	-3	0.29		
Class Size							-1	0.29	0	0.49	-1	0.39		
Future Aspirations									-2	0.82	-5	0.53		
Self Press									82	0.00	72	0.01		
Mother's Press									-46	0.10	-42	0.14		
Home Background Index											29	0.05	42	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.6 Predictors of School Effectiveness in Science, Eighth Grade*, Czech Republic

Variance Decomposition	
Between Schools	12%
Within Schools	88%
Total	100%

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	43%		44%		49%		51%		75%		75%		32%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	256	0.02	326	0.00	305	0.01	324	0.00	271	0.03	269	0.03	574	0.00
Homework (3 Subjects)	19	0.11	21	0.07	17	0.13	19	0.09	18	0.08	17	0.10		
Homework (Amount Sci.)	35	0.05	33	0.06	34	0.05	30	0.09	11	0.48	12	0.44		
Attitude to Science	-14	0.40	-12	0.46	-6	0.72	-6	0.70	8	0.61	6	0.67		
Efficacy of Science	52	0.00	51	0.00	50	0.00	48	0.00	31	0.03	32	0.02		
Experiments	33	0.12	28	0.20	40	0.06	25	0.26	-2	0.93	-3	0.89		
Teaching Experience			0	0.96	0	0.68	0	0.69	0	0.62	0	0.73		
Readiness to Teach Gen. Sci.			-24	0.08	-26	0.05	-23	0.08	-13	0.25	-14	0.23		
Student Admin. Violations					-8	0.14	-8	0.13	-1	0.87	0	0.97		
Serious Student Misbehaviors					-8	0.17	-8	0.17	-10	0.05	-11	0.05		
Urban Location							0	1.00	0	0.96	1	0.85		
Class Size							1	0.01	1	0.03	1	0.03		
Future Aspirations									19	0.00	20	0.00		
Self Press									42	0.08	45	0.06		
Mother's Press									13	0.61	9	0.72		
Home Background Index											-11	0.41	50	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.7 Predictors of School Effectiveness in Science, Eighth Grade*, France

Variance Decomposition	
Between Schools	15%
Within Schools	85%
Total	100%

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	38%		43%		48%		50%		60%		60%		31%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	314	0.00	336	0.00	345	0.00	335	0.00	412	0.00	435	0.00	498	0.00
Homework (3 Subjects)	47	0.00	49	0.00	45	0.00	45	0.00	24	0.09	24	0.09		
Homework (Amount Sci.)	-21	0.27	-27	0.15	-21	0.25	-26	0.17	-18	0.32	-20	0.27		
Attitude to Science	12	0.33	8	0.53	12	0.31	11	0.38	3	0.82	1	0.90		
Efficacy of Science	21	0.17	20	0.19	11	0.45	12	0.42	1	0.96	1	0.96		
Experiments	-9	0.12	-9	0.11	-6	0.30	-6	0.26	-6	0.29	-5	0.31		
Teaching Experience			1	0.04	1	0.12	1	0.08	1	0.11	1	0.08		
Readiness to Teach Gen. Sci.			-9	0.31	-7	0.40	-9	0.30	-5	0.58	-4	0.62		
Student Admin. Violations					-12	0.01	-12	0.02	-14	0.00	-13	0.01		
Serious Student Misbehaviors					11	0.09	11	0.11	11	0.08	11	0.08		
Urban Location							-5	0.20	-5	0.14	-6	0.09		
Class Size							1	0.19	1	0.26	1	0.39		
Future Aspirations									13	0.00	10	0.04		
Self Press									-21	0.35	-24	0.29		
Mother's Press									1	0.98	3	0.91		
Home Background Index											17	0.34	54	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.8 Predictors of School Effectiveness in Science, Eighth Grade*, Hong Kong

Variance Decomposition			
Between Schools	30%		
Within Schools	70%		
Total	100%		

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
Models of School Effectiveness	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	65%		64%		65%		66%		68%		75%		44%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	330	0.01	343	0.01	349	0.01	255	0.06	394	0.03	390	0.02	522	0.00
Homework (3 Subjects)	88	0.00	87	0.00	77	0.00	71	0.00	41	0.09	46	0.03		
Homework (Amount Sci.)	-33	0.37	-33	0.38	-28	0.44	-19	0.60	-12	0.74	-36	0.29		
Attitude to Science	24	0.23	27	0.19	29	0.15	22	0.27	20	0.33	20	0.30		
Efficacy of Science	-7	0.84	-11	0.77	-1	0.98	7	0.85	7	0.86	-4	0.90		
Experiments	-31	0.01	-32	0.01	-29	0.02	-26	0.04	-21	0.10	-21	0.07		
Teaching Experience			0	0.41	0	0.58	0	0.68	0	0.93	0	0.70		
Readiness to Teach Gen. Sci.			-4	0.65	-7	0.48	-3	0.73	-7	0.48	0	1.00		
Student Admin. Violations					-3	0.57	-2	0.64	-3	0.53	-2	0.66		
Serious Student Misbehaviors					-7	0.41	-8	0.31	-7	0.40	-6	0.45		
Urban Location							6	0.36	9	0.20	5	0.42		
Class Size							2	0.14	1	0.42	1	0.44		
Future Aspirations									11	0.30	9	0.34		
Self Press									-36	0.46	-13	0.77		
Mother's Press									-24	0.57	-16	0.66		
Home Background Index											62	0.00	133	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.9 Predictors of School Effectiveness in Science, Eighth Grade*, Ireland

