

Chapter 3

Effective Schools in Reading, Mathematics, and Science at the Fourth Grade

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Introduction

Results from several cycles of TIMSS and PIRLS as well as from considerable research conducted around the world have demonstrated the consistency of a number of fundamental school factors being associated with higher achievement across the school subjects of reading, mathematics, and science. Data gathered from the 34 countries and 3 benchmarking entities that conducted the TIMSS and PIRLS 2011 assessments with the same fourth grade students present a unique opportunity to study relative school effectiveness across countries in reading, mathematics, and science. This chapter examines how these

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important school factors operate across countries at the fourth grade and vary in an international context.

The TIMSS 2011 fourth grade assessments in mathematics and science and the PIRLS 2011 assessment in reading comprehension provide comprehensive, robust achievement measures in these three core learning areas. The assessments were based on comprehensive frameworks developed collaboratively with the participating countries, and included large numbers of items to assess these frameworks (175 items in mathematics, 168 items in science, and 130 items in reading). For each country, the data are based on nationally representative samples of students. Altogether, nearly 200,000 students took part in TIMSS and PIRLS 2011, with each student assessed in all three of the core school subjects.

In addition to comprehensive assessments of achievement, TIMSS and PIRLS 2011 each included an array of background questionnaires to collect information about the contexts for teaching and learning in each of the participating countries. The context questionnaires administered to school principals, teachers, and students were designed to collect a range of information about school environments, school resources, teacher preparation, and classroom instruction. In addition, a questionnaire for parents collected information about students' home environment. The TIMSS and PIRLS 2011 participants jointly developed the questionnaires, and the response data were used to create new TIMSS and PIRLS context questionnaire scales using IRT methods. These scales measure important school factors, such as academic climate, resource adequacy, school safety, curricular emphasis, and instructional engagement, as well as aspects of the home environment. The context questionnaire scales were developed in parallel across reading, mathematics, and science, and provide a solid foundation for studying the relative effectiveness of school and classroom contexts for teaching and learning.

This chapter is intended to illustrate the power of the TIMSS and PIRLS 2011 data for studying school effectiveness by exploring relationships among school environment and instruction, student home background, and student achievement in reading, mathematics, and science in the participating countries. As such, the study is not intended to be a definitive analysis of the factors associated with effective schools in each country. Rather, this chapter presents an analytic framework that could provide an overview of how these relationships vary across countries and be used as a starting point for more detailed analyses within countries.

School Effectiveness Analyses

School effectiveness analyses seek to improve educational practice by studying what makes for a successful school beyond having a student body where most of the students are from advantaged socioeconomic backgrounds. Using this approach, an effective school is one that has an effect on student achievement over and above home influences. From an analytic perspective, school effectiveness studies make use of multilevel modeling in order to analyze the relationship between school factors and achievement after controlling for the influences of students' home backgrounds. Because TIMSS and PIRLS 2011 included a home questionnaire completed by students' parents and primary caregivers, the data provide considerable information about students' home environments. This study uses these data to examine the effects of home environment on students' achievement and then to control for those effects in looking at the school factors. Examining students' schooling in the light of home factors can help to better understand the interaction between home and school effects.

According to Sammons (2007), researchers have been examining different aspects of school effectiveness in order to improve educational outcomes for students for more than 40 years; further, while definitions of school effectiveness vary, most researchers agree that, when comparing schools with similar student populations, an effective school is one that “adds extra value” to student achievement. That is, the characteristics students have when entering school are strongly associated with achievement and should be explicitly controlled in the analysis model in order to better isolate the effects of a school. An effective school has the capacity to improve students' achievement despite the characteristics of the student body.

Teddlie and Reynolds (2000) have traced the origins of school effective research back to the mid-1960s in the United States when most educational research involved investigating the relationship between inputs (human and physical resources) and outputs (student achievement). A school was defined by its material resources, and differences in student achievement were attributed to unequal opportunities in terms of school environments (Scheerens & Bosker, 1997). However, because school differences primarily were attributed to student background characteristics rather than educational practices, educational researchers were criticized for not measuring the educational processes within schools (Teddlie & Reynolds, 2000). In addition, the lack of sophisticated

methodology prevented researchers from making fair comparisons between schools (Creemers, Kyriakides, & Sammons, 2010).

In the 1980s, more contextual factors (e.g., psychological scales) and more sensitive outcome measures were used in school effectiveness research (Townsend, 2007). Also, advances in computing technology had made computer programs for multilevel modeling more widely available (Teddle & Reynolds, 2000). The most notable improvement in school effectiveness research, according to Rumberger & Palardy (2004), was using multilevel modeling to estimate the effects of factors on student outcomes more accurately, by looking at the effects at different levels in the education system (i.e., the student level, classroom level, and school level).

School effectiveness research distinguishes itself from other strands of educational effectiveness research, such as economically oriented studies and instructional effectiveness studies, by focusing on the importance of differences between schools (Scheerens & Bosker, 1997). Research investigating school differences focuses on the aspects of schools that have an influence on achievement so that the results can be used to suggest improvements and shape reform policies. As such, school effectiveness research uses the school as the major unit of change in educational reform (Teddle, 2010).

A Strong Conceptual Model

Like all studies of cross-sectional survey data, the statistical modeling conducted for this study is crucially dependent on the naturally-occurring variation and covariation in the data. The assumption is that expected relationships between variables will be reflected in observable patterns in the data. However, education systems are the result of management and development over many years, and often the variables of interest have been manipulated to achieve policy goals, so that expected relationships may not be apparent in the data. For example, the school system may be organized so that there is little difference between schools in the achievement of their students, making it difficult to relate school factors to student achievement. Similarly, there may be particular factors, such as instructional time, that are the same for all the schools in a country and consequently cannot play a role in a statistical model for that country. In this situation, it is important to have a strong conceptual model based on a clear vision of the essential characteristics of effective schools in order to guide the analysis.

This study of school effectiveness is deeply rooted in considerable work studying the factors that influence school quality, as documented in the *TIMSS 2011* and *PIRLS 2011 Contextual Frameworks* (Mullis, Martin, Ruddock, O’Sullivan, & Preuschoff, 2009; Mullis, Martin, Kennedy, Trong, & Sainsbury, 2009). Building on that body of research, the *TIMSS 2011 Results in Mathematics* (Mullis, Martin, Foy, & Arora, 2012), the *TIMSS 2011 Results in Science* (Martin, Mullis, Foy, & Stanco, 2012), and the *PIRLS 2011 Results in Reading* (Mullis, Martin, Foy, & Drucker, 2012) showed that students with the highest achievement typically attended schools that emphasize academic success, as indicated by rigorous curricular goals, effective teachers, students that desire to do well, and parental support. Students that attended schools with disorderly environments and reported more frequent bullying had much lower achievement than their counterparts in safe and orderly schools. Exhibit 3.1 presents this study’s conceptual framework of school effectiveness, informed by the latest results from TIMSS and PIRLS 2011 as well as the existing body of school effectiveness research.

Exhibit 3.1: Model of Effective Schools

Strongly supported by the research, this study maintains a firm conviction that effective schools:

Are Safe and Orderly

Support Academic Success

Have adequate facilities and equipment

Are staffed with well-prepared teachers

Have well-resourced classrooms

Provide effective instruction

First, TIMSS and PIRLS 2011 results showed that students who attended schools with disorderly environments and who reported more frequent bullying had much lower achievement than their counterparts in safe and orderly schools. It makes sense that for a school to be effective, it needs a safe and orderly environment, and that schools with considerable disciplinary problems are not conducive to higher student achievement. When students and teachers are fearful and worried about their safety, it is difficult to maintain a strong focus on academics.

Second, students with the highest achievement in TIMSS and PIRLS 2011 typically attended schools that emphasized academic success. In order to achieve excellence, it is not enough to simply “keep order”; the school administration

and teachers as well as the students and their parents must press for academic success. A school with a positive atmosphere supportive of high achievement and a rigorous academic program can even overcome socioeconomic disadvantages (McGuigan & Hoy, 2006). From this perspective, schools need to communicate their academic emphasis through clear and rigorous academic goals, and school administrators and teachers need to support these goals and believe that students can attain them. The effect of aiming for students' high achievement is greatest when there is a collective influence, including parents and the students themselves.

Third, TIMSS and PIRLS and many other studies have shown that resources are crucial for effective schooling, perhaps even more so in developing countries than in economically developed countries. The 2011 data showed that students in schools not affected by resource shortages had higher average achievement than their counterparts in less well-resourced schools. Successful schools are likely to have better working conditions and facilities, such that the physical environment is structurally sturdy, big enough, well-maintained, and comfortable (e.g., temperature and lighting). Additionally, effective schools have more instructional materials, such as books, computers, technologically innovative instructional aids, and equipment and supplies (everything from basic paper and pencils to science laboratory equipment).

Fourth, although the school environment and facilities can provide important support for teaching and learning, teacher quality is essential because most instruction is provided directly to students by classroom teachers. There is growing evidence that teacher preparation is a powerful predictor of students' achievement, perhaps even overcoming socioeconomic and language background factors (Darling-Hammond, 2000). To engage students in learning, teachers need to be well-prepared such that they have a solid mastery of the content in the subject to be taught and a repertoire of effective pedagogical approaches. In TIMSS 2011, higher achievement was related to teachers' having more teaching experience, being confident in their teaching, and being satisfied with their careers. The majority of fourth grade students had teachers with bachelor's degrees, and most had teachers that reported having at least ten years of teaching experience, being very well prepared to teach their subject matter, and feeling very confident in their teaching.

Fifth, teachers need well-resourced classrooms. There are many resources that can facilitate classroom teaching, such as textbooks, computers, instructional software, and equipment for various projects. There also are

some materials associated with instruction in specific subjects. For example, because having students read books and a variety of different types of materials is fundamental to developing their reading comprehension skills and strategies, a number of educational systems have invested in classroom libraries so that children can have ready access to books and magazines as part of their reading lessons and activities. Similarly, access to calculators and a variety of manipulative materials can be important to mathematics instruction, and science equipment, models, and materials can be central to science instruction.

Sixth, teachers need to provide effective, engaging instruction. Teachers who are well-prepared and well-resourced most likely would be in the best position to provide effective, engaging instruction. According to work supported by the US Center for Education Statistics (McLaughlin et al., 2005), student engagement focuses on the importance of the activity that brings the student and the subject matter content together. Engagement refers to the cognitive interaction between the students and instructional content, and this interaction can be stimulated by any instructional approach. What matters is students' in-the-moment cognitive interaction with the instructional content such that learning takes place. Of course, if students are being involved in the instruction in some way, even by attentive listening, then there is a much higher likelihood of engagement and learning. In TIMSS and PIRLS 2011, internationally, the fourth grade students who were "engaged" in their mathematics, science, and reading lessons had the highest achievement, followed by those "somewhat engaged," and then those few students "not engaged" with much lower achievement.

Measures of School Effectiveness

The large amount of background data collected in TIMSS and PIRLS 2011 was reviewed in order to select the school effectiveness measures to include in the present study. As a fundamental selection criterion, the measures needed to address school characteristics included in the conceptual model. In addition, because the idea was to study relative effects across reading, mathematics, and science, the measures needed to be available in parallel across all three subjects. Also, as much as possible, measures needed to be consistently related to higher achievement at the fourth grade across the three subject areas and across the participating countries. Finally, as matter of reliability and efficiency, it was decided primarily to use or modify scales that were included in the TIMSS and PIRLS 2011 international reports.

In the end, 11 context questionnaire scales were selected for inclusion in the analysis and combined into five robust school effectiveness measures: three measures of effective school environment, and two measures of effective school instruction. In general, each of the five measures of school effectiveness was based on a school average of several context questionnaire scales, with each context questionnaire scale typically including about six questions/statements. The components of the five school effectiveness measures are described in the following sections, with further detail available in *Technical Appendix B: School Effectiveness Models and Analyses*.

School Environment

Following this study’s conceptual model, the school effectiveness analyses include three measures of school environment:

- ◆ Schools are safe and orderly;
- ◆ Schools support academic success; and
- ◆ Schools have a physical environment and resources that are adequate for learning.

Schools Are Safe and Orderly

The measure of a school being safe and orderly was the school average of three different context questionnaire scales measuring school safety: one based on principals’ reports of discipline problems in the school, one based on teachers’ reports of school safety, and one based on students’ reports of being bullied.

School Discipline and Safety Scale—Principals’ reports of “hardly any problems,” “minor problems,” or “moderate problems” concerning 10 potential school problems:

- ◆ Students arriving late at school;
- ◆ Student absenteeism (i.e., unjustified absences);
- ◆ Classroom disturbances;
- ◆ Cheating;
- ◆ Profanity;
- ◆ Vandalism;
- ◆ Theft;
- ◆ Intimidation or verbal abuse among students (including texting, emailing, etc.);
- ◆ Physical fights among students; and
- ◆ Intimidation or verbal abuse of teachers or staff (including texting, emailing, etc.).

Safe and Orderly School Scale—Teachers’ degree of agreement with the following five statements:

- ◆ This school is located in a safe neighborhood;
- ◆ I feel safe at this school;
- ◆ This school’s security policies and practices are sufficient;
- ◆ The students behave in an orderly manner; and
- ◆ The students are respectful of the teacher.

Students Bullied at School Scale—Students’ reports about how often they experienced the following six bullying behaviors:

- ◆ I was made fun of or called names;
- ◆ I was left out of games or activities by other students;
- ◆ Someone spread lies about me;
- ◆ Something was stolen from me;
- ◆ I was hit or hurt by other students (e.g., shoving, hitting, kicking); and
- ◆ I was made to do things I didn’t want to do by other students.

Schools Support Academic Success

The measure of a school’s degree of support for academic success was the school average of two context questionnaire scales. In this case, teachers and principals provided responses to the same emphasis on academic success scale.

Teachers’ Reports, School Emphasis on Academic Success—Teachers’ responses characterizing five aspects of their school as Very High, High, or Medium:

Principals’ Reports, School Emphasis on Academic Success—Principals’ responses characterizing five aspects of their school as Very High, High, or Medium:

- ◆ Teachers’ understanding of the curricular goals;
- ◆ Teachers’ degree of success in implementing the school’s curriculum;
- ◆ Teachers’ expectation for student achievement;
- ◆ Parental support for student achievement; and
- ◆ Students’ desire to do well in school.

Adequate Environment and Resources

This effective schools measure was the school average of two context questionnaire scales: one based on teachers' views of their working conditions, and the other based on principals' perceptions of the degree to which the school facilities and resource availability were affecting the quality of instruction.