Variance Decomposition			Models of School Effectiveness													
Between Schools 36% / Within Schools 64% / Total 100%			Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
			Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model			61%		61%		61%		61%		67%		72%		49%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)			Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept			99	0.21	184	0.08	197	0.06	174	0.11	161	0.22	220	0.08	537	0.00
Homework (3 Subjects)			113	0.00	108	0.00	107	0.00	102	0.00	75	0.00	63	0.00		
Homework (Amount Sci.)			-28	0.40	-25	0.46	-28	0.41	-24	0.48	-5	0.89	-19	0.55		
Attitude to Science			22	0.11	24	0.08	23	0.11	24	0.10	22	0.13	33	0.02		
Efficacy of Science			31	0.17	30	0.19	33	0.15	33	0.15	15	0.52	3	0.91		
Experiments			-6	0.36	-7	0.32	-6	0.40	-5	0.44	-2	0.76	2	0.75		
Teaching Experience					0	0.90	0	0.95	0	0.97	0	0.50	0	0.49		
Readiness to Teach Gen. Sci.					-27	0.20	-27	0.19	-30	0.16	-33	0.11	-20	0.31		
Student Admin. Violations							-4	0.41	-4	0.41	-1	0.85	-1	0.80		
Serious Student Misbehaviors							-3	0.77	-2	0.80	1	0.86	-3	0.76		
Urban Location									1	0.79	-2	0.72	-4	0.34		
Class Size									1	0.35	0	0.81	-2	0.20		
Future Aspirations											24	0.00	18	0.01		
Self Press											27	0.46	34	0.34		
Mother's Press											12	0.78	23	0.56		
Home Background Index													75	0.00	135	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.10 Predictors of School Effectiveness in Science, Eighth Grade*, New Zealand

Variance Decomposition	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
Between Schools 35% Within Schools 65% Total 100%	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	56%		55%		55%		56%		68%		72%		58%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	142	0.05	108	0.26	127	0.20	113	0.25	58	0.58	168	0.11	526	0.00
Homework (3 Subjects)	71	0.00	72	0.00	73	0.00	72	0.00	40	0.01	32	0.02		
Homework (Amount Sci.)	-102	0.00	-101	0.00	-106	0.00	-100	0.00	-67	0.01	-63	0.01		
Attitude to Science	4	0.75	5	0.72	5	0.73	6	0.63	8	0.50	6	0.59		
Efficacy of Science	82	0.00	84	0.00	83	0.00	80	0.00	55	0.00	34	0.07		
Experiments	-9	0.43	-7	0.53	-6	0.57	-7	0.52	1	0.92	-1	0.93		
Teaching Experience			0	0.78	0	0.93	0	0.83	0	0.99	0	0.85		
Readiness to Teach Gen. Sci.			9	0.57	7	0.64	4	0.78	-2	0.87	6	0.65		
Student Admin. Violations					-7	0.15	-6	0.19	-5	0.21	-2	0.54		
Serious Student Misbehaviors					4	0.52	3	0.60	9	0.11	10	0.07		
Urban Location							-8	0.08	-9	0.04	-8	0.03		
Class Size							2	0.07	1	0.23	1	0.40		
Future Aspirations									32	0.00	24	0.00		
Self Press									-1	0.97	-12	0.67		
Mother's Press									43	0.23	49	0.15		
Home Background Index											64	0.00	126	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.11 Predictors of School Effectiveness in Science, Eighth Grade*, Singapore

Variance Decomposition			
Between Schools	41%		
Within Schools	59%		
Total	100%		

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	64%		63%		66%		66%		82%		83%		62%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	-67	0.49	-52	0.60	5	0.96	-59	0.60	-132	0.30	-74	0.55	602	0.00
Homework (3 Subjects)	111	0.00	110	0.00	101	0.00	99	0.00	65	0.01	53	0.02		
Homework (Amount Sci.)	-90	0.00	-90	0.00	-79	0.00	-78	0.00	-64	0.00	-53	0.00		
Attitude to Science	36	0.06	35	0.08	38	0.05	37	0.06	34	0.03	36	0.02		
Efficacy of Science	130	0.00	133	0.00	126	0.00	132	0.00	52	0.01	50	0.02		
Experiments	-42	0.00	-41	0.00	-37	0.00	-37	0.00	-24	0.02	-20	0.05		
Teaching Experience			0	0.97	0	0.71	0	0.68	0	0.72	0	0.63		
Readiness to Teach Gen. Sci.			-9	0.40	-15	0.15	-13	0.19	-5	0.52	-6	0.47		
Student Admin. Violations					-11	0.02	-9	0.04	-3	0.35	-3	0.42		
Serious Student Misbehaviors					-1	0.94	-1	0.90	-2	0.83	0	0.96		
Urban Location							11	0.16	2	0.75	3	0.65		
Class Size							0	0.73	0	0.69	1	0.46		
Future Aspirations									66	0.00	53	0.00		
Self Press									38	0.39	28	0.52		
Mother's Press									9	0.82	26	0.51		
Home Background Index											44	0.01	162	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.12 Predictors of School Effectiveness in Science, Eighth Grade*, Slovak Republic

Variance Decomposition	
Between Schools	15%
Within Schools	85%
Total	100%

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	39%		38%		37%		38%		48%		47%		32%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	177	0.22	225	0.13	202	0.19	170	0.28	90	0.60	107	0.54	537	0.00
Homework (3 Subjects)	33	0.09	34	0.07	39	0.06	47	0.02	38	0.07	38	0.07		
Homework (Amount Sci.)	-6	0.76	-2	0.94	-4	0.82	-1	0.97	2	0.91	1	0.95		
Attitude to Science	-7	0.77	-7	0.77	-6	0.80	-3	0.90	-1	0.95	1	0.98		
Efficacy of Science	51	0.02	47	0.02	49	0.02	43	0.04	32	0.11	33	0.11		
Experiments	36	0.09	32	0.14	29	0.19	24	0.29	24	0.26	22	0.32		
Teaching Experience			0	0.31	0	0.37	0	0.34	0	0.64	0	0.70		
Readiness to Teach Gen. Sci.			-12	0.36	-10	0.48	-12	0.40	-3	0.81	-3	0.81		
Student Admin. Violations					7	0.46	6	0.54	7	0.45	7	0.44		
Serious Student Misbehaviors					0	0.98	1	0.91	-1	0.91	-2	0.84		
Urban Location							1	0.86	-3	0.59	-3	0.51		
Class Size							2	0.09	1	0.42	1	0.44		
Future Aspirations									18	0.00	16	0.01		
Self Press									19	0.62	18	0.63		
Mother's Press									20	0.63	17	0.68		
Home Background Index											11	0.59	38	0.02

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.13 Predictors of School Effectiveness in Science, Eighth Grade*, Sweden

Variance Decomposition														
Between Schools 11% Within Schools 89% Total 100%	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	53%		54%		52%		52%		62%		68%		54%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	191	0.01	214	0.01	212	0.01	198	0.02	120	0.25	174	0.09	537	0.00
Homework (3 Subjects)	41	0.03	44	0.02	43	0.04	45	0.03	42	0.03	32	0.09		
Homework (Amount Sci.)	-34	0.12	-33	0.13	-34	0.13	-30	0.19	-40	0.09	-28	0.22		
Attitude to Science	34	0.05	30	0.08	31	0.09	25	0.18	21	0.28	19	0.30		
Efficacy of Science	40	0.04	42	0.03	42	0.04	43	0.03	43	0.03	29	0.13		
Experiments	8	0.26	8	0.29	8	0.30	7	0.38	9	0.18	10	0.14		
Teaching Experience			0	0.57	0	0.58	0	0.54	0	0.42	0	0.53		
Readiness to Teach Gen. Sci.			-11	0.24	-11	0.25	-10	0.27	-13	0.13	-9	0.27		
Student Admin. Violations					-1	0.90	0	1.00	1	0.85	2	0.60		
Serious Student Misbehaviors					1	0.85	0	0.99	-1	0.84	-3	0.62		
Urban Location							3	0.39	-1	0.89	-1	0.76		
Class Size							1	0.54	0	0.88	0	0.78		
Future Aspirations									20	0.00	17	0.00		
Self Press									34	0.21	28	0.27		
Mother's Press									-6	0.83	8	0.78		
Home Background Index											41	0.00	68	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit B.14 Predictors of School Effectiveness in Science, Eighth Grade*, United States

Variance Decomposition	
Between Schools	34%
Within Schools	66%
Total	100%

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home – School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	73%		73%		73%		74%		76%		78%		66%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	158	0.01	151	0.02	154	0.02	211	0.00	156	0.17	273	0.02	535	0.00
Homework (3 Subjects)	53	0.00	53	0.00	52	0.00	58	0.00	51	0.00	33	0.02		
Homework (Amount Sci.)	-89	0.00	-91	0.00	-90	0.00	-89	0.00	-83	0.00	-71	0.00		
Attitude to Science	-14	0.21	-11	0.35	-10	0.39	-11	0.32	-1	0.92	3	0.82		
Efficacy of Science	104	0.00	101	0.00	101	0.00	92	0.00	81	0.00	60	0.01		
Experiments	-4	0.50	-2	0.73	-3	0.67	-3	0.67	-1	0.92	-2	0.83		
Teaching Experience			1	0.16	1	0.16	0	0.20	0	0.17	0	0.27		
Readiness to Teach Gen. Sci.			-2	0.87	-1	0.91	-3	0.79	-4	0.67	-4	0.68		
Student Admin. Violations					1	0.83	3	0.55	3	0.59	4	0.40		
Serious Student Misbehaviors					-2	0.69	-1	0.82	0	0.95	-3	0.64		
Urban Location							-8	0.03	-8	0.04	-9	0.02		
Class Size							-1	0.37	0	0.46	0	0.43		
Future Aspirations									11	0.04	10	0.06		
Self Press									58	0.07	46	0.15		
Mother's Press									-47	0.20	-38	0.28		
Home Background Index											36	0.01	82	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Appendix C

Predictors of School Effectiveness in Mathematics

Exhibit C.1 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Australia

Variance Decomposition														
Between Schools 50%														
Within Schools 50%														
Total 100%														

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	71%		71%		71%		71%		81%		81%		50%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	140	0.00	13	0.00	15	0.00	17	0.00	20	0.01	21	0.01	53	0.00
Homework (3 Subjects)	79	0.00	7	0.00	7	0.00	7	0.00	4	0.00	3	0.00		
Homework (Amount)	-101	0.00	-100	0.00	-95	0.00	-92	0.00	-78	0.00	-69	0.00		
Homework (In Class Checking)	16	0.00	1	0.00	1	0.00	1	0.00	1	0.00	1	0.01		
Attitude to Mathematics	23	0.09	2	0.07	2	0.09	2	0.15	-1	0.96	4	0.77		
Classroom Environment	50	0.00	4	0.00	5	0.00	5	0.00	4	0.00	4	0.00		
Math Class Size	2	0.00	2	0.00	2	0.00	2	0.00	1	0.03	1	0.03		
Teaching Experience			0	0.42	0	0.33	0	0.33	0	0.26	0	0.32		
Student Admin. Violations					-9	0.04	-9	0.05	-9	0.02	-7	0.10		
Serious Student Misbehaviors					6	0.32	6	0.32	1	0.02	1	0.01		
Urban Location							-5	0.28	-7	0.08	-7	0.06		
Class Size							0	0.81	0	0.63	0	0.75		
Future Aspirations									3	0.00	2	0.00		
Self Press									-20	0.40	-29	0.22		
Mother's Press									2	0.95	1	0.49		
Home Background Index											3	0.01	15	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.2 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Belgium (Flemish)