Teacher Working Conditions Scale—Teachers' reports that they had “Hardly Any Problems,” “Minor Problems,” or “Moderate Problems” concerning five potential problem areas:

- ◆ The school building needs significant repair;
- ◆ Classrooms are overcrowded;
- ◆ Teachers have too many teaching hours;
- ◆ Teachers do not have adequate workspace (e.g., for preparation, collaboration, or meeting with students); and
- ◆ Teachers do not have adequate instruction materials and supplies.

School Resource Shortage Scale—Principals' responses about whether instruction was “Not Affected,” “Somewhat Affected,” or “Affected A Lot” by resource shortages in four areas: A. general school resources (six questions); B. mathematics resources (six questions); C. science resources (six questions); and D. reading resources (five questions). Although this entire set of questions was presented together to principals and analyzed as a single scale for this analysis, three separate scales were created for the three international reports containing the mathematics, science, and reading results (i.e., the general and mathematics questions, the general and science questions, and the general and reading questions).

Section A—General School Resources

- ◆ Instructional materials (e.g., textbooks);
- ◆ Supplies (e.g., paper, pencils);
- ◆ School buildings and grounds;
- ◆ Heating/cooling and lighting systems;
- ◆ Instructional space (e.g., classrooms); and
- ◆ Technologically competent staff.

Sections B, C, and D—Subject specific resources (Mathematics, Science, and Reading, respectively). Sections B, asking about mathematics, and C, asking about science, contained the same six questions. Section D, asking about reading, contained five of the six questions, the exception being “calculators for instruction”:

- ◆ Teachers with a specialization in the subject;
- ◆ Computers for instruction;
- ◆ Computer software for instruction;
- ◆ Library materials for instruction;
- ◆ Audio-visual resources for instruction; and
- ◆ Calculators.

School Instruction

Selecting school effectiveness measures of classroom instruction was more challenging, because the TIMSS and PIRLS 2011 background data and context questionnaire scales about teacher quality and instructional engagement are less well developed than the data about school climate and resources. However, two indicators of instructional effectiveness are included in the school effectiveness models. The school effectiveness measures of school instructional quality are as follows:

- ◆ Early curricular emphasis on higher order reading processes; and
- ◆ Students engaged in reading, mathematics, and science lessons.

Early Curricular Emphasis on Reading Skills

This measure is one of the context questionnaire scales developed for PIRLS 2011.

Emphasis in Early Grades on Reading Skills and Strategies—Principals’ responses about the earliest grade at which each of 11 reading skills and strategies were emphasized.

- ◆ Reading isolated sentences;
- ◆ Reading connected text;
- ◆ Locating information within the text;
- ◆ Identifying the main idea of a text;
- ◆ Explaining or supporting understanding of a text;
- ◆ Comparing a text with personal experience;
- ◆ Comparing different texts;
- ◆ Making predictions about what will happen next in a text;
- ◆ Making generalizations and drawing inferences based on a text;
- ◆ Describing the style or structure of a text; and
- ◆ Determining the author’s perspective or intention.

Student Engaged in Reading, Mathematics, and Science Lessons

The measure of student engagement in instruction was the school average across three context questionnaire scales measuring students' engagement in their lessons: one for reading, one for mathematics, and one for science. Students reported separately about their mathematics and science lessons in terms of their degree of agreement with the five statements listed below:

Students Engaged in Lessons—Students' degree of agreement with five statements about their instruction:

- ◆ I know what my teachers expect me to do;
- ◆ I think of things not related to the lesson (reverse coded);
- ◆ My teacher is easy to understand;
- ◆ I am interested in what my teacher says; and
- ◆ My teachers gives my interesting things to do.

Students also reported about their reading lessons using the same scale but beginning with two questions specific to their reading materials.

Students Engaged in Reading Lessons—Students' degree of agreement with seven statements about their instruction:

- ◆ I like what I read about in school;
- ◆ My teacher gives me interesting things to read;
- ◆ I know what my teachers expect me to do;
- ◆ I think of things not related to the lesson (reverse coded);
- ◆ My teacher is easy to understand;
- ◆ I am interested in what my teacher says; and
- ◆ My teachers gives my interesting things to do.

Examining the Effects of Student Home Environment

Considerable research has shown that higher levels of school resources are associated with higher achievement. However, the relationship between school resources and student achievement is complicated. On one hand, as described earlier under the discussion of the adequacy of school facilities and instructional resources, a school can invest more money for such things as facilities, teachers' salaries, equipment, and materials. On the other hand, a school can have a more socioeconomically advantaged student population that has access to more resources, for example, because of its location or because it competes for

students. The home backgrounds of students attending a school can be closely related to the learning environment of the school, with the two reinforcing each other and being strongly linked to academic achievement. Students from higher socioeconomic backgrounds are likely to be healthy and come to school better fed and clothed than their more disadvantaged counterparts. Students from home backgrounds supportive of learning are likely to have more positive attitudes toward learning, and perhaps, even better discipline. They are likely to come to school already having the prerequisite literacy and numeracy skills necessary for advancing in the curriculum. Beyond that, parents that have high educational expectations for their children are more likely to take an active interest in the quality of teachers, the adequacy of school facilities, and the availability of school resources.

In actuality, it is impossible to disentangle the effect of students' home environment on their educational achievement from the effect of their schooling on their educational achievement. However, it is possible to apply statistical models to the data that make predictions about the likely effect of the school variables on student achievement if all students came from equivalent home backgrounds.

Description of the Home Background Variables

Two home background context questionnaire scales from TIMSS and PIRLS 2011 were used to describe students' home environment:

- ◆ Home Resources for Learning Scale; and
- ◆ Could Accomplish Early Literacy/Numeracy Tasks When Entered School.

The **Home Resources for Learning Scale** is based on five different questions: two questions included in the student questionnaire, and three questions included in the home questionnaire completed by students' parents and primary caregivers. Students were scored according to their own and their parents' responses concerning the availability of the five resources listed below.

Number of books in the home (students' responses)

1. 0–10
2. 11–25
3. 26–100
4. 101–200
5. More than 200

Number of home study supports (students' responses)

1. None
2. Internet connection or own room
3. Both Internet and own room

Number of children's books in the home (parents' responses)

1. 0–10
2. 11–25
3. 26–50
4. 51–100
5. More than 100

Highest level of education of either parent (parents' responses)

1. Finished some primary or lower secondary or did not go to school
2. Finished lower secondary
3. Finished upper secondary
4. Finished post-secondary education
5. Finished university or higher

Highest level of occupation of either parent (parents' responses)

1. Has never worked outside the home for pay, general laborer, or semi-professional (skilled agricultural or fishery worker, craft or trade worker, plant or machine operator)
2. Clerical (clerk or service or sales worker)
3. Small business owner
4. Professional (corporate manager or senior official, professional, or technician or associate professional)

Early Literacy/Numeracy Tasks was the student's average of their scores on two early learning scales: Could Do Early Literacy Tasks When Began Primary School, and Could Do Early Numeracy Tasks When Began Primary School.

Could Do Early Literacy Tasks When Began Primary School—Students were scored according to the parents' responses to how well (i.e., "Very Well," "Moderately Well," "Not Very Well," or "Not at All") their child could do five early literacy activities when he/she began primary/elementary school:

- ◆ Recognize most of the letters of the alphabet;
- ◆ Read some words;
- ◆ Read sentences;
- ◆ Write letters of the alphabet; and
- ◆ Write some words.

Could Do Early Numeracy Tasks When Began Primary School—Students were scored according to their parents’ responses to how well their child could do six early numeracy tasks, as shown below.

Could your child do the following when he/she began primary/elementary school?

1. Count by himself/herself (Up to 100 or higher, Up to 20, Up to 10, Not at all)
2. Recognize different shapes (e.g., square, rectangle, circle)
3. (More than 4 shapes, 3–4 shapes, 1–2 shapes, None)
4. Recognize the written numbers from 1–10 (All 10 numbers, 5–9 numbers, 1–4 numbers, None)
5. Write the numbers from 1–10 (All 10 numbers, 5–9 numbers, 1–4 numbers, None)
6. Do simple addition (yes or no)
7. Do simple subtraction (yes or no)

The School Effectiveness Analysis

In building an analytical model that shows the relationship between school variables and student achievement while controlling for the effects of home environment, it is important to recognize that these effects can operate at two levels: at the individual level through the direct effect of home environment on achievement, and at the school level through the effect of attending school with other students from similar advantaged or disadvantaged home backgrounds. Recognizing that, in any given school, students vary in their home backgrounds and also that schools can vary in the composition of their student body, this study adopted a two-level approach to statistically adjusting for home background differences, whereby both the differences between students within each school and the average differences between schools were explicitly modeled. This analysis shows the predicted effect on student achievement in reading, mathematics, and science of simultaneously adjusting the data so that

all students in each school have equivalent home backgrounds and all schools have equivalent average home background. Although the analysis for each subject was based on a single model that controlled for both student-within-school and between-school differences, the results are presented separately so that the relative magnitude of their effects can be examined.

To investigate how the characteristics of effective schools were associated with achievement in reading, mathematics, and science, this study made use of multilevel regression modeling (also known as hierarchical linear modeling). This type of prediction modeling allows characteristics of persons (such as students) and groups (such as schools) to be included together to predict individual-level outcomes, while accounting for the clustering of individuals in groups and maintaining correct standard errors for testing the significance of the relationships (Raudenbush & Bryk, 2002). The goal of the analyses was to examine how the characteristics of effective schools were associated with achievement in reading, mathematics, and science across countries, and whether schools in some countries were relatively more effective in one or two of these subjects than the others.

Separately for each country, and for reading, mathematics, and science within each country, a series of multilevel regression models was formulated, each comprising a combination of the school explanatory measures and the student and school control variables. These models were used to describe how the school explanatory measures were associated with achievement, both before and after controlling for home background at student and school level. Specifically, for reading, mathematics and science, the models were grouped into three blocks, as described below.

School Explanatory Models

These models included the School Environment and School Instruction measures, separately and together, and were formulated in order to investigate the relationship between the school explanatory variables and student achievement in reading, mathematics, and science without reference to student home environment.

Home Background Control Model

This model included the Home Resources and Early Literacy/Numeracy measures together, and was formulated to investigate the relationship between home environment at the student and school level and student achievement in reading, mathematics, and science.

School Explanatory with Control Models

Combining the School Explanatory models and the Home Background Control model, these models were formulated to investigate the relationship between the school explanatory variables, separately and together, and student achievement in reading, mathematics, and science, after controlling for the home background characteristics of individual students within the school and of the student body of the school.

These multilevel regression models provided the detailed information needed to conduct a school effectiveness analysis of student achievement in reading, mathematics, and science.

Interpreting the Multilevel Regression Models

The regression coefficients in the multilevel models show the estimated effect of each predictor (school or student) variable, and are interpreted in the same way as an ordinary least squares regression coefficient; that is, for every one unit increase in the predictor variable, the outcome variable (student achievement) is predicted to increase or decrease by an amount indicated by the size and direction of the associated regression coefficient, holding all else constant. The regression coefficients are in the metric of the TIMSS and PIRLS achievement scales, in which 100 scale score points corresponds approximately to one standard deviation within a country.² The magnitude and direction of the regression coefficients in the models and the significance of the difference from zero indicate the relationship between each predictor and achievement, holding all else in the model constant.

The percentage of variance explained by the predictors in the models is a useful summary of the strength of the relationship between the predictors and achievement in reading, mathematics, and science. The percentage of variance explained can be interpreted as the extent to which the variance in student achievement would be reduced if the data were adjusted so that all students had the same value on the predictor variable. For each country and separately for reading, mathematics, and science, the total student variance is decomposed into the percentages due to differences between schools (i.e., the extent to which schools differ in the average achievement of their students) and the differences between students within the schools. In the multilevel regression models, school-level predictors were added to explain school-to-

2 The TIMSS achievement scales were established by TIMSS 1995, the first TIMSS assessment, so that 100 scale score points was equal to one standard deviation across all participating countries, and the scale centerpoint of 500 was equal to the mean score across countries. Scales were established separately by grade and for mathematics and science. Subsequently, data from TIMSS 1999, TIMSS 2003, TIMSS 2007, and TIMSS 2011 were placed on the TIMSS scale. Similarly, the PIRLS achievement scale was constructed so that 100 points was equal to the standard deviation across all countries that participated in PIRLS 2001, the first PIRLS assessment, and the centerpoint of 500 was set to the mean across countries.

school differences in achievement. The percentage of variance explained by the school-level predictors and by the school-level measures was combined as the percentage of total variance in achievement explained, information that is analogous to an R^2 statistic. A detailed description of the analysis procedures, the types of information provided by the models, and guidance on the interpretation of the findings are presented in *Technical Appendix B: School Effectiveness Models and Analyses*.

Results

The multilevel regression modeling was conducted separately for reading, mathematics, and science for each country. As a prelude to these analyses, Exhibits 3.2 through 3.4 present, for reading, mathematics, and science, respectively, the decomposition of total student achievement variance into the percentages due to differences between schools and the differences within schools, together with the school-level correlations of each of the five school explanatory variables with achievement. The school-level correlations represent the correlation between the school score on the school explanatory variables and average student achievement in the school.

According to the conceptual model for this study, student achievement should be higher in schools that are safe and orderly, have strong support for academic success, have adequate environment and resources, have a rigorous curriculum as evidenced by an early emphasis on reading skills, and where students are engaged in their reading, mathematics, and science lessons. On the basis of this model, the school-level correlations between each of these variables and student achievement should be positive and substantial in each country, because they represent the basic relationship between each school variable and average school achievement, without any statistical controls or adjustments. In fact, as shown in the exhibits, the correlations varied quite a lot both across countries and across the five explanatory variables. The correlations for reading, mathematics, and science were similar, on average, across countries and variables, although there were differences among individual countries.

Among the School Environment variables, school-level correlations were strongest for **Schools Support Academic Success**, with average correlations across countries of 0.34 to 0.35 for the three subjects. There was considerable variation within countries, however, with highest correlations in Botswana (0.61 to 0.62 across reading, mathematics, and science) and the lowest correlations in Italy (0.04 to 0.10). Correlations for **Schools are Safe and Orderly** were next

highest, on average, ranging from 0.28 to 0.29 across the subjects, with the highest correlations in Australia (0.54 to 0.55) and the lowest in Poland (−0.07 to 0.14). Correlations were lower for the third School Environment variable, **Adequate Environment and Resources**, averaging 0.09 to 0.10 across countries. Correlations were highest in Qatar (0.33 to 0.39) and lowest in Croatia and the Czech Republic (−0.12).