Variance Decomposition	
Between Schools	53%
Within Schools	47%
Total	100%

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	46%		45%		44%		43%		66%		69%		38%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	141	0.06	139	0.07	139	0.10	115	0.20	132	0.19	174	0.07	572	0.00
Homework (3 Subjects)	63	0.01	63	0.01	63	0.01	66	0.01	12	0.59	14	0.52		
Homework (Amount)	-43	0.00	-44	0.00	-44	0.00	-43	0.00	-12	0.32	-4	0.72		
Homework (In Class Checking)	-6	0.48	-6	0.45	-6	0.46	-7	0.40	-10	0.14	-7	0.26		
Attitude to Mathematics	26	0.13	25	0.16	25	0.16	25	0.17	23	0.14	15	0.32		
Classroom Environment	59	0.00	58	0.00	59	0.00	59	0.00	42	0.00	44	0.00		
Math Class Size	4	0.00	5	0.00	5	0.00	5	0.00	3	0.00	3	0.00		
Teaching Experience			0	0.57	0	0.57	0	0.58	0	0.45	0	0.42		
Student Admin. Violations					-1	0.94	-3	0.78	0	0.96	5	0.54		
Serious Student Misbehaviors					0	0.96	2	0.86	11	0.11	7	0.34		
Urban Location							5	0.34	6	0.14	1	0.83		
Class Size							0	0.99	0	0.91	-1	0.45		
Future Aspirations									26	0.00	20	0.00		
Self Press									44	0.15	39	0.18		
Mother's Press									-2	0.96	11	0.70		
Home Background Index											80	0.00	186	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.3 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Belgium (French)

Variance Decomposition	
Between Schools	32%
Within Schools	68%
Total	100%

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	42%		41%		44%		47%		78%		81%		59%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	154	0.09	142	0.13	181	0.06	203	0.03	24	0.79	183	0.13	539	0.00
Homework (3 Subjects)	79	0.02	77	0.03	65	0.06	59	0.09	22	0.40	5	0.87		
Homework (Amount)	-46	0.03	-48	0.03	-47	0.03	-49	0.02	-29	0.08	-31	0.06		
Homework (In Class Checking)	14	0.13	13	0.16	14	0.15	12	0.21	8	0.24	10	0.13		
Attitude to Mathematics	20	0.27	23	0.22	23	0.21	10	0.60	5	0.73	-1	0.97		
Classroom Environment	20	0.16	20	0.16	22	0.11	28	0.05	28	0.01	31	0.01		
Math Class Size	4	0.02	4	0.01	4	0.01	1	0.50	0	0.86	0	0.78		
Teaching Experience			0	0.40	1	0.28	0	0.39	0	0.96	0	0.94		
Student Admin. Violations					-10	0.08	-10	0.10	-7	0.14	-7	0.09		
Serious Student Misbehaviors					4	0.63	4	0.58	5	0.38	5	0.37		
Urban Location							-5	0.40	-4	0.28	-2	0.55		
Class Size							4	0.05	3	0.08	2	0.14		
Future Aspirations									42	0.00	29	0.00		
Self Press									75	0.06	36	0.40		
Mother's Press									7	0.88	23	0.59		
Home Background Index											54	0.04	137	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.4 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Canada

Variance Decomposition	
Between Schools	20%
Within Schools	80%
Total	100%

Models of School Effectiveness	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	25%		25%		27%		29%		39%		39%		8%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	505	0.00	511	0.00	509	0.00	498	0.00	491	0.00	497	0.00	523	0.00
Homework (3 Subjects)	26	0.01	26	0.01	24	0.01	24	0.01	15	0.12	13	0.18		
Homework (Amount)	-29	0.02	-28	0.02	-25	0.04	-25	0.03	-21	0.07	-20	0.09		
Homework (In Class)	0	0.98	0	0.99	0	0.96	0	0.99	2	0.68	2	0.66		
Attitude to Mathematics	-43	0.00	-44	0.00	-40	0.00	-41	0.00	-28	0.03	-27	0.03		
Classroom Environment	39	0.00	39	0.00	37	0.00	38	0.00	32	0.00	33	0.00		
Math Class Size	0	0.56	0	0.60	0	0.55	0	0.81	0	0.39	0	0.40		
Teaching Experience			0	0.29	0	0.38	0	0.47	0	0.39	0	0.34		
Student Admin. Violations					7	0.04	6	0.09	5	0.12	6	0.09		
Serious Student Misbehaviors					-11	0.02	-12	0.01	-9	0.07	-9	0.07		
Urban Location							-1	0.81	-1	0.63	-2	0.57		
Class Size							1	0.09	1	0.06	1	0.07		
Future Aspirations									10	0.08	9	0.13		
Self Press									60	0.02	58	0.02		
Mother's Press									-101	0.00	-99	0.00		
Home Background Index											9	0.45	23	0.05

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.5 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Czech Republic

Variance Decomposition	
Between Schools	21%
Within Schools	79%
Total	100%

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	43%		43%		43%		43%		71%		71%		29%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	288	0.00	288	0.00	320	0.00	319	0.00	255	0.00	257	0.00	560	0.00
Homework (3 Subjects)	72	0.00	72	0.00	67	0.00	69	0.00	45	0.00	46	0.00		
Homework (Amount)	-65	0.01	-65	0.01	-58	0.02	-60	0.02	-45	0.03	-47	0.03		
Homework (In Class Checking)	2	0.70	2	0.70	2	0.68	4	0.55	-1	0.82	-1	0.81		
Attitude to Mathematics	-13	0.45	-13	0.45	-16	0.35	-19	0.27	-15	0.28	-15	0.30		
Classroom Environment	29	0.04	29	0.04	28	0.05	31	0.04	26	0.03	26	0.03		
Math Class Size	4	0.00	4	0.00	4	0.00	5	0.00	2	0.15	2	0.15		
Teaching Experience			0	0.99	0	0.92	0	0.95	0	0.92	0	0.94		
Student Admin. Violations					-12	0.11	-12	0.11	-1	0.84	-2	0.80		
Student Serious Misbehaviors					3	0.69	3	0.66	-3	0.68	-2	0.70		
Urban Location							2	0.60	0	0.99	0	0.97		
Class Size							-2	0.14	0	0.85	0	0.81		
Future Aspirations									30	0.00	29	0.00		
Self Press									25	0.38	23	0.44		
Mother's Press									7	0.83	8	0.80		
Home Background Index											5	0.78	72	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.6 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Germany

Variance Decomposition		
Between Schools		49%
Within Schools		51%
Total		100%

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	41%		40%		46%		44%		71%		77%		63%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	408	0.00	409	0.00	415	0.00	407	0.00	250	0.01	363	0.00	525	0.00
Homework (3 Subjects)	53	0.02	53	0.02	43	0.05	40	0.09	42	0.04	40	0.03		
Homework (Amount)	31	0.59	31	0.59	49	0.38	53	0.36	2	0.96	-19	0.66		
Homework (In Class Checking)	10	0.48	9	0.51	15	0.27	15	0.30	-2	0.88	0	0.98		
Attitude to Mathematics	-76	0.01	-77	0.01	-51	0.10	-48	0.14	-27	0.30	-20	0.41		
Classroom Environment	27	0.20	27	0.20	19	0.37	17	0.42	13	0.48	5	0.77		
Math Class Size	3	0.05	3	0.05	3	0.14	3	0.27	0	0.91	0	0.83		
Teaching Experience			0	0.92	0	0.88	0	0.94	0	0.99	-1	0.39		
Student Admin. Violations					-29	0.02	-30	0.02	-21	0.04	-20	0.03		
Serious Student Misbehaviors					11	0.46	12	0.46	20	0.12	14	0.24		
Urban Location							4	0.64	-6	0.40	-6	0.37		
Class Size							0	0.97	1	0.75	1	0.49		
Future Aspirations									36	0.00	14	0.21		
Self Press									64	0.07	40	0.23		
Mother's Press									2	0.96	19	0.60		
Home Background Index											114	0.01	205	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.7 Predictors of School Effectiveness in Mathematics, Eighth Grade*, France

Variance Decomposition		
Between Schools	29%	
Within Schools	71%	
Total	100%	

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	43%		42%		50%		52%		57%		56%		24%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	197	0.00	199	0.00	232	0.00	248	0.00	281	0.01	279	0.02	540	0.00
Homework (3 Subjects)	86	0.00	87	0.00	70	0.00	77	0.00	55	0.01	55	0.02		
Homework (Amount)	-25	0.21	-24	0.21	-10	0.59	-16	0.40	-12	0.52	-12	0.53		
Homework (In Class Checking)	9	0.13	10	0.12	14	0.03	14	0.02	9	0.13	9	0.14		
Attitude to Mathematics	-22	0.17	-24	0.16	-13	0.42	-11	0.52	-7	0.69	-7	0.68		
Classroom Environment	42	0.00	44	0.00	35	0.01	35	0.01	26	0.05	27	0.06		
Math Class Size	3	0.00	3	0.00	3	0.01	4	0.00	3	0.02	3	0.02		
Teaching Experience			0	0.66	0	0.72	0	0.54	0	0.98	0	0.98		
Student Admin. Violations					-24	0.00	-20	0.01	-20	0.01	-20	0.01		
Serious Student Misbehaviors					16	0.07	13	0.13	13	0.13	13	0.14		
Intercept							-5	0.16	-6	0.10	-6	0.12		
Intercept							-3	0.12	-2	0.26	-2	0.26		
Future Aspirations									15	0.01	15	0.05		
Self Press									1	0.98	1	0.98		
Mother's Press									-13	0.75	-13	0.74		
Home Background Index											-2	0.93	72	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.8 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Hong Kong

Variance Decomposition		
Between Schools	47%	
Within Schools	53%	
Total	100%	

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	64%		64%		66%		67%		69%		78%		42%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	19	0.86	12	0.92	66	0.54	-8	0.95	197	0.35	133	0.46	587	0.00
Homework (3 Subjects)	153	0.00	150	0.00	142	0.00	131	0.00	87	0.00	63	0.02		
Homework (Amount)	-18	0.67	-14	0.74	-23	0.57	-13	0.75	-10	0.81	-31	0.39		
Homework (In Class Checking)	14	0.36	14	0.37	17	0.28	19	0.22	7	0.64	5	0.73		
Attitude to Mathematics	53	0.13	54	0.12	49	0.15	40	0.24	24	0.51	40	0.20		
Classroom Environment	-7	0.72	-6	0.77	1	0.98	8	0.68	9	0.66	37	0.04		
Math Class Size	1	0.14	1	0.14	1	0.10	1	0.36	1	0.47	1	0.41		
Teaching Experience			0	0.44	0	0.48	0	0.49	0	0.67	0	0.49		
Student Admin. Violations					-9	0.24	-9	0.27	-9	0.25	-8	0.25		
Serious Student Misbehaviors					-8	0.52	-10	0.41	-7	0.56	-8	0.42		
Urban Location							11	0.24	15	0.11	10	0.21		
Class Size							2	0.26	1	0.58	1	0.66		
Future Aspirations									20	0.13	20	0.08		
Self Press									-38	0.52	-6	0.90		
Mother's Press									-26	0.63	-14	0.76		
Home Background Index											108	0.00	197	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.9 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Iceland