With respect to the two School Instruction variables, school-level correlations were highest for **Students Engaged in Reading, Mathematics, and Science Lessons**, with an average correlation across countries of 0.15 to 0.16 for the three subjects. Correlations were highest in Botswana (0.59 to 0.64) and lowest in Poland (−0.19 to −0.23). In general, the lowest school-level correlations were for the School Instruction variable **Early Emphasis on Reading Skills**, with average correlations across countries of 0.07 to 0.08 for the three subjects. Correlations were highest in Dubai, UAE (0.48 for each subject) and lowest in Portugal (−0.10 to −0.12).

Country-by-Country Analyses

The results for individual countries are presented in Exhibits 3.5 through 3.41, with one exhibit for each country. The school explanatory and home background control variables are listed as rows in the upper part of each exhibit, and the regression coefficients for the School Explanatory models, the Home Background Control model, and the School Explanatory with Control models as columns intersecting the rows. Results are included for reading, mathematics, and science for each model. Each regression coefficient is presented together with its standard error and an indicator of whether it differs significantly from zero. The lower part of each exhibit shows the variance decomposition (between and within schools) for each of the multilevel regression models, separately for reading, mathematics, and science.

As an example of how the results of the school effectiveness analysis may be interpreted, the results for Australia, the first in the individual country presentations (Exhibit 3.5), are described in some detail. The Australian data show evidence of considerable differences among schools in student achievement (about one fourth of the total student variance—similar to the average across all countries), as well as strong relationships between the school environment and instruction variables and student achievement, and so are ideal for discussing the interpretation of results. The results for Botswana (Exhibit 3.37) also are described in detail. Botswana is a good example of a country where student

achievement differs considerably from school to school, and where school factors are related to student achievement even after controlling for student home background—i.e., some schools may be considered to be more “effective” than others.

School Explanatory Models—Australia

As discussed earlier, according to the conceptual model underpinning the effective schools analysis, student achievement in reading, mathematics, and science should be higher in schools that are safe and orderly, support academic success, and have adequate environment and resources than in schools that are deficient in one or more of these areas. The data show support for this proposition for Australia, with school-level correlations of 0.54 to 0.55 across the subjects for **Schools are Safe and Orderly**, 0.43 to 0.44 for **Schools Support Academic Success**, and 0.28 for **Adequate Environment and Resources** (see Exhibits 3.2, 3.3, and 3.4).

As shown in the lower part of Exhibit 3.5, there were considerable differences among schools in Australia in the achievement of their students, with 23 percent of the total variance in reading achievement and 28 percent of the total variance in mathematics and science achievement due to differences between schools and available to be explained by school-to-school differences in the explanatory variables.

The School Environment model (the first column of data in Exhibit 3.5) shows for each subject the predicted relationship with achievement of each of the three school environment variables when combined in a single model. This model reflects not only the relationship between the school environment variables and achievement but also any correlations among the school environment variables. In the Australian data, as might be expected given the school-level correlations, being in a safe and orderly school was the strongest predictor of achievement in each of the three subjects, with regression coefficients of 20 to 21 points after controlling for the other two variables. Being in a school that supported academic success also was a significant predictor, with regression coefficients of 6 points in each subject. However, the model shows no effect for being in a school with adequate environment and resources. Presumably, when the model statistically adjusts the data so that the schools have the same degree of orderliness and same level of support for academic success, any variation in environment and resources is eliminated. The school environment variables explained between 41 and 43 percent of the school-to-

school differences in reading, mathematics, and science scores in Australia, or between 10 and 12 percent of the total variance, suggesting that removing all differences in school environment would reduce total achievement differences by this amount.

In accordance with the conceptual model, the School Instruction model for Australia predicts that students in schools where the student body was engaged in their lessons would have higher reading, mathematics, and science scores than students in other schools. These school instruction variables explained 6 percent of the school-to-school differences in reading, mathematics, and science scores, or between 1 and 2 percent of the total variance. However, the model shows no effect for school-to-school variations in early emphasis in reading skills, either because controlling for level of engagement also eliminates any differences, or because there is no variation between Australian schools when emphasis is placed on various reading skills and strategies.

Although, in Australia, both the School Environment and the School Instruction models contained significant predictors of student achievement when considered separately, when these were combined in a single School Environment and Instruction model, the Students Engaged predictor no longer made an independent contribution, suggesting that the statistical adjustment made by the model to give schools the same degree of orderliness and level of support for academic success removes any differences in student engagement in lessons. Accordingly, the combined School Environment and School Instruction variables explained 44 percent of the school-to-school differences in reading achievement, and 43 percent of the school-to-school differences in mathematics and science achievement, only marginally more than the School Environment variables alone. Overall, the School Explanatory models accounted for between 10 and 12 percent of the total variance in reading, mathematics, and science scores.

Home Background Control Model—Australia

The Home Background Control model for Australia provides evidence of a strong relationship between students' home environment and their achievement in reading, mathematics, and science, and that this relationship operates both at the school level (in terms of the average level of the home background variables in the school, i.e., the student body composition), and within school (in terms of the difference between an individual student's home background and the average for the school). In Australia, the predicted effect of attending a school

where many of the students came from well-resourced homes is particularly strong (regression coefficients of 49 to 56 points across subjects), suggesting that schools differ considerably in the composition of the student body and that achievement in all three subjects is higher in schools with many students from advantaged home backgrounds and lower in schools with many students from disadvantaged home backgrounds.

In addition to the school composition effect in Australia, the Home Background Control model predicts an extra benefit from having a level of home background above the average for the school (and, conversely, an extra disadvantage to having a home background level below the average for the school). This effect is represented by the students within school regression coefficients, which are positive for both Home Resources for Learning and Early Literacy/Numeracy Tasks for all three subjects.

The home background control variables explained between 58 and 61 percent of the school-to-school differences in Australia, and between 7 and 10 percent of the student-to-student differences within schools in reading, mathematics, and science scores. Overall, the student and school home background control variables explained 19 percent of the total variability in reading scores, and 24 percent of the total variability in mathematics and science scores.

School Explanatory with Control Models—Australia

The School Explanatory with Control models show the predicted effect on the school explanatory variables of statistically eliminating all differences between schools in the average level of student home background and also eliminating all home background differences among the students within the schools. For Australia, eliminating the differences in home background between schools and students had the effect of reducing the regression coefficients for **Schools Are Safe and Orderly** by half, and reducing the **Schools Support Academic Success** coefficients to just above zero. Although the **Schools Are Safe and Orderly** coefficients were reduced, they remained substantial (8 to 11 score points), and because all differences due to home background have been eliminated, these coefficients may be interpreted as the effects of the school environment variables over and above all other factors.

Combined, the school explanatory and control variables accounted for about two-thirds of the school-to-school differences in achievement in Australia (67% for reading and mathematics; and 69% for science), representing

an increase of 8 to 9 percent over the amount accounted for by the home background control variables alone. Overall, 21 percent of the total variability in reading scores, and 26 percent of the total variability in mathematics and science scores was explained by the school explanatory variables and the home background control variables.

Effective Schools Analysis—Botswana

As one of the countries with relatively large differences between schools in achievement, Botswana provides a further example of how the effective schools analysis can reveal differential effects of school environment and instructional variables on student achievement, even after adjusting for home background effects. As shown in Exhibit 3.37, about one-third of the total variance in student achievement (38% in reading, 31% in mathematics, and 35% in science) was due to differences between schools and was available to be explained by school-to-school differences in the explanatory variables.

In Botswana, school-level correlations with achievement for the school environment variables were highest for **Schools Support Academic Success** (0.61 to 0.62), next highest for **Schools Are Safe and Orderly** (0.46 to 0.49), and lowest for **Adequate Environment and Resources** (0.22 to 0.23) (see Exhibits 3.2, 3.3, and 3.4). When these were combined in the School Environment model (the first column of data in Exhibit 3.37), being in a school that supported academic success and being in a safe and orderly school were the strongest predictors of achievement in each of the three subjects, with regression coefficients of 14 to 22 points after controlling for each of the other variables. As for Australia, the model for Botswana showed no effect for being in a school with adequate environment and resources. The school environment variables explained between 44 and 46 percent of the school-to-school differences in reading, mathematics, and science scores in Botswana, or between 14 and 17 percent of the total variance, suggesting that eliminating all differences in school environment would reduce total achievement differences by this amount. This was slightly more than in Australia.

Although Botswana was similar to Australia in that there was essentially no correlation between **Early Emphasis on Reading Skills** and achievement, the countries differed in that there was a much stronger correlation with **Students Engaged in their Lessons** in Botswana—about 0.6, compared to about 0.2. The School Instruction model for Botswana accounted for 36 to 43 percent of the school-to-school differences in reading, mathematics, and science scores, or between 13 and 15 percent of the total variance. Further, in the combined School

Environment and School Instruction model, the **Students Engaged in their Lessons** variable had the strongest relationship with achievement (regression coefficients of 32 to 54 points), followed by **Schools Support Academic Success** (regression coefficients of 11 to 17 points). Altogether, in Botswana the School Environment and School Instruction variables accounted for 58 percent of the school-to-school differences in reading achievement, 62 percent in mathematics, and 63 percent in science, or between 19 and 22 percent of the total variance in reading, mathematics, and science scores.

Similar to the situation in Australia, the Home Background Control model for Botswana showed a strong relationship between students' home environment and their achievement in reading, mathematics, and science. The predicted effect of attending a school where many of the students came from well-resourced homes is particularly strong (regression coefficients 26 to 39 points), and the within-school effect, the predicted advantage or disadvantage of having a level of home background above or below the average for the school, also was significant for all three subjects. The home background control variables explained between 56 and 68 percent of the school-to-school differences, and between 4 and 7 percent of the student-to-student differences within schools in reading, mathematics, and science scores. Overall, the student and school home background control variables explained 30 percent of the total variability in reading scores, 20 percent in mathematics, and 25 percent in science.

In Botswana, in contrast to Australia, eliminating the differences in home background between schools and students (the School Explanatory with Control model) does not remove the School Instruction effects, and reduces but does not eliminate the School Environment effects. The predicted effect of the **Students Engaged in their Lessons** variable was reduced somewhat but still substantial (regression coefficients of 27 to 44 points), while the regression coefficients for **Schools Are Safe and Orderly** (7 to 9 points) and **Schools Support Academic Success** (5 to 7 points) retain small but significant effects.

Combined, the school explanatory and control variables accounted for four-fifths or more of the school-to-school differences in achievement in Botswana (84% for reading and science; and 80% for mathematics), representing an increase of 16 to 24 percentage points over the amount accounted for by the home background control variables alone. Overall, 36 percent of the total variability in reading scores, 28 percent in mathematics, and 33 percent in science was accounted for by the school explanatory variables and the home background control variables.

Results across TIMSS and PIRLS 2011 Participants

Looking across the individual country results in Exhibits 3.5 through 3.41, the average percentage of variance due to differences between schools was fairly similar for reading (22%), mathematics (26%), and science (25%), although there were considerable differences from country to country. Slovenia had the smallest percentage of variance in achievement between schools, with 5 percent for reading and 8 percent for mathematics and science. In several other countries, including Austria, Chinese Taipei, Croatia, Finland, Norway, and Poland, the percentage of variance between schools was 10 percent or less in at least one subject. Because schools in these countries do not differ very much in the average achievement of their students, there is little scope for finding school variables that account for this difference.

The largest percentage of variance in achievement between schools was observed for Dubai, UAE, where approximately 50 percent was between schools. Honduras, United Arab Emirates, Qatar, Azerbaijan, and Abu Dhabi, UAE also had relatively large percentages of variance between schools.

The Home Background Control model was successful in capturing the relationship between home background and student achievement in reading, mathematics, and science in every participant, although the exact nature of the relationship varied among the countries. The Home Resources for Learning variable was the strongest predictor, with significant effects at both the school level (in terms of the average level of home resources for students in the school) and within the school (in terms of the difference between an individual's home resources and the average for the school) in almost every country. The Early Literacy/Numeracy Tasks was a less powerful predictor, with significant between-school effects in about half of the countries.

As shown in Exhibits 3.2 through 3.5, the school variables posited by the conceptual model are positively correlated with student achievement in most countries, providing *prima facie* evidence from the data for the validity of the model. The School Explanatory models show that many of these relationships persist when the school environment and school instruction variables are combined in a single model (without any other controls). Only two countries, the Czech Republic and the Russian Federation, had no significant predictors of student achievement in these School Explanatory models.

The School Explanatory with Home Background Control model shows how the effect of the School Environment and Instruction variables on achievement is predicted to change when the data are adjusted statistically so that all students

have the same home background. As would be expected, given that schools with many students from supportive home environments often have positive school environment and instruction, introducing the home background variables as controls reduces the strength of the relationship between school environment and instruction and student achievement. Whereas only in the Czech Republic and the Russian Federation was there no relationship between the school variables and achievement before controlling for home background, there were seven more countries with no significant relationship after including the home background controls: Austria, Honduras, Iran, Poland, Romania, Slovenia, and Sweden.

All of the 28 remaining countries and benchmarking participants had a significant relationship between at least one of the School Environment or Instruction variables and achievement in reading, mathematics, or science after controlling for home background. Of the School Environment variables, **Schools Are Safe and Orderly** was related to achievement in at least one subject over and above the effects of home background in 15 countries, and in all three subjects in 7 countries. **Schools Support Academic Success** was a positive predictor of achievement in at least one subject in 10 countries and in all three in 2 countries. **Adequate Environment and Resources** had a predicted effect on achievement independent of home background in at least one subject in just 3 countries, and in all three subjects in just one country.

Of the two School Instruction variables, **Students Engaged in Reading, Mathematics, and Science Lessons** was the more powerful predictor, and was positively related to achievement in at least one subject in 17 countries after controlling for home background and in all three subjects in 9 countries. In contrast, **Early Emphasis in Reading Skills** was a significant predictor in just two countries.