Variance Decomposition	
Between Schools	15%
Within Schools	85%
Total	100%

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	54%		52%		49%		52%		67%		70%		31%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	301	0.00	305	0.00	257	0.02	307	0.01	192	0.18	190	0.17	491	0.00
Homework (3 Subjects)	47	0.04	46	0.05	46	0.05	43	0.07	42	0.05	47	0.03		
Homework (Amount)	-43	0.01	-44	0.02	-38	0.07	-41	0.06	-28	0.18	-29	0.16		
Homework (In Class Checking)	11	0.19	11	0.19	12	0.17	8	0.36	8	0.35	7	0.38		
Attitude to Mathematics	-10	0.63	-12	0.59	-8	0.73	-7	0.76	-8	0.72	6	0.80		
Classroom Environment	39	0.01	42	0.03	44	0.02	38	0.05	26	0.17	12	0.54		
Math Class Size	1	0.38	1	0.37	1	0.34	2	0.08	2	0.10	2	0.13		
Teaching Experience			0	0.78	0	0.90	0	0.88	0	0.53	0	0.69		
Student Admin. Violations					7	0.45	5	0.56	6	0.44	2	0.82		
Serious Student Misbehaviors					5	0.75	2	0.91	4	0.80	7	0.60		
Urban Location							2	0.71	1	0.83	0	0.92		
Class Size							-2	0.15	-2	0.27	-2	0.24		
Future Aspirations									21	0.02	19	0.03		
Self Press									-44	0.31	-48	0.26		
Mother's Press									68	0.16	78	0.11		
Home Background Index											61	0.08	87	0.01

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.10 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Ireland

Variance Decomposition	
Between Schools	51%
Within Schools	49%
Total	100%

Models of School Effectiveness	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	67%		67%		67%		67%		76%		80%		52%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	164	0.01	161	0.01	172	0.02	211	0.01	93	0.43	158	0.16	524	0.00
Homework (3 Subjects)	84	0.00	84	0.00	83	0.00	87	0.00	69	0.00	57	0.00		
Homework (Amount)	-35	0.14	-34	0.15	-32	0.20	-33	0.18	-17	0.45	-21	0.30		
Homework (In Class Checking)	2	0.82	2	0.86	2	0.86	0	0.98	2	0.78	5	0.57		
Attitude to Mathematics	-9	0.63	-8	0.66	-8	0.68	-10	0.59	8	0.69	12	0.52		
Classroom Environment	27	0.04	26	0.05	26	0.05	24	0.07	4	0.74	13	0.26		
Math Class Size	4	0.00	4	0.00	4	0.00	5	0.00	3	0.00	3	0.00		
Teaching Experience			0	0.59	0	0.63	0	0.78	0	0.34	0	0.77		
Student Admin. Violations					-7	0.17	-6	0.25	-2	0.61	-4	0.33		
Serious Student Misbehaviors					6	0.52	3	0.76	14	0.12	11	0.19		
Urban Location							3	0.49	0	0.97	-3	0.47		
Class Size							-2	0.20	-3	0.04	-4	0.01		
Future Aspirations									32	0.00	20	0.00		
Self Press									45	0.20	48	0.13		
Mother's Press									-16	0.68	0	1.00		
Home Background Index											81	0.00	174	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.11 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Netherlands

Variance Decomposition	
Between Schools	54%
Within Schools	46%
Total	100%

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	62%		61%		66%		65%		79%		83%		54%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	27	0.84	39	0.78	129	0.33	77	0.59	3	0.98	70	0.55	551	0.00
Homework (3 Subjects)	124	0.00	119	0.01	102	0.01	105	0.01	95	0.01	95	0.00		
Homework (Amount)	-113	0.01	-114	0.01	-136	0.00	-139	0.00	-100	0.01	-77	0.02		
Homework (In Class Checking)	31	0.00	30	0.00	27	0.01	24	0.02	12	0.17	6	0.43		
Attitude to Mathematics	31	0.11	32	0.11	30	0.12	34	0.09	36	0.03	29	0.06		
Classroom Environment	-18	0.30	-19	0.29	-11	0.50	-11	0.56	-8	0.59	-3	0.86		
Math Class Size	5	0.00	5	0.00	5	0.00	4	0.01	4	0.01	4	0.00		
Teaching Experience			0	0.63	0	0.42	1	0.36	0	0.97	0	0.99		
Student Admin. Violations					-23	0.01	-22	0.01	-22	0.00	-14	0.05		
Serious Student Misbehaviors					7	0.44	10	0.34	9	0.29	6	0.43		
Urban Location							2	0.81	-1	0.84	-4	0.53		
Class Size							2	0.43	0	0.98	-2	0.37		
Future Aspirations									33	0.00	25	0.00		
Self Press									41	0.41	36	0.44		
Mother's Press									-7	0.88	-3	0.95		
Home Background Index											89	0.00	204	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.12 Predictors of School Effectiveness in Mathematics, Eighth Grade*, New Zealand

Variance Decomposition														
Between Schools 48%														
Within Schools 52%														
Total 100%														