Looking across the countries, 15 of the participants had just one significant predictor after controlling for home background. These included Australia, Chinese Taipei, Croatia, Finland, Lithuania, Northern Ireland, Norway, the Slovak Republic (**Schools Are Safe and Orderly**); Quebec (**Schools Support Academic Success**); Italy (**Adequate Environment and Resources**); and Georgia, Hong Kong SAR, Hungary, Portugal, and Singapore (**Students Engaged in Reading, Mathematics, and Science Lessons**). **Students Engaged in Reading, Mathematics, and Science Lessons** was a significant predictor after controlling for home background in all 8 of the countries with two significant predictors, with **Schools Support Academic Success** the second predictor in

Azerbaijan, Ireland, Saudi Arabia, Abu Dhabi, and Dubai; **Schools Are Safe and Orderly** the second predictor in Malta and Spain; and **Adequate Environment and Resources** the second predictor in Morocco.

Germany, Oman, Qatar, and Botswana each had three significant predictors of achievement after controlling for home background, with **Schools Are Safe and Orderly** a significant predictor in each case. The other two predictors were **Schools Support Academic Success** and **Students Engaged in Reading, Mathematics, and Science Lessons** in Oman and Botswana; **Schools Support Academic Success** and **Early Emphasis on Reading Skills** in Germany; and **Schools Support Academic Success** and **Students Engaged in Reading, Mathematics, and Science Lessons** in Qatar. The largest number of significant predictors after controlling for home background was in the United Arab Emirates, where **Schools Are Safe and Orderly**, **Schools Support Academic Success**, **Early Emphasis on Reading Skills**, and **Students Engaged in Reading, Mathematics, and Science Lessons** each had a positive effect.

Summary

Conscious that education systems typically have evolved as the result of management and development over many years, and that the variables of interest have been manipulated to achieve policy goals so that expected relationships may not be apparent in the data, this study relied on a strong conceptual model based on a clear vision of the essential characteristics of effective schools to guide the analyses. Building on the school effectiveness research literature and capitalizing on the unique array of school and student variables available in the *TIMSS and PIRLS 2011 Fourth Grade Combined International Database* (Foy, 2013), the conceptual model specified a small number of school characteristics considered essential for effective schooling in all countries: a school environment that was safe and orderly, supportive of academic success, and with adequate facilities and equipment, and school instruction that emphasized higher order reading processes and student engagement in reading, mathematics, and science lessons.

Because the conceptual model is based on the idea that all effective schools possess these characteristics to some degree, it raises the expectation that the TIMSS and PIRLS data would show positive relationships between these characteristics and student achievement in each country. In fact, however, the countries varied considerably in the extent to which the relationships predicted by the conceptual model were observed in the data. In a number of countries,

most notably Slovenia, Austria, Chinese Taipei, Croatia, Finland, Norway, and Poland, primary schools are organized so that there is little school-to-school difference in student achievement and, consequently, there is little scope for relationships between school characteristics and achievement at the fourth grade in the data from these countries. School effectiveness analyses in countries such as these are limited in the information they can provide about characteristics of effective schooling.

However, there also were countries where schools differed considerably in the achievement of their students, to the extent that, on average across all participating countries, about one fourth of the total student variance was attributable to differences among schools. In such countries, a strong positive relationship often was in evidence between one or more school characteristic and achievement in reading, mathematics, and science. For example, Botswana, as described earlier, had considerable differences among schools in student achievement and positive relationships between school environment and instruction, home background, and student achievement, and these relationships persisted after controlling for the effects of home background.

In summary, this study found considerable differences across countries in the way student achievement is distributed across schools and in the way school variables are related to student achievement, although the results were fairly similar for reading, mathematics, and science. For example, the average percentage of variance due to differences between schools was 22 percent for reading, 26 percent for mathematics, and 25 percent for science. Despite the differences, the Home Background Control model was successful in capturing the relationship between home background and student achievement in reading, mathematics, and science in every country, although the exact nature of the relationship varied among the countries. The Home Resources for Learning variable was the strongest predictor, with significant effects at both the school level and within the school in almost every country. The Early Literacy/Numeracy Tasks was a less powerful predictor, with significant between-school effects in about half of the countries.

The school variables posited by the conceptual model were positively correlated with student achievement in most countries, providing *prima facie* evidence from the data for the validity of the model. The School Explanatory models showed that many of these relationships persisted when the school environment and school instruction variables were combined in a single model (without any other controls). Only two countries, the Czech Republic and the Russian Federation, had no significant predictors of student achievement in these School Explanatory models. Almost all of the remaining countries and benchmarking participants had a significant relationship between at least one of the School Environment or Instruction variables and achievement in reading, mathematics, or science after controlling for home background.

Of the School Environment variables, **Schools Are Safe and Orderly** was related to achievement in at least one subject over and above the effects of home background in 15 countries, and in all three subjects in 7 countries. **Schools Support Academic Success** was a positive predictor of achievement in at least one subject in 10 countries and in all three in 2 countries. **Adequate Environment and Resources** had a predicted effect on achievement independent of home background in at least one subject in just 3 countries, and in all three subjects in just one country. Of the two School Instruction variables, **Students Engaged in Reading, Mathematics, and Science Lessons** was the more powerful predictor, and was positively related to achievement in at least one subject in 17 countries after controlling for home background and in all three subjects in 9 countries. In contrast, **Early Emphasis in Reading Skills** was a significant predictor in just two countries.

Exhibit 3.2: Variance Decomposition and Correlations of School Explanatory Variables with Reading Achievement

Country	Percentage of Total Variance		School-level Correlations				
	Between Schools	Within Schools	Schools Are Safe and Orderly	Schools Support Academic Success	Adequate Environment and Resources	Early Emphasis on Reading Skills	Students Engaged in Reading, Mathematics, and Science Lessons
Australia	23	77	0.55	0.44	0.28	0.03	0.21
Austria	9	91	0.36	0.36	0.04	-0.05	-0.13
Azerbaijan	44	56	0.23	0.16	0.05	-0.03	0.43
Chinese Taipei	10	90	0.18	0.27	0.03	-0.03	0.27
Croatia	10	90	0.09	0.22	-0.12	0.11	-0.14
Czech Republic	15	85	0.04	0.15	-0.12	-0.03	-0.01
Finland	7	93	0.39	0.40	0.08	0.13	-0.06
Georgia	25	75	0.12	0.22	-0.03	0.01	0.37
Germany	24	76	0.43	0.53	0.16	0.24	-0.04
Hong Kong SAR	21	79	0.17	0.04	-0.03	0.19	0.40
Hungary	32	68	0.45	0.52	-0.03	0.07	0.02
Iran, Islamic Rep. of	39	61	0.19	0.35	0.13	0.25	0.00
Ireland	12	88	0.55	0.43	0.13	0.12	0.07
Italy	17	83	0.20	0.04	0.15	-0.02	0.08
Lithuania	19	81	0.24	0.40	0.00	0.15	0.20
Malta	28	72	0.45	0.55	0.26	0.03	0.47
Morocco	38	62	0.25	0.45	0.21	0.28	0.45
Northern Ireland	11	89	0.41	0.34	0.11	0.08	0.18
Norway	8	92	0.31	0.36	-0.01	-0.02	0.24
Oman	18	82	0.20	0.41	0.24	0.26	0.34
Poland	10	90	-0.07	0.35	-0.01	-0.04	-0.19
Portugal	18	82	0.26	0.40	-0.01	-0.12	0.37
Qatar	38	62	0.52	0.43	0.36	0.23	0.45
Romania	35	65	0.35	0.44	0.08	0.13	0.37
Russian Federation	25	75	0.15	0.20	0.14	-0.03	0.03
Saudi Arabia	36	64	0.31	0.54	0.26	0.18	0.48
Singapore	25	75	0.29	0.43	-0.01	-0.02	0.08
Slovak Republic	18	82	0.27	0.39	0.04	0.04	-0.03
Slovenia	5	95	0.09	0.17	0.03	-0.04	-0.07
Spain	18	82	0.36	0.42	0.03	-0.11	0.18
Sweden	13	87	0.47	0.36	0.25	0.08	-0.07
United Arab Emirates	43	57	0.39	0.39	0.33	0.42	0.32
International Avg.	22	78	0.29	0.35	0.09	0.08	0.16
Sixth Grade Countries							
Botswana	38	62	0.46	0.62	0.22	0.02	0.59
Honduras	43	57	0.15	0.10	0.35	0.25	-0.06
Benchmarking Participants							
Quebec, Canada	11	89	0.30	0.45	0.26	0.02	0.21
Abu Dhabi, UAE	40	60	0.36	0.41	0.33	0.21	0.30
Dubai, UAE	51	49	0.43	0.38	0.34	0.48	0.39

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Exhibit 3.3: Variance Decomposition and Correlations of School Explanatory Variables with Mathematics Achievement

Country	Percentage of Total Variance		School-level Correlations				
	Between Schools	Within Schools	Schools Are Safe and Orderly	Schools Support Academic Success	Adequate Environment and Resources	Early Emphasis on Reading Skills	Students Engaged in Reading, Mathematics, and Science Lessons
Australia	28	72	0.54	0.43	0.28	0.04	0.21
Austria	16	84	0.38	0.37	0.15	-0.05	-0.08
Azerbaijan	48	52	0.19	0.16	0.11	-0.08	0.54
Chinese Taipei	11	89	0.18	0.27	0.06	-0.01	0.26
Croatia	13	87	0.06	0.21	-0.02	0.16	-0.13
Czech Republic	21	79	0.04	0.14	-0.12	-0.01	0.00
Finland	9	91	0.39	0.41	0.14	0.18	-0.06
Georgia	38	62	0.07	0.25	-0.03	-0.04	0.34
Germany	27	73	0.39	0.52	0.13	0.21	-0.08
Hong Kong SAR	22	78	0.18	0.13	-0.03	0.18	0.41
Hungary	36	64	0.48	0.53	-0.02	0.07	0.01
Iran, Islamic Rep. of	38	62	0.15	0.31	0.11	0.20	-0.02
Ireland	17	83	0.52	0.42	0.12	0.07	0.12
Italy	26	74	0.18	0.10	0.20	0.01	0.08
Lithuania	20	80	0.21	0.42	0.00	0.13	0.14
Malta	20	80	0.47	0.54	0.23	0.00	0.41
Morocco	44	56	0.21	0.36	0.20	0.20	0.41
Northern Ireland	17	83	0.42	0.28	0.07	0.03	0.20
Norway	14	86	0.35	0.35	0.04	0.02	0.21
Oman	20	80	0.18	0.36	0.16	0.23	0.35
Poland	13	87	-0.11	0.35	-0.03	-0.04	-0.23
Portugal	38	62	0.28	0.40	0.04	-0.11	0.35
Qatar	45	55	0.44	0.38	0.39	0.22	0.36
Romania	38	62	0.37	0.43	0.09	0.09	0.29
Russian Federation	34	66	0.16	0.12	0.09	-0.05	0.05
Saudi Arabia	37	63	0.21	0.37	0.12	0.09	0.22
Singapore	25	75	0.27	0.42	-0.03	-0.01	0.10
Slovak Republic	27	73	0.29	0.38	0.02	0.06	0.04
Slovenia	8	92	0.08	0.17	0.00	-0.06	-0.11
Spain	21	79	0.42	0.49	0.03	-0.05	0.20
Sweden	12	88	0.51	0.46	0.28	0.14	-0.09
United Arab Emirates	45	55	0.34	0.36	0.30	0.42	0.27
International Avg.	26	74	0.28	0.34	0.10	0.07	0.15
Sixth Grade Countries							
Botswana	31	69	0.49	0.61	0.23	0.03	0.62
Honduras	47	53	0.13	0.13	0.39	0.21	-0.04
Benchmarking Participants							
Quebec, Canada	15	85	0.29	0.45	0.27	-0.05	0.08
Abu Dhabi, UAE	42	58	0.33	0.37	0.31	0.25	0.22
Dubai, UAE	52	48	0.41	0.37	0.33	0.48	0.36

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Exhibit 3.4: Variance Decomposition and Correlations of School Explanatory Variables with Science Achievement

Country	Percentage of Total Variance		School-level Correlations				
	Between Schools	Within Schools	Schools Are Safe and Orderly	Schools Support Academic Success	Adequate Environment and Resources	Early Emphasis on Reading Skills	Students Engaged in Reading, Mathematics, and Science Lessons
Australia	28	72	0.54	0.44	0.28	0.02	0.21
Austria	13	87	0.42	0.38	0.14	-0.04	-0.15
Azerbaijan	49	51	0.22	0.18	0.06	-0.04	0.55
Chinese Taipei	10	90	0.18	0.26	0.06	0.01	0.24
Croatia	11	89	0.10	0.20	-0.12	0.10	-0.13
Czech Republic	14	86	0.07	0.15	-0.10	-0.03	0.02
Finland	10	90	0.42	0.43	0.08	0.14	-0.13
Georgia	32	68	0.05	0.21	-0.07	-0.03	0.34
Germany	26	74	0.44	0.55	0.16	0.20	-0.07
Hong Kong SAR	20	80	0.13	0.08	-0.04	0.18	0.36
Hungary	38	62	0.46	0.51	-0.04	0.06	0.01
Iran, Islamic Rep. of	42	58	0.13	0.32	0.09	0.20	-0.06
Ireland	19	81	0.53	0.42	0.12	0.12	0.12
Italy	26	74	0.20	0.07	0.15	-0.01	0.06
Lithuania	23	77	0.23	0.38	-0.01	0.12	0.18
Malta	24	76	0.41	0.55	0.31	0.01	0.41
Morocco	36	64	0.22	0.40	0.21	0.22	0.45
Northern Ireland	22	78	0.40	0.31	0.05	0.05	0.21
Norway	9	91	0.34	0.41	0.03	-0.03	0.20
Oman	21	79	0.19	0.36	0.15	0.23	0.40
Poland	11	89	-0.13	0.34	-0.05	-0.06	-0.23
Portugal	34	66	0.26	0.42	0.02	-0.10	0.37
Qatar	42	58	0.48	0.39	0.33	0.18	0.41
Romania	37	63	0.38	0.42	0.08	0.13	0.35
Russian Federation	33	67	0.16	0.15	0.12	-0.01	0.05
Saudi Arabia	37	63	0.29	0.50	0.21	0.15	0.39
Singapore	25	75	0.27	0.44	-0.02	-0.02	0.06
Slovak Republic	26	74	0.28	0.37	0.02	0.05	0.03
Slovenia	8	92	0.09	0.14	0.01	-0.05	-0.10
Spain	19	81	0.37	0.43	0.04	-0.06	0.16
Sweden	15	85	0.54	0.41	0.27	0.08	-0.10
United Arab Emirates	41	59	0.36	0.39	0.30	0.39	0.35
International Avg.	25	75	0.28	0.34	0.09	0.07	0.16
Sixth Grade Countries							
Botswana	35	65	0.47	0.61	0.22	0.03	0.64
Honduras	52	48	0.13	0.10	0.32	0.22	-0.09
Benchmarking Participants							
Quebec, Canada	14	86	0.28	0.45	0.22	-0.03	0.17
Abu Dhabi, UAE	38	62	0.35	0.41	0.31	0.20	0.32
Dubai, UAE	49	51	0.42	0.39	0.33	0.48	0.41