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	52%		52%		53%		53%		65%		69%		53%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	217	0.00	222	0.00	256	0.00	254	0.00	179	0.07	200	0.04	508	0.00
Homework (3 Subjects)	76	0.00	76	0.00	73	0.00	73	0.00	38	0.01	25	0.07		
Homework (Amount)	-65	0.01	-65	0.01	-66	0.01	-61	0.02	-54	0.02	-35	0.12		
Homework (In Class Checking)	0	0.97	0	0.99	-3	0.69	-3	0.71	-3	0.62	-4	0.51		
Attitude to Mathematics	-3	0.90	-3	0.90	0	0.99	0	1.00	8	0.73	18	0.43		
Classroom Environment	22	0.15	23	0.15	20	0.19	24	0.14	16	0.27	13	0.36		
Math Class Size	4	0.00	4	0.00	4	0.00	4	0.00	2	0.01	2	0.01		
Teaching Experience			0	0.55	0	0.48	0	0.51	0	0.45	0	0.66		
Student Admin. Violations					-10	0.05	-10	0.06	-7	0.14	-4	0.44		
Serious Student Misbehaviors					2	0.80	1	0.84	6	0.37	6	0.33		
Urban Location							-4	0.43	-6	0.23	-7	0.16		
Class Size							0	0.83	0	0.77	0	0.87		
Future Aspirations									35	0.00	26	0.00		
Self Press									-2	0.94	-4	0.89		
Mother's Press									14	0.71	29	0.42		
Home Background Index											62	0.00	135	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.13 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Russian Federation

Variance Decomposition	
Between Schools	39%
Within Schools	61%
Total	100%

	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
Models of School Effectiveness	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	35%		34%		34%		35%		37%		45%		34%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	61	0.48	60	0.49	28	0.77	29	0.76	-27	0.85	76	0.57	530	0.00
Homework (3 Subjects)	104	0.00	104	0.00	107	0.00	104	0.00	102	0.00	93	0.00		
Homework (Amount)	-23	0.22	-23	0.23	-26	0.18	-27	0.16	-27	0.15	-33	0.07		
Homework (In Class Checking)	7	0.52	7	0.53	7	0.54	6	0.63	3	0.83	0	0.98		
Attitude to Mathematics	26	0.31	26	0.33	32	0.25	33	0.23	34	0.22	26	0.32		
Classroom Environment	22	0.19	22	0.21	20	0.26	19	0.29	16	0.37	19	0.27		
Math Class Size	2	0.01	2	0.01	2	0.01	1	0.42	1	0.48	1	0.33		
Teaching Experience			0	0.98	0	0.98	0	0.85	0	0.88	0	0.90		
Student Admin. Violations					-6	0.33	-6	0.36	-6	0.29	-5	0.34		
Serious Student Misbehaviors					17	0.16	16	0.19	20	0.11	24	0.04		
Urban Location							8	0.17	9	0.15	2	0.69		
Class Size							0	0.83	0	0.99	-1	0.53		
Future Aspirations									9	0.08	2	0.72		
Self Press									-42	0.34	-30	0.48		
Mother's Press									68	0.13	68	0.11		
Home Background Index											89	0.00	117	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.14 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Singapore

Variance Decomposition	
Between Schools	39%
Within Schools	61%
Total	100%

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	52%		53%		56%		56%		79%		82%		57%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	166	0.05	158	0.07	212	0.01	240	0.01	118	0.26	232	0.02	639	0.00
Homework (3 Subjects)	80	0.01	90	0.01	92	0.00	92	0.00	52	0.04	33	0.17		
Homework (Amount)	-50	0.00	-50	0.00	-42	0.01	-42	0.01	-42	0.00	-26	0.05		
Homework (In Class Checking)	-14	0.28	-14	0.28	-14	0.28	-14	0.27	-15	0.11	-16	0.08		
Attitude to Mathematics	21	0.35	16	0.47	10	0.65	9	0.67	-4	0.83	-12	0.46		
Classroom Environment	95	0.00	89	0.00	81	0.00	81	0.00	47	0.00	51	0.00		
Math Class Size	0	0.54	0	0.49	1	0.35	1	0.57	0	0.74	1	0.33		
Teaching Experience			0	0.12	1	0.04	1	0.04	0	0.10	1	0.04		
Student Admin. Violations					-3	0.54	-4	0.46	2	0.65	2	0.52		
Serious Student Misbehaviors					-21	0.06	-21	0.06	-16	0.05	-14	0.08		
Urban Location							-6	0.45	-6	0.28	-5	0.35		
Class Size							0	0.97	1	0.59	1	0.53		
Future Aspirations									62	0.00	42	0.00		
Self Press									4	0.92	-7	0.85		
Mother's Press									12	0.74	30	0.40		
Home Background Index											59	0.00	148	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.15 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Slovak Republic

Variance Decomposition: Between Schools 20%; Within Schools 80%; Total 100%	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	32%		32%		34%		32%		54%		55%		32%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	266	0.00	270	0.00	285	0.00	265	0.00	89	0.38	116	0.26	544	0.00
Homework (3 Subjects)	44	0.03	41	0.05	32	0.14	36	0.10	27	0.17	30	0.12		
Homework (Amount)	-37	0.14	-33	0.19	-26	0.31	-25	0.34	5	0.83	6	0.81		
Homework (In Class Checking)	3	0.74	3	0.77	0	1.00	0	0.99	4	0.64	4	0.63		
Attitude to Mathematics	43	0.04	46	0.03	56	0.01	52	0.03	41	0.05	41	0.05		
Classroom Environment	10	0.53	7	0.68	4	0.80	7	0.68	21	0.17	21	0.17		
Math Class Size	1	0.21	1	0.24	1	0.21	0	0.88	-1	0.67	-1	0.64		
Teaching Experience			0	0.35	0	0.30	0	0.29	0	0.54	0	0.67		
Student Admin. Violations					8	0.45	7	0.52	11	0.25	11	0.26		
Serious Student Misbehaviors					-16	0.05	-14	0.08	-12	0.09	-13	0.08		
Urban Location							1	0.82	-5	0.28	-7	0.15		
Class Size							2	0.41	1	0.56	1	0.59		
Future Aspirations									27	0.00	23	0.00		
Self Press									57	0.12	56	0.12		
Mother's Press									-3	0.94	-6	0.88		
Home Background Index											30	0.12	55	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.16 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Slovenia