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	21 (3.5) ▲	—	20 (3.5) ▲	—	10 (3.5) ▲	—	10 (3.5) ▲
	MAT	21 (4.1) ▲	—	21 (4.1) ▲	—	11 (4.0) ▲	—	11 (4.0) ▲
	SCI	20 (3.5) ▲	—	19 (3.5) ▲	—	8 (3.3) ▲	—	8 (3.3) ▲
Schools Support Academic Success	REA	6 (2.1) ▲	—	6 (2.1) ▲	—	2 (1.8)	—	3 (1.8)
	MAT	6 (2.4) ▲	—	7 (2.4) ▲	—	3 (2.1)	—	3 (2.1)
	SCI	6 (2.0) ▲	—	6 (2.0) ▲	—	3 (1.6)	—	3 (1.6)
Adequate Environment and Resources	REA	2 (2.5)	—	2 (2.5)	—	1 (1.9)	—	1 (1.9)
	MAT	3 (2.5)	—	3 (2.5)	—	2 (2.0)	—	1 (2.0)
	SCI	2 (2.5)	—	2 (2.5)	—	1 (1.8)	—	1 (1.8)
School Instruction								
Early Emphasis on Reading Skills	REA	—	0 (1.8)	2 (1.5)	—	—	1 (1.4)	1 (1.3)
	MAT	—	1 (1.9)	2 (1.7)	—	—	2 (1.5)	2 (1.4)
	SCI	—	0 (1.7)	2 (1.5)	—	—	1 (1.3)	1 (1.2)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	15 (5.2) ▲	6 (4.2)	—	—	7 (3.7)	4 (3.6)
	MAT	—	16 (5.6) ▲	6 (4.3)	—	—	6 (3.7)	3 (3.6)
	SCI	—	14 (5.2) ▲	5 (4.2)	—	—	6 (3.2)	3 (3.2)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	12 (1.3) ▲	12 (1.3) ▲	12 (1.3) ▲	12 (1.3) ▲
	MAT	—	—	—	12 (1.4) ▲	12 (1.4) ▲	12 (1.4) ▲	12 (1.4) ▲
	SCI	—	—	—	13 (1.1) ▲	13 (1.1) ▲	13 (1.1) ▲	13 (1.1) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	11 (1.3) ▲	11 (1.3) ▲	11 (1.3) ▲	11 (1.3) ▲
	MAT	—	—	—	15 (1.4) ▲	15 (1.4) ▲	15 (1.4) ▲	15 (1.4) ▲
	SCI	—	—	—	12 (1.2) ▲	12 (1.2) ▲	12 (1.2) ▲	12 (1.2) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	49 (3.7) ▲	38 (3.8) ▲	48 (3.9) ▲	38 (3.8) ▲
	MAT	—	—	—	56 (4.0) ▲	43 (3.9) ▲	55 (3.9) ▲	42 (3.9) ▲
	SCI	—	—	—	49 (3.4) ▲	40 (3.6) ▲	48 (3.5) ▲	39 (3.6) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	19 (6.8) ▲	15 (7.0) ▲	17 (6.9) ▲	15 (7.0) ▲
	MAT	—	—	—	23 (8.4) ▲	19 (8.8) ▲	22 (8.2) ▲	19 (8.5) ▲
	SCI	—	—	—	21 (6.0) ▲	18 (6.2) ▲	19 (6.2) ▲	17 (6.2) ▲

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (23%)	43	6	44	58	66	59	67
Within Schools (77%)	—	—	—	7	6	7	6
Total	10	1	10	19	20	19	21
Mathematics							
Between Schools (28%)	41	6	43	58	66	60	67
Within Schools (72%)	—	—	—	10	10	10	10
Total	12	2	12	24	26	24	26
Science							
Between Schools (28%)	42	6	43	61	68	62	69
Within Schools (72%)	—	—	—	10	10	10	10
Total	12	2	12	24	26	25	26

() Percentage of available variance shown in parentheses.

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
School Explanatory Variables								
School Environment								
Schools Are Safe and Orderly	REA	8 (3.3) ▲	—	8 (3.3) ▲	—	4 (2.4)	—	4 (2.4)
	MAT	9 (4.1) ▲	—	9 (4.1) ▲	—	6 (3.7)	—	5 (3.6)
	SCI	10 (3.7) ▲	—	10 (3.7) ▲	—	6 (3.1)	—	5 (3.0)
Schools Support Academic Success	REA	5 (2.4) ▲	—	5 (2.4) ▲	—	2 (2.0)	—	2 (1.9)
	MAT	5 (2.6) ▲	—	6 (2.6) ▲	—	2 (2.4)	—	3 (2.4)
	SCI	6 (2.4) ▲	—	6 (2.5) ▲	—	2 (2.2)	—	2 (2.2)
Adequate Environment and Resources	REA	-2 (1.3)	—	-2 (1.4)	—	-2 (1.2)	—	-2 (1.2)
	MAT	0 (1.7)	—	0 (1.7)	—	0 (1.6)	—	1 (1.6)
	SCI	-1 (1.5)	—	-1 (1.6)	—	0 (1.3)	—	0 (1.3)
School Instruction								
Early Emphasis on Reading Skills	REA	—	-1 (1.7)	-2 (1.6)	—	—	-2 (1.5)	-2 (1.4)
	MAT	—	-2 (2.0)	-3 (1.7)	—	—	-3 (1.8)	-3 (1.6)
	SCI	—	-1 (2.0)	-2 (1.7)	—	—	-3 (1.8)	-3 (1.6)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	-4 (3.9)	-4 (3.8)	—	—	-2 (3.2)	-2 (3.2)
	MAT	—	-3 (5.1)	-2 (4.9)	—	—	0 (4.5)	1 (4.6)
	SCI	—	-5 (4.9)	-5 (4.7)	—	—	-2 (3.9)	-2 (4.0)
Home Background Control Variables								
Students within Schools								
Home Resources for Learning	REA	—	—	—	19 (0.8) ▲	19 (0.8) ▲	19 (0.8) ▲	19 (0.8) ▲
	MAT	—	—	—	16 (0.7) ▲	16 (0.7) ▲	16 (0.7) ▲	16 (0.7) ▲
	SCI	—	—	—	20 (0.9) ▲	20 (1.0) ▲	20 (1.0) ▲	20 (1.0) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	5 (0.8) ▲	5 (0.8) ▲	5 (0.8) ▲	5 (0.8) ▲
	MAT	—	—	—	8 (0.7) ▲	8 (0.7) ▲	8 (0.7) ▲	8 (0.7) ▲
	SCI	—	—	—	5 (0.7) ▲	5 (0.7) ▲	5 (0.7) ▲	5 (0.7) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	27 (2.6) ▲	24 (2.9) ▲	27 (2.6) ▲	24 (2.9) ▲
	MAT	—	—	—	25 (3.5) ▲	21 (3.6) ▲	26 (3.5) ▲	21 (3.5) ▲
	SCI	—	—	—	26 (3.4) ▲	23 (3.5) ▲	26 (3.4) ▲	23 (3.5) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	-1 (6.4)	0 (6.3)	-2 (6.0)	-1 (5.9)
	MAT	—	—	—	7 (7.0)	9 (7.0)	6 (6.4)	8 (6.3)
	SCI	—	—	—	-4 (6.7)	-3 (6.7)	-5 (6.3)	-4 (6.3)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (9%)	25	2	28	55	58	57	60
Within Schools (91%)	—	—	—	18	18	18	18
Total	2	0	2	21	22	21	22
Mathematics							
Between Schools (16%)	22	1	24	37	42	38	44
Within Schools (84%)	—	—	—	20	20	20	20
Total	3	0	4	23	23	23	24
Science							
Between Schools (13%)	26	2	28	46	52	48	54
Within Schools (87%)	—	—	—	20	20	20	20
Total	3	0	4	24	24	24	25

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	11 (4.5) ▲	—	8 (4.3)	—	10 (4.7) ▲	—	7 (4.6)
	MAT	16 (5.6) ▲	—	9 (5.5)	—	15 (5.3) ▲	—	9 (5.1)
	SCI	17 (5.8) ▲	—	11 (5.1) ▲	—	16 (5.8) ▲	—	10 (5.2)
Schools Support Academic Success	REA	6 (3.6)	—	6 (2.8) ▲	—	6 (3.7)	—	6 (2.8) ▲
	MAT	5 (4.8)	—	6 (3.5)	—	6 (4.9)	—	5 (3.8)
	SCI	7 (4.6)	—	7 (3.2) ▲	—	6 (4.9)	—	6 (3.5)
Adequate Environment and Resources	REA	-1 (4.4)	—	-1 (3.2)	—	-2 (4.5)	—	-1 (3.5)
	MAT	5 (5.7)	—	5 (3.9)	—	5 (5.6)	—	3 (4.0)
	SCI	0 (6.5)	—	0 (4.0)	—	0 (6.5)	—	0 (4.1)
School Instruction								
Early Emphasis on Reading Skills	REA	—	1 (2.8)	1 (2.7)	—	—	1 (2.8)	1 (2.7)
	MAT	—	-4 (3.6)	-3 (3.4)	—	—	-4 (3.8)	-4 (3.6)
	SCI	—	0 (3.3)	0 (3.2)	—	—	0 (3.2)	0 (3.1)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	34 (9.3) ▲	31 (8.9) ▲	—	—	36 (8.3) ▲	33 (7.8) ▲
	MAT	—	57 (10.3) ▲	53 (10.0) ▲	—	—	63 (8.4) ▲	59 (8.2) ▲
	SCI	—	59 (9.4) ▲	56 (9.0) ▲	—	—	62 (8.3) ▲	58 (8.0) ▲
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	6 (1.0) ▲	6 (1.0) ▲	6 (1.0) ▲	6 (1.0) ▲
	MAT	—	—	—	9 (1.2) ▲	9 (1.2) ▲	9 (1.2) ▲	9 (1.2) ▲
	SCI	—	—	—	9 (1.1) ▲	9 (1.1) ▲	9 (1.1) ▲	9 (1.1) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	4 (0.8) ▲	4 (0.8) ▲	4 (0.8) ▲	4 (0.8) ▲
	MAT	—	—	—	4 (0.9) ▲	4 (0.9) ▲	4 (0.9) ▲	4 (0.9) ▲
	SCI	—	—	—	5 (1.0) ▲	5 (1.0) ▲	5 (1.0) ▲	5 (1.0) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	13 (7.6)	8 (7.6)	18 (6.5) ▲	13 (6.4) ▲
	MAT	—	—	—	12 (10.4)	7 (9.9)	20 (8.5) ▲	16 (8.2)
	SCI	—	—	—	16 (10.5)	10 (10.2)	24 (8.6) ▲	19 (8.1) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	-11 (7.4)	-11 (7.5)	-13 (7.2)	-13 (7.3)
	MAT	—	—	—	-11 (8.8)	-10 (8.3)	-15 (7.8)	-14 (7.5)
	SCI	—	—	—	-10 (8.6)	-9 (8.1)	-13 (7.9)	-12 (7.6)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (44%)	10	20	26	4	13	25	30
Within Schools (56%)	—	—	—	3	3	3	3
Total	4	9	11	3	7	13	15
Mathematics							
Between Schools (48%)	10	29	34	0	10	31	35
Within Schools (52%)	—	—	—	5	5	5	5
Total	5	14	17	3	7	17	19
Science							
Between Schools (49%)	11	33	39	1	12	36	41
Within Schools (51%)	—	—	—	5	5	5	5
Total	5	16	19	3	8	20	22

() Percentage of available variance shown in parentheses.

Exhibit 3.8: School Effectiveness Models for Reading, Mathematics, and Science – Chinese Taipei

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	5 (3.8)	—	4 (3.5)	—	5 (2.2) ▲	—	5 (2.2) ▲
	MAT	4 (3.5)	—	3 (3.3)	—	5 (2.1) ▲	—	4 (2.1)
	SCI	4 (3.5)	—	4 (3.3)	—	5 (1.9) ▲	—	5 (1.9) ▲
Schools Support Academic Success	REA	6 (2.4) ▲	—	6 (2.4) ▲	—	0 (1.3)	—	0 (1.3)
	MAT	6 (2.3) ▲	—	6 (2.2) ▲	—	0 (1.5)	—	0 (1.5)
	SCI	6 (2.2) ▲	—	5 (2.2) ▲	—	-1 (1.3)	—	-1 (1.3)
Adequate Environment and Resources	REA	0 (2.0)	—	0 (2.0)	—	-1 (1.4)	—	-1 (1.3)
	MAT	0 (2.2)	—	1 (2.1)	—	0 (1.6)	—	0 (1.5)
	SCI	0 (2.1)	—	1 (2.0)	—	0 (1.4)	—	1 (1.3)
School Instruction								
Early Emphasis on Reading Skills	REA	—	-1 (1.5)	-1 (1.4)	—	—	-1 (0.8)	-1 (0.7)
	MAT	—	0 (1.5)	-1 (1.3)	—	—	-1 (0.8)	-1 (0.8)
	SCI	—	0 (1.5)	-1 (1.3)	—	—	-1 (0.8)	-1 (0.8)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	12 (3.5) ▲	10 (3.3) ▲	—	—	4 (2.5)	4 (2.5)
	MAT	—	12 (3.7) ▲	10 (3.7) ▲	—	—	4 (2.6)	4 (2.6)
	SCI	—	11 (3.5) ▲	8 (3.5) ▲	—	—	2 (2.6)	2 (2.5)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	10 (0.7) ▲	10 (0.7) ▲	10 (0.7) ▲	10 (0.7) ▲
	MAT	—	—	—	12 (0.8) ▲	12 (0.8) ▲	12 (0.8) ▲	12 (0.8) ▲
	SCI	—	—	—	12 (0.7) ▲	12 (0.7) ▲	12 (0.7) ▲	12 (0.7) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	14 (1.0) ▲	14 (1.0) ▲	14 (1.0) ▲	14 (1.0) ▲
	MAT	—	—	—	17 (1.1) ▲	17 (1.1) ▲	17 (1.1) ▲	17 (1.1) ▲
	SCI	—	—	—	15 (1.2) ▲	15 (1.2) ▲	15 (1.2) ▲	15 (1.2) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	20 (2.0) ▲	20 (2.1) ▲	20 (2.1) ▲	20 (2.1) ▲
	MAT	—	—	—	22 (2.5) ▲	22 (2.5) ▲	22 (2.6) ▲	22 (2.6) ▲
	SCI	—	—	—	22 (2.1) ▲	22 (2.2) ▲	22 (2.1) ▲	22 (2.2) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	27 (8.7) ▲	27 (7.5) ▲	26 (8.4) ▲	25 (7.3) ▲
	MAT	—	—	—	23 (6.3) ▲	22 (6.6) ▲	21 (6.0) ▲	20 (6.4) ▲
	SCI	—	—	—	21 (6.6) ▲	21 (6.0) ▲	20 (6.3) ▲	20 (5.8) ▲

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (10%)	14	11	21	75	77	77	78
Within Schools (90%)	—	—	—	15	15	15	15
Total	2	1	2	21	21	21	21
Mathematics							
Between Schools (11%)	13	10	20	74	76	76	78
Within Schools (89%)	—	—	—	20	20	20	20
Total	1	1	2	25	26	26	26
Science							
Between Schools (10%)	13	8	18	79	81	80	82
Within Schools (90%)	—	—	—	20	20	20	20
Total	1	1	2	26	26	26	26

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	2 (2.8)	—	3 (2.7)	—	4 (1.9)	—	4 (1.9) ▲
	MAT	1 (3.2)	—	2 (3.0)	—	3 (2.0)	—	3 (2.0)
	SCI	2 (2.9)	—	3 (2.7)	—	4 (2.1)	—	4 (2.0)
Schools Support Academic Success	REA	5 (1.9) ▲	—	5 (1.9) ▲	—	0 (1.2)	—	0 (1.2)
	MAT	5 (2.1) ▲	—	4 (2.0) ▲	—	-1 (1.3)	—	-1 (1.2)
	SCI	4 (1.7) ▲	—	4 (1.7) ▲	—	-1 (1.1)	—	-1 (1.1)
Adequate Environment and Resources	REA	-3 (1.5)	—	-2 (1.6)	—	-1 (1.2)	—	-1 (1.2)
	MAT	-1 (1.7)	—	0 (1.8)	—	1 (1.2)	—	1 (1.3)
	SCI	-3 (1.5)	—	-2 (1.6)	—	-1 (1.2)	—	-1 (1.2)
School Instruction								
Early Emphasis on Reading Skills	REA	—	1 (1.5)	0 (1.6)	—	—	0 (1.0)	0 (1.1)
	MAT	—	2 (1.8)	1 (1.8)	—	—	0 (1.2)	0 (1.2)
	SCI	—	1 (1.4)	0 (1.4)	—	—	-1 (1.0)	-1 (1.0)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	-7 (3.5) ▼	-8 (3.6) ▼	—	—	-2 (2.7)	-2 (2.6)
	MAT	—	-8 (4.3)	-9 (4.6) ▼	—	—	-1 (2.6)	-2 (2.7)
	SCI	—	-7 (3.4) ▼	-8 (3.6) ▼	—	—	-2 (2.7)	-2 (2.7)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	12 (0.8) ▲	12 (0.8) ▲	12 (0.8) ▲	12 (0.8) ▲
	MAT	—	—	—	11 (0.8) ▲	11 (0.8) ▲	11 (0.8) ▲	11 (0.8) ▲
	SCI	—	—	—	12 (1.0) ▲	12 (1.0) ▲	12 (1.0) ▲	12 (1.0) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	12 (0.7) ▲	12 (0.7) ▲	12 (0.7) ▲	12 (0.7) ▲
	MAT	—	—	—	16 (0.9) ▲	16 (0.9) ▲	16 (0.9) ▲	16 (0.9) ▲
	SCI	—	—	—	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	23 (2.1) ▲	22 (2.0) ▲	23 (2.0) ▲	22 (1.9) ▲
	MAT	—	—	—	24 (2.4) ▲	25 (2.6) ▲	24 (2.4) ▲	25 (2.6) ▲
	SCI	—	—	—	21 (2.7) ▲	21 (2.6) ▲	21 (2.7) ▲	21 (2.7) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	9 (4.3) ▲	10 (4.2) ▲	9 (4.3) ▲	10 (4.2) ▲
	MAT	—	—	—	15 (5.5) ▲	15 (5.3) ▲	15 (5.5) ▲	15 (5.2) ▲
	SCI	—	—	—	4 (5.5)	6 (5.2)	4 (5.4)	5 (5.1)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (10%)	11	6	16	73	74	73	74
Within Schools (90%)	—	—	—	16	16	16	16
Total	1	1	2	22	22	22	22
Mathematics							
Between Schools (13%)	6	6	12	69	70	70	70
Within Schools (87%)	—	—	—	21	21	21	21
Total	1	1	2	27	27	27	27
Science							
Between Schools (11%)	9	5	13	62	64	62	64
Within Schools (89%)	—	—	—	16	16	16	16
Total	1	1	1	21	21	21	21

() Percentage of available variance shown in parentheses.

Exhibit 3.10: School Effectiveness Models for Reading, Mathematics, and Science – Czech Republic

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	2 (5.4)	—	2 (5.5)	—	4 (3.0)	—	4 (2.9)
	MAT	1 (7.7)	—	2 (7.8)	—	5 (3.9)	—	5 (3.8)
	SCI	3 (5.9)	—	3 (5.9)	—	5 (3.2)	—	5 (3.2)
Schools Support Academic Success	REA	2 (2.4)	—	3 (2.4)	—	-1 (1.5)	—	-2 (1.5)
	MAT	3 (3.0)	—	3 (2.9)	—	-2 (1.5)	—	-2 (1.6)
	SCI	3 (2.5)	—	3 (2.5)	—	-1 (1.5)	—	-2 (1.6)
Adequate Environment and Resources	REA	-4 (2.9)	—	-5 (3.0)	—	-2 (1.6)	—	-1 (1.5)
	MAT	-5 (3.8)	—	-5 (3.8)	—	-2 (2.0)	—	-2 (1.9)
	SCI	-4 (3.2)	—	-4 (3.2)	—	-1 (1.7)	—	-1 (1.7)
School Instruction								
Early Emphasis on Reading Skills	REA	—	0 (1.4)	-1 (1.3)	—	—	1 (0.9)	1 (0.9)
	MAT	—	0 (1.5)	-1 (1.5)	—	—	1 (0.9)	1 (0.9)
	SCI	—	0 (1.4)	-1 (1.3)	—	—	1 (0.9)	1 (0.8)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	-1 (4.7)	-2 (4.5)	—	—	1 (3.3)	1 (3.2)
	MAT	—	-1 (5.5)	-2 (5.2)	—	—	1 (3.4)	1 (3.4)
	SCI	—	1 (4.2)	0 (4.2)	—	—	3 (3.1)	3 (3.2)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	15 (1.1) ▲	15 (1.1) ▲	15 (1.1) ▲	15 (1.1) ▲
	MAT	—	—	—	17 (1.2) ▲	17 (1.2) ▲	17 (1.2) ▲	17 (1.2) ▲
	SCI	—	—	—	17 (1.3) ▲	17 (1.3) ▲	17 (1.3) ▲	17 (1.3) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	7 (0.8) ▲	7 (0.8) ▲	7 (0.8) ▲	7 (0.8) ▲
	MAT	—	—	—	9 (0.9) ▲	9 (0.9) ▲	9 (0.9) ▲	9 (0.9) ▲
	SCI	—	—	—	7 (1.0) ▲	7 (1.0) ▲	7 (1.0) ▲	7 (1.0) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	31 (4.5) ▲	31 (4.3) ▲	31 (4.5) ▲	31 (4.4) ▲
	MAT	—	—	—	37 (5.9) ▲	38 (5.6) ▲	38 (6.0) ▲	38 (5.8) ▲
	SCI	—	—	—	31 (4.9) ▲	32 (4.8) ▲	32 (4.9) ▲	32 (4.9) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	16 (5.5) ▲	17 (5.2) ▲	16 (5.7) ▲	16 (5.4) ▲
	MAT	—	—	—	26 (7.7) ▲	26 (7.2) ▲	25 (7.9) ▲	26 (7.5) ▲
	SCI	—	—	—	19 (5.7) ▲	19 (5.4) ▲	18 (6.0) ▲	19 (5.6) ▲

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (15%)	6	0	7	76	77	76	77
Within Schools (85%)	—	—	—	16	16	16	16
Total	1	0	1	25	25	25	25
Mathematics							
Between Schools (21%)	5	0	6	77	78	77	79
Within Schools (79%)	—	—	—	19	19	19	19
Total	1	0	1	31	31	31	31
Science							
Between Schools (14%)	6	0	6	73	75	74	76
Within Schools (86%)	—	—	—	17	17	17	17
Total	1	0	1	25	25	25	25

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	9 (3.2) ▲	—	9 (3.2) ▲	—	10 (2.6) ▲	—	10 (2.6) ▲
	MAT	9 (3.1) ▲	—	9 (3.1) ▲	—	10 (2.6) ▲	—	10 (2.5) ▲
	SCI	11 (2.6) ▲	—	11 (2.6) ▲	—	10 (2.3) ▲	—	11 (2.3) ▲
Schools Support Academic Success	REA	5 (2.4) ▲	—	5 (2.5)	—	0 (2.2)	—	-1 (2.3)
	MAT	5 (2.2) ▲	—	5 (2.3) ▲	—	0 (2.2)	—	-1 (2.1)
	SCI	6 (2.2) ▲	—	6 (2.3) ▲	—	2 (2.1)	—	2 (2.2)
Adequate Environment and Resources	REA	-2 (1.8)	—	-2 (1.8)	—	1 (1.6)	—	1 (1.5)
	MAT	-1 (1.6)	—	0 (1.6)	—	2 (1.5)	—	3 (1.5)
	SCI	-3 (1.6)	—	-3 (1.5)	—	0 (1.5)	—	0 (1.5)
School Instruction								
Early Emphasis on Reading Skills	REA	—	1 (1.9)	0 (1.7)	—	—	1 (1.7)	1 (1.5)
	MAT	—	2 (2.5)	1 (2.3)	—	—	2 (2.4)	2 (2.1)
	SCI	—	1 (2.0)	0 (1.9)	—	—	1 (1.7)	1 (1.6)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	-4 (5.4)	-3 (5.2)	—	—	1 (4.6)	0 (4.2)
	MAT	—	-3 (6.2)	-3 (6.2)	—	—	-1 (5.7)	-1 (5.4)
	SCI	—	-6 (5.3)	-5 (5.0)	—	—	0 (4.4)	-1 (4.0)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	11 (1.1) ▲	11 (1.1) ▲	11 (1.0) ▲	11 (1.0) ▲
	MAT	—	—	—	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲
	SCI	—	—	—	11 (1.0) ▲	11 (1.0) ▲	11 (1.0) ▲	11 (1.0) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	15 (1.0) ▲	15 (1.0) ▲	15 (1.0) ▲	15 (1.0) ▲
	MAT	—	—	—	18 (0.8) ▲	18 (0.8) ▲	18 (0.8) ▲	18 (0.8) ▲
	SCI	—	—	—	12 (1.0) ▲	12 (1.0) ▲	12 (1.0) ▲	12 (1.0) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	19 (4.1) ▲	19 (4.3) ▲	19 (3.9) ▲	19 (4.0) ▲
	MAT	—	—	—	15 (5.3) ▲	15 (5.8) ▲	15 (4.9) ▲	16 (5.1) ▲
	SCI	—	—	—	20 (4.7) ▲	18 (4.4) ▲	20 (4.9) ▲	18 (4.3) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	10 (6.2)	10 (5.4)	10 (6.3)	10 (5.5)
	MAT	—	—	—	15 (6.1) ▲	15 (5.6) ▲	15 (6.2) ▲	15 (5.5) ▲
	SCI	—	—	—	7 (5.9)	6 (5.3)	7 (6.1)	6 (5.3)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (7%)	39	3	40	30	58	31	58
Within Schools (93%)	—	—	—	22	22	22	22
Total	3	0	3	23	25	23	25
Mathematics							
Between Schools (9%)	32	4	34	18	42	20	44
Within Schools (91%)	—	—	—	28	28	28	28
Total	3	0	3	27	29	27	29
Science							
Between Schools (10%)	40	4	42	25	53	26	54
Within Schools (90%)	—	—	—	20	20	20	20
Total	4	0	4	20	23	20	23

() Percentage of available variance shown in parentheses.

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	5 (4.2)	—	3 (3.7)	—	3 (3.5)	—	2 (3.2)
	MAT	0 (5.8)	—	-2 (4.8)	—	-1 (5.4)	—	-2 (4.5)
	SCI	0 (5.1)	—	-2 (4.3)	—	-2 (4.6)	—	-4 (4.0)
Schools Support Academic Success	REA	9 (3.8) ▲	—	7 (3.6)	—	2 (3.3)	—	1 (3.0)
	MAT	16 (5.9) ▲	—	13 (5.5) ▲	—	12 (6.8)	—	10 (6.2)
	SCI	12 (4.8) ▲	—	10 (4.4) ▲	—	7 (5.7)	—	6 (5.2)
Adequate Environment and Resources	REA	-4 (3.8)	—	-6 (3.7)	—	-7 (3.2) ▼	—	-7 (3.1) ▼
	MAT	-8 (4.9)	—	-9 (4.9)	—	-11 (4.6) ▼	—	-11 (4.5) ▼
	SCI	-7 (4.6)	—	-8 (4.6)	—	-9 (4.1) ▼	—	-10 (4.0) ▼
School Instruction								
Early Emphasis on Reading Skills	REA	—	1 (3.1)	0 (3.3)	—	—	-1 (2.6)	0 (2.7)
	MAT	—	-2 (4.1)	-2 (4.1)	—	—	-3 (3.4)	-2 (3.4)
	SCI	—	0 (3.5)	0 (3.6)	—	—	-2 (3.1)	-1 (3.2)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	31 (9.2) ▲	29 (9.5) ▲	—	—	23 (8.8) ▲	24 (8.7) ▲
	MAT	—	40 (12.5) ▲	37 (12.9) ▲	—	—	35 (11.8) ▲	35 (11.4) ▲
	SCI	—	35 (11.6) ▲	34 (12.0) ▲	—	—	29 (11.2) ▲	31 (10.8) ▲
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	11 (1.2) ▲	11 (1.2) ▲	11 (1.2) ▲	11 (1.2) ▲
	MAT	—	—	—	10 (1.5) ▲	10 (1.5) ▲	10 (1.5) ▲	10 (1.5) ▲
	SCI	—	—	—	11 (1.3) ▲	11 (1.3) ▲	11 (1.3) ▲	11 (1.3) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	9 (0.8) ▲	9 (0.8) ▲	9 (0.8) ▲	9 (0.8) ▲
	MAT	—	—	—	8 (1.1) ▲	8 (1.0) ▲	8 (1.0) ▲	8 (1.0) ▲
	SCI	—	—	—	9 (1.0) ▲	9 (1.1) ▲	9 (1.0) ▲	9 (1.1) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	20 (3.2) ▲	21 (3.4) ▲	18 (3.2) ▲	20 (3.4) ▲
	MAT	—	—	—	21 (4.7) ▲	19 (5.1) ▲	18 (4.6) ▲	18 (5.1) ▲
	SCI	—	—	—	17 (4.4) ▲	17 (4.9) ▲	15 (4.4) ▲	15 (4.9) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	5 (5.4)	4 (5.3)	4 (5.0)	4 (4.9)
	MAT	—	—	—	-1 (9.2)	-2 (9.1)	-2 (8.2)	-3 (8.3)
	SCI	—	—	—	4 (7.5)	3 (7.5)	3 (6.7)	3 (6.8)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (25%)	9	16	22	34	37	41	45
Within Schools (75%)	—	—	—	11	11	11	11
Total	2	4	5	17	18	19	20
Mathematics							
Between Schools (38%)	10	14	21	11	16	20	25
Within Schools (62%)	—	—	—	11	11	11	11
Total	4	5	8	11	13	14	16
Science							
Between Schools (32%)	8	15	21	16	21	25	30
Within Schools (68%)	—	—	—	12	12	12	12
Total	3	5	7	13	15	16	18

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	9 (3.3) ▲	—	9 (3.3) ▲	—	9 (3.1) ▲	—	9 (3.1) ▲
	MAT	6 (3.1)	—	7 (3.1) ▲	—	6 (3.0) ▲	—	7 (2.9) ▲
	SCI	8 (3.4) ▲	—	9 (3.5) ▲	—	8 (3.2) ▲	—	8 (3.2) ▲
Schools Support Academic Success	REA	16 (3.4) ▲	—	15 (3.0) ▲	—	6 (3.2)	—	6 (2.9)
	MAT	15 (3.2) ▲	—	14 (2.7) ▲	—	7 (3.0) ▲	—	6 (2.8) ▲
	SCI	17 (3.2) ▲	—	15 (2.9) ▲	—	7 (3.0) ▲	—	7 (2.8) ▲
Adequate Environment and Resources	REA	-1 (2.1)	—	-1 (2.0)	—	1 (1.9)	—	1 (1.9)
	MAT	-1 (1.9)	—	-2 (1.8)	—	0 (1.7)	—	0 (1.7)
	SCI	-1 (1.9)	—	-1 (1.8)	—	1 (1.7)	—	1 (1.7)
School Instruction								
Early Emphasis on Reading Skills	REA	—	8 (2.8) ▲	5 (2.3) ▲	—	—	5 (2.1) ▲	4 (1.9) ▲
	MAT	—	7 (2.7) ▲	4 (2.2) ▲	—	—	4 (2.1)	3 (1.9)
	SCI	—	7 (2.8) ▲	4 (2.3)	—	—	4 (2.1) ▲	3 (2.0)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	-4 (4.8)	-3 (3.7)	—	—	1 (4.3)	-1 (3.8)
	MAT	—	-6 (4.5)	-5 (3.6)	—	—	-2 (4.2)	-4 (3.6)
	SCI	—	-6 (4.9)	-5 (3.8)	—	—	-1 (4.3)	-3 (3.8)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	16 (0.8) ▲	16 (0.8) ▲	16 (0.8) ▲	16 (0.8) ▲
	MAT	—	—	—	13 (0.8) ▲	13 (0.8) ▲	13 (0.8) ▲	13 (0.8) ▲
	SCI	—	—	—	17 (0.8) ▲	16 (0.8) ▲	17 (0.8) ▲	16 (0.8) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	7 (0.9) ▲	7 (0.9) ▲	7 (0.9) ▲	7 (0.9) ▲
	MAT	—	—	—	9 (1.0) ▲	9 (1.0) ▲	9 (1.0) ▲	9 (1.0) ▲
	SCI	—	—	—	5 (1.1) ▲	5 (1.1) ▲	5 (1.1) ▲	5 (1.1) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	35 (3.9) ▲	26 (3.7) ▲	33 (3.6) ▲	25 (3.8) ▲
	MAT	—	—	—	31 (3.9) ▲	22 (3.8) ▲	30 (3.8) ▲	21 (3.9) ▲
	SCI	—	—	—	36 (4.1) ▲	26 (3.9) ▲	34 (3.9) ▲	25 (4.0) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	8 (10.4)	11 (9.4)	6 (10.0)	10 (9.0)
	MAT	—	—	—	10 (9.5)	13 (8.5)	9 (9.3)	13 (8.2)
	SCI	—	—	—	5 (10.3)	9 (9.2)	4 (10.0)	8 (8.9)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (24%)	40	10	44	49	58	53	61
Within Schools (76%)	—	—	—	15	15	15	15
Total	10	2	11	23	25	24	26
Mathematics							
Between Schools (27%)	37	9	41	44	52	47	55
Within Schools (73%)	—	—	—	17	17	17	17
Total	10	3	11	24	26	25	27
Science							
Between Schools (26%)	41	9	44	48	58	51	59
Within Schools (74%)	—	—	—	17	17	17	17
Total	11	2	11	25	27	25	28

() Percentage of available variance shown in parentheses.

Exhibit 3.14: School Effectiveness Models for Reading, Mathematics, and Science – Hong Kong SAR

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	7 (4.0)	—	2 (3.9)	—	4 (2.2) ▲	—	3 (2.1)
	MAT	6 (3.9)	—	1 (3.9)	—	3 (2.1)	—	2 (2.2)
	SCI	5 (4.2)	—	0 (4.3)	—	2 (2.2)	—	1 (2.4)
Schools Support Academic Success	REA	0 (2.6)	—	-4 (2.5)	—	-4 (1.9)	—	-5 (2.0) ▼
	MAT	3 (2.6)	—	-1 (2.5)	—	-2 (1.7)	—	-2 (1.7)
	SCI	2 (2.7)	—	-2 (2.6)	—	-2 (1.8)	—	-3 (1.9)
Adequate Environment and Resources	REA	-2 (3.8)	—	-2 (3.5)	—	-1 (1.9)	—	-1 (1.8)
	MAT	-2 (3.6)	—	-2 (3.3)	—	-2 (2.5)	—	-2 (2.4)
	SCI	-2 (4.2)	—	-2 (3.9)	—	-2 (2.2)	—	-2 (2.2)
School Instruction								
Early Emphasis on Reading Skills	REA	—	3 (1.6) ▲	4 (1.6) ▲	—	—	1 (1.1)	1 (1.0)
	MAT	—	3 (1.5) ▲	3 (1.5)	—	—	0 (0.9)	0 (0.9)
	SCI	—	3 (1.6) ▲	3 (1.6) ▲	—	—	1 (1.0)	1 (1.0)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	22 (4.3) ▲	23 (5.2) ▲	—	—	8 (3.3) ▲	9 (3.5) ▲
	MAT	—	22 (4.4) ▲	22 (5.0) ▲	—	—	7 (3.3) ▲	7 (3.5)
	SCI	—	20 (4.4) ▲	21 (5.3) ▲	—	—	4 (3.4)	6 (3.7)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	2 (0.7) ▲	2 (0.7) ▲	3 (0.7) ▲	2 (0.7) ▲
	MAT	—	—	—	3 (0.7) ▲	3 (0.7) ▲	3 (0.7) ▲	3 (0.7) ▲
	SCI	—	—	—	5 (0.8) ▲	5 (0.8) ▲	5 (0.8) ▲	5 (0.8) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	13 (1.1) ▲	13 (1.1) ▲	13 (1.1) ▲	13 (1.1) ▲
	MAT	—	—	—	12 (1.1) ▲	12 (1.1) ▲	12 (1.1) ▲	12 (1.1) ▲
	SCI	—	—	—	15 (1.4) ▲	15 (1.4) ▲	15 (1.4) ▲	15 (1.4) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	3 (2.0)	5 (2.2) ▲	2 (2.1)	4 (2.2) ▲
	MAT	—	—	—	6 (2.0) ▲	7 (2.2) ▲	5 (2.0) ▲	6 (2.2) ▲
	SCI	—	—	—	5 (1.9) ▲	6 (2.1) ▲	4 (2.0) ▲	6 (2.1) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	62 (4.7) ▲	60 (4.5) ▲	59 (4.5) ▲	56 (4.4) ▲
	MAT	—	—	—	55 (4.9) ▲	54 (4.8) ▲	53 (5.0) ▲	52 (5.0) ▲
	SCI	—	—	—	60 (5.2) ▲	58 (5.2) ▲	58 (5.2) ▲	56 (5.2) ▲

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (21%)	4	20	22	68	70	70	73
Within Schools (79%)	—	—	—	8	8	8	8
Total	1	4	4	20	21	21	21
Mathematics							
Between Schools (22%)	4	20	20	68	69	70	71
Within Schools (78%)	—	—	—	10	10	10	10
Total	1	4	5	23	23	23	24
Science							
Between Schools (20%)	2	17	18	69	69	69	71
Within Schools (80%)	—	—	—	11	11	11	11
Total	0	3	4	22	23	23	23

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	11 (6.1)	—	10 (6.3)	—	1 (3.7)	—	0 (3.8)
	MAT	16 (5.5) ▲	—	16 (5.6) ▲	—	4 (3.6)	—	2 (3.7)
	SCI	13 (6.3) ▲	—	13 (6.4)	—	3 (3.9)	—	1 (4.0)
Schools Support Academic Success	REA	16 (3.9) ▲	—	16 (3.8) ▲	—	2 (2.6)	—	1 (2.3)
	MAT	18 (4.0) ▲	—	18 (3.9) ▲	—	3 (2.5)	—	3 (2.3)
	SCI	17 (4.2) ▲	—	18 (4.0) ▲	—	3 (2.9)	—	2 (2.7)
Adequate Environment and Resources	REA	-2 (2.2)	—	-3 (2.1)	—	1 (1.5)	—	1 (1.4)
	MAT	-3 (2.3)	—	-3 (2.2)	—	1 (1.3)	—	1 (1.3)
	SCI	-3 (2.3)	—	-4 (2.2)	—	0 (1.7)	—	0 (1.6)
School Instruction								
Early Emphasis on Reading Skills	REA	—	0 (3.5)	-2 (2.7)	—	—	0 (1.8)	0 (1.8)
	MAT	—	0 (3.6)	-3 (2.4)	—	—	0 (1.7)	-1 (1.7)
	SCI	—	0 (3.7)	-3 (2.7)	—	—	0 (1.9)	0 (2.0)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	5 (11.6)	2 (9.3)	—	—	15 (6.1) ▲	15 (5.9) ▲
	MAT	—	7 (11.7)	2 (9.3)	—	—	17 (6.6) ▲	16 (6.3) ▲
	SCI	—	6 (12.6)	3 (10.3)	—	—	17 (7.9) ▲	17 (7.8) ▲
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	16 (0.8) ▲	16 (0.8) ▲	16 (0.9) ▲	16 (0.8) ▲
	MAT	—	—	—	17 (0.8) ▲	17 (0.8) ▲	17 (0.8) ▲	17 (0.8) ▲
	SCI	—	—	—	17 (0.9) ▲	17 (0.9) ▲	17 (0.9) ▲	17 (0.8) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	8 (0.8) ▲	8 (0.7) ▲	8 (0.7) ▲	8 (0.7) ▲
	MAT	—	—	—	9 (0.8) ▲	9 (0.8) ▲	9 (0.8) ▲	9 (0.8) ▲
	SCI	—	—	—	6 (1.0) ▲	6 (1.0) ▲	6 (1.0) ▲	6 (1.0) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	29 (2.0) ▲	27 (2.7) ▲	29 (2.0) ▲	29 (2.4) ▲
	MAT	—	—	—	35 (2.1) ▲	31 (2.6) ▲	35 (2.1) ▲	32 (2.3) ▲
	SCI	—	—	—	31 (2.1) ▲	28 (2.9) ▲	31 (2.1) ▲	30 (2.7) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	2 (7.0)	3 (7.1)	6 (7.6)	6 (7.5)
	MAT	—	—	—	-3 (7.8)	-2 (8.0)	2 (8.6)	2 (8.6)
	SCI	—	—	—	-1 (8.2)	0 (8.6)	4 (9.0)	4 (9.1)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (32%)	37	0	38	74	74	76	76
Within Schools (68%)	—	—	—	20	20	20	20
Total	12	0	12	37	37	38	38
Mathematics							
Between Schools (36%)	43	0	43	77	77	78	79
Within Schools (64%)	—	—	—	22	22	22	22
Total	15	0	15	42	42	42	42
Science							
Between Schools (38%)	37	0	38	68	69	70	70
Within Schools (62%)	—	—	—	21	21	21	21
Total	14	0	15	39	39	40	40

() Percentage of available variance shown in parentheses.

Exhibit 3.16: School Effectiveness Models for Reading, Mathematics, and Science – Iran, Islamic Republic of

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	0 (4.4)	—	0 (4.3)	—	6 (3.5)	—	6 (3.6)
	MAT	-1 (4.8)	—	-1 (4.8)	—	5 (3.8)	—	4 (3.8)
	SCI	-2 (5.3)	—	-1 (5.2)	—	5 (4.1)	—	5 (4.2)
Schools Support Academic Success	REA	14 (3.7) ▲	—	12 (3.6) ▲	—	3 (3.1)	—	3 (3.1)
	MAT	13 (3.9) ▲	—	11 (3.9) ▲	—	2 (3.2)	—	2 (3.2)
	SCI	15 (4.1) ▲	—	13 (4.1) ▲	—	3 (3.3)	—	3 (3.3)
Adequate Environment and Resources	REA	2 (3.7)	—	3 (3.7)	—	-1 (2.8)	—	-1 (2.8)
	MAT	2 (3.7)	—	3 (3.7)	—	-2 (2.7)	—	-2 (2.8)
	SCI	1 (4.3)	—	2 (4.1)	—	-2 (3.1)	—	-2 (3.2)
School Instruction								
Early Emphasis on Reading Skills	REA	—	12 (2.6) ▲	10 (2.6) ▲	—	—	3 (1.9)	2 (1.9)
	MAT	—	9 (2.5) ▲	7 (2.5) ▲	—	—	1 (1.9)	0 (1.9)
	SCI	—	11 (2.9) ▲	9 (2.8) ▲	—	—	1 (2.1)	0 (2.2)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	3 (5.8)	0 (5.9)	—	—	5 (4.4)	3 (4.5)
	MAT	—	3 (5.8)	0 (6.0)	—	—	5 (4.5)	3 (4.6)
	SCI	—	0 (6.6)	-3 (6.6)	—	—	2 (4.7)	0 (4.7)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	8 (0.9) ▲	8 (0.9) ▲	8 (0.9) ▲	8 (0.9) ▲
	MAT	—	—	—	7 (1.1) ▲	7 (1.1) ▲	7 (1.1) ▲	7 (1.1) ▲
	SCI	—	—	—	8 (1.1) ▲	8 (1.1) ▲	8 (1.1) ▲	8 (1.1) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	8 (0.7) ▲	8 (0.7) ▲	8 (0.7) ▲	8 (0.7) ▲
	MAT	—	—	—	9 (0.7) ▲	9 (0.7) ▲	9 (0.7) ▲	9 (0.7) ▲
	SCI	—	—	—	8 (0.7) ▲	8 (0.7) ▲	8 (0.7) ▲	8 (0.7) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	24 (2.0) ▲	23 (2.4) ▲	23 (2.0) ▲	22 (2.4) ▲
	MAT	—	—	—	23 (2.2) ▲	22 (2.5) ▲	23 (2.4) ▲	23 (2.6) ▲
	SCI	—	—	—	26 (2.2) ▲	26 (2.5) ▲	26 (2.4) ▲	26 (2.6) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	4 (4.8)	4 (4.9)	3 (4.7)	3 (4.9)
	MAT	—	—	—	0 (4.9)	0 (5.0)	0 (4.9)	0 (5.1)
	SCI	—	—	—	4 (5.3)	4 (5.5)	4 (5.4)	4 (5.6)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (39%)	13	10	19	57	59	58	59
Within Schools (61%)	—	—	—	7	7	7	7
Total	5	4	7	26	27	27	27
Mathematics							
Between Schools (38%)	10	6	14	51	53	52	53
Within Schools (62%)	—	—	—	8	8	8	8
Total	4	2	5	25	25	25	25
Science							
Between Schools (42%)	10	7	15	55	56	55	56
Within Schools (58%)	—	—	—	7	7	7	7
Total	4	3	6	27	28	27	28

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	11 (4.0) ▲	—	11 (3.9) ▲	—	7 (3.1) ▲	—	5 (3.2)
	MAT	12 (3.8) ▲	—	11 (3.8) ▲	—	6 (3.9)	—	4 (3.8)
	SCI	11 (4.2) ▲	—	11 (4.1) ▲	—	5 (4.3)	—	3 (4.2)
Schools Support Academic Success	REA	5 (2.2) ▲	—	5 (2.2) ▲	—	2 (1.9)	—	2 (1.9)
	MAT	5 (2.2) ▲	—	6 (2.4) ▲	—	3 (2.1)	—	4 (2.2)
	SCI	6 (2.4) ▲	—	7 (2.5) ▲	—	4 (2.3)	—	5 (2.4) ▲
Adequate Environment and Resources	REA	-1 (2.1)	—	-2 (2.1)	—	-1 (1.5)	—	-1 (1.6)
	MAT	0 (2.5)	—	-1 (2.3)	—	1 (2.1)	—	0 (2.0)
	SCI	0 (2.9)	—	-1 (2.9)	—	1 (2.5)	—	0 (2.5)
School Instruction								
Early Emphasis on Reading Skills	REA	—	3 (1.7)	2 (1.8)	—	—	2 (1.5)	2 (1.4)
	MAT	—	1 (1.7)	0 (1.7)	—	—	1 (1.6)	1 (1.5)
	SCI	—	3 (1.8)	2 (1.9)	—	—	2 (1.8)	2 (1.6)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	6 (4.4)	5 (4.4)	—	—	7 (3.3) ▲	6 (3.5)
	MAT	—	10 (6.6)	9 (6.5)	—	—	13 (5.2) ▲	12 (5.5) ▲
	SCI	—	9 (6.4)	9 (6.2)	—	—	11 (5.4) ▲	11 (5.4) ▲
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	19 (1.0) ▲	19 (1.0) ▲	19 (1.0) ▲	19 (1.0) ▲
	MAT	—	—	—	17 (0.9) ▲	17 (0.9) ▲	17 (0.9) ▲	17 (0.9) ▲
	SCI	—	—	—	17 (1.3) ▲	17 (1.3) ▲	17 (1.3) ▲	17 (1.3) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	8 (1.2) ▲	8 (1.1) ▲	8 (1.2) ▲	8 (1.1) ▲
	MAT	—	—	—	10 (1.3) ▲	10 (1.3) ▲	10 (1.3) ▲	10 (1.3) ▲
	SCI	—	—	—	7 (1.0) ▲	7 (1.0) ▲	7 (1.0) ▲	7 (1.0) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	27 (3.1) ▲	23 (3.1) ▲	27 (3.2) ▲	24 (3.1) ▲
	MAT	—	—	—	25 (3.8) ▲	20 (4.0) ▲	25 (3.7) ▲	21 (3.8) ▲
	SCI	—	—	—	27 (3.6) ▲	22 (3.8) ▲	27 (3.7) ▲	23 (3.6) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	2 (7.5)	5 (7.0)	0 (7.6)	3 (7.1)
	MAT	—	—	—	-2 (7.1)	1 (6.9)	-5 (7.6)	-3 (7.4)
	SCI	—	—	—	-1 (7.6)	1 (7.0)	-5 (8.0)	-4 (7.4)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (12%)	37	4	38	57	68	61	70
Within Schools (88%)	—	—	—	20	20	20	20
Total	4	0	4	25	26	25	26
Mathematics							
Between Schools (17%)	31	4	33	37	46	43	51
Within Schools (83%)	—	—	—	21	21	21	21
Total	5	1	6	24	25	25	26
Science							
Between Schools (19%)	29	4	32	40	49	46	54
Within Schools (81%)	—	—	—	19	19	19	19
Total	5	1	6	23	25	24	25

() Percentage of available variance shown in parentheses.

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	7 (2.6) ▲	—	7 (2.6) ▲	—	5 (2.6) ▲	—	5 (2.6)
	MAT	7 (4.4)	—	7 (4.4)	—	5 (4.3)	—	5 (4.3)
	SCI	9 (3.9) ▲	—	9 (3.9) ▲	—	7 (4.0)	—	7 (4.0)
Schools Support Academic Success	REA	-3 (2.5)	—	-2 (2.6)	—	-3 (2.2)	—	-3 (2.2)
	MAT	-1 (3.1)	—	-1 (3.3)	—	-2 (3.1)	—	-2 (3.2)
	SCI	-2 (3.1)	—	-2 (3.2)	—	-2 (2.9)	—	-2 (3.1)
Adequate Environment and Resources	REA	3 (2.4)	—	3 (2.5)	—	3 (2.0)	—	3 (2.0)
	MAT	6 (3.2) ▲	—	6 (3.2) ▲	—	7 (3.0) ▲	—	7 (3.1) ▲
	SCI	4 (3.2)	—	4 (3.2)	—	4 (2.8)	—	4 (2.8)
School Instruction								
Early Emphasis on Reading Skills	REA	—	-1 (1.6)	-1 (1.6)	—	—	0 (1.5)	0 (1.5)
	MAT	—	0 (2.0)	-1 (2.1)	—	—	1 (2.0)	0 (2.2)
	SCI	—	-1 (2.1)	-2 (2.2)	—	—	0 (2.0)	-1 (2.1)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	4 (3.8)	3 (4.1)	—	—	6 (4.0)	5 (4.1)
	MAT	—	6 (5.8)	3 (5.6)	—	—	6 (5.9)	4 (5.4)
	SCI	—	4 (5.7)	2 (5.6)	—	—	6 (5.8)	4 (5.5)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	16 (0.9) ▲	16 (0.9) ▲	16 (0.9) ▲	16 (0.9) ▲
	MAT	—	—	—	12 (1.0) ▲	12 (1.0) ▲	12 (1.0) ▲	12 (1.0) ▲
	SCI	—	—	—	15 (1.0) ▲	15 (1.0) ▲	15 (1.0) ▲	15 (1.0) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	7 (0.9) ▲	7 (0.9) ▲	7 (0.9) ▲	7 (0.9) ▲
	MAT	—	—	—	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲
	SCI	—	—	—	6 (0.9) ▲	6 (0.9) ▲	6 (0.9) ▲	6 (0.9) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	22 (3.5) ▲	21 (3.4) ▲	22 (3.5) ▲	21 (3.4) ▲
	MAT	—	—	—	20 (4.6) ▲	19 (4.6) ▲	20 (4.5) ▲	19 (4.5) ▲
	SCI	—	—	—	23 (4.4) ▲	22 (4.3) ▲	23 (4.4) ▲	22 (4.3) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	2 (5.3)	3 (5.3)	0 (5.4)	2 (5.4)
	MAT	—	—	—	7 (6.5)	8 (6.7)	4 (6.6)	7 (6.8)
	SCI	—	—	—	1 (6.2)	2 (6.4)	-1 (6.3)	1 (6.4)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (17%)	6	1	7	22	26	23	26
Within Schools (83%)	—	—	—	15	15	15	15
Total	1	0	1	16	17	16	17
Mathematics							
Between Schools (26%)	7	1	7	8	13	9	14
Within Schools (74%)	—	—	—	15	15	15	15
Total	2	0	2	13	14	13	14
Science							
Between Schools (26%)	5	0	6	14	18	15	18
Within Schools (74%)	—	—	—	14	14	14	14
Total	1	0	2	14	15	14	15

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
School Explanatory Variables								
School Environment								
Schools Are Safe and Orderly	REA	8 (6.0)	—	7 (5.5)	—	7 (3.3) ▲	—	7 (3.4) ▲
	MAT	6 (6.5)	—	5 (6.3)	—	5 (3.7)	—	6 (3.8)
	SCI	8 (6.5)	—	7 (5.8)	—	7 (2.9) ▲	—	7 (2.9) ▲
Schools Support Academic Success	REA	11 (2.8) ▲	—	9 (2.6) ▲	—	0 (1.9)	—	0 (1.8)
	MAT	13 (3.4) ▲	—	12 (3.2) ▲	—	1 (2.0)	—	1 (2.0)
	SCI	10 (3.5) ▲	—	9 (3.3) ▲	—	-1 (2.1)	—	-1 (2.1)
Adequate Environment and Resources	REA	-4 (3.9)	—	-4 (4.0)	—	2 (1.8)	—	1 (1.8)
	MAT	-5 (4.6)	—	-5 (4.6)	—	2 (2.2)	—	2 (2.2)
	SCI	-5 (4.8)	—	-5 (4.8)	—	1 (2.2)	—	1 (2.2)
School Instruction								
Early Emphasis on Reading Skills	REA	—	5 (1.8) ▲	4 (1.9) ▲	—	—	2 (1.2)	2 (1.2)
	MAT	—	4 (2.1) ▲	3 (1.9)	—	—	2 (1.1)	2 (1.1)
	SCI	—	3 (2.0)	3 (2.0)	—	—	1 (1.2)	2 (1.2)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	18 (6.1) ▲	13 (5.0) ▲	—	—	8 (3.1) ▲	6 (3.1)
	MAT	—	14 (6.3) ▲	9 (5.3)	—	—	3 (3.6)	1 (3.5)
	SCI	—	18 (6.2) ▲	13 (4.8) ▲	—	—	7 (3.2) ▲	5 (3.1)
Home Background Control Variables								
Students within Schools								
Home Resources for Learning	REA	—	—	—	13 (0.8) ▲	13 (0.8) ▲	13 (0.8) ▲	13 (0.8) ▲
	MAT	—	—	—	11 (1.2) ▲	11 (1.2) ▲	11 (1.2) ▲	11 (1.2) ▲
	SCI	—	—	—	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	15 (0.9) ▲	15 (0.9) ▲	15 (0.9) ▲	15 (0.9) ▲
	MAT	—	—	—	18 (0.9) ▲	18 (0.9) ▲	18 (0.9) ▲	18 (0.9) ▲
	SCI	—	—	—	14 (0.9) ▲	14 (0.9) ▲	14 (0.9) ▲	14 (0.9) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	19 (3.4) ▲	19 (3.1) ▲	18 (3.0) ▲	19 (2.8) ▲
	MAT	—	—	—	21 (3.7) ▲	21 (3.6) ▲	21 (3.6) ▲	21 (3.4) ▲
	SCI	—	—	—	18 (3.4) ▲	19 (3.3) ▲	18 (3.2) ▲	18 (3.1) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	26 (6.6) ▲	25 (5.8) ▲	24 (6.1) ▲	23 (5.2) ▲
	MAT	—	—	—	27 (5.4) ▲	26 (5.4) ▲	26 (5.5) ▲	26 (5.3) ▲
	SCI	—	—	—	29 (5.7) ▲	28 (5.5) ▲	27 (5.3) ▲	27 (5.1) ▲

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (19%)	24	15	31	78	82	80	83
Within Schools (81%)	—	—	—	21	21	21	21
Total	5	3	6	32	33	33	33
Mathematics							
Between Schools (20%)	23	9	27	78	81	78	81
Within Schools (80%)	—	—	—	22	22	22	22
Total	5	2	5	33	34	33	34
Science							
Between Schools (23%)	20	12	26	77	80	78	81
Within Schools (77%)	—	—	—	20	20	20	20
Total	5	3	6	33	34	33	34

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	21 (5.7) ▲	—	18 (5.6) ▲	—	11 (4.9) ▲	—	8 (4.1) ▲
	MAT	15 (3.6) ▲	—	14 (3.6) ▲	—	10 (3.2) ▲	—	9 (3.0) ▲
	SCI	16 (4.6) ▲	—	14 (4.6) ▲	—	7 (4.0)	—	6 (3.6)
Schools Support Academic Success	REA	21 (4.2) ▲	—	19 (4.1) ▲	—	8 (3.1) ▲