Variance Decomposition: Between Schools 12%; Within Schools 88%; Total 100%	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	42%		40%		38%		36%		51%		51%		32%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	540	0.00	542	0.00	541	0.00	530	0.00	449	0.00	425	0.00	542	0.00
Homework (3 Subjects)	-12	0.57	-12	0.56	-12	0.58	-11	0.63	1	0.96	0	0.99		
Homework (Amount)	-50	0.00	-50	0.00	-50	0.00	-54	0.00	-47	0.01	-47	0.01		
Homework (In Class Checking)	-1	0.93	-1	0.92	-1	0.87	-1	0.88	0	0.97	-1	0.91		
Attitude to Mathematics	1	0.94	1	0.96	2	0.94	3	0.88	-2	0.91	-3	0.88		
Classroom Environment	16	0.12	16	0.12	16	0.13	17	0.11	16	0.12	15	0.14		
Math Class Size	2	0.08	2	0.08	2	0.16	1	0.42	1	0.33	1	0.30		
Teaching Experience			0	0.77	0	0.77	0	0.70	0	0.63	0	0.55		
Student Admin. Violations					0	1.00	0	0.95	-2	0.78	1	0.93		
Serious Student Misbehaviors					2	0.83	3	0.70	5	0.53	5	0.56		
Urban Location							-3	0.47	-4	0.24	-4	0.25		
Class Size							1	0.47	0	0.80	0	0.72		
Future Aspirations									13	0.02	16	0.01		
Self Press									38	0.22	43	0.17		
Mother's Press									-26	0.42	-26	0.42		
Home Background Index											-26	0.28	32	0.06

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.17 Predictors of School Effectiveness in Mathematics, Eighth Grade*, Sweden

Variance Decomposition: Between Schools 31%; Within Schools 69%; Total 100%	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	48%		47%		47%		47%		53%		68%		48%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	222	0.00	217	0.00	230	0.00	195	0.00	138	0.10	166	0.02	518	0.00
Homework (3 Subjects)	34	0.03	36	0.03	33	0.04	32	0.05	31	0.06	26	0.07		
Homework (Amount)	-59	0.01	-59	0.01	-55	0.02	-49	0.04	-52	0.02	-49	0.02		
Homework (In Class Checking)	0	0.93	0	0.96	0	0.95	-1	0.77	-2	0.65	-1	0.89		
Attitude to Mathematics	53	0.00	54	0.00	53	0.00	53	0.00	43	0.01	49	0.00		
Classroom Environment	8	0.48	6	0.60	6	0.61	6	0.63	3	0.83	-8	0.42		
Math Class Size	4	0.00	4	0.00	4	0.00	3	0.00	3	0.00	2	0.00		
Teaching Experience			0	0.56	0	0.60	0	0.50	0	0.32	0	0.21		
Student Admin. Violations					-2	0.74	-1	0.85	1	0.83	3	0.48		
Serious Student Misbehaviors					-3	0.77	-4	0.63	-6	0.48	-7	0.33		
Urban Location							3	0.43	0	0.95	-1	0.70		
Class Size							1	0.20	1	0.22	1	0.10		
Future Aspirations									20	0.00	13	0.00		
Self Press									7	0.77	7	0.77		
Mother's Press									15	0.53	33	0.13		
Home Background Index											83	0.00	110	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

Exhibit C.18 Predictors of School Effectiveness in Mathematics, Eighth Grade*, United States

Variance Decomposition		
Between Schools	52%	
Within Schools	48%	
Total	100%	

	Models of School Effectiveness													
	Model 1		Model 2		Model 3		Model 4		Model 5		Model 6		Model 7	
	Classroom Characteristics		Model 1 with Teacher Characteristics		Model 2 with School Climate		Model 3 with School Location and Size		Model 4 with Home- School Interaction		Model 5 with Home Background Index		Home Background Index Only	
Percentage of Between School Variance Explained by Model	52%		55%		54%		54%		61%		73%		64%	
Regression Coefficient Estimates (With Probabilities Indicating Significance Levels)	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.	Coeff.	Prob.
Intercept	237	0.00	223	0.00	232	0.00	233	0.00	384	0.00	442	0.00	504	0.00
Homework (3 Subjects)	62	0.00	59	0.00	58	0.00	59	0.00	44	0.00	20	0.06		
Homework (Amount)	-16	0.38	-15	0.40	-13	0.46	-14	0.45	-26	0.14	-21	0.16		
Homework (In Class Checking)	20	0.01	21	0.01	20	0.01	20	0.01	18	0.02	12	0.07		
Attitude to Mathematics	-24	0.13	-16	0.30	-15	0.34	-14	0.41	-22	0.20	-12	0.45		
Classroom Environment	70	0.00	63	0.00	62	0.00	61	0.00	54	0.00	34	0.00		
Math Class Size	0	0.19	0	0.33	0	0.33	0	0.33	0	0.21	0	0.36		
Teaching Experience			1	0.00	1	0.01	1	0.01	1	0.02	1	0.01		
Student Admin. Violations					-2	0.78	-1	0.80	-4	0.50	2	0.70		
Serious Student Misbehaviors					-1	0.89	-1	0.93	2	0.74	0	0.96		
Urban Location							-4	0.40	-4	0.30	-4	0.29		
Class Size							0	0.85	0	0.65	0	0.74		
Future Aspirations									13	0.00	9	0.03		
Self Press									3	0.91	-15	0.58		
Mother's Press									-91	0.01	-46	0.12		
Home Background Index											80	0.00	122	0.00

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

*Eighth grade in most countries; see Exhibit 1 for information about the grades tested in each country.

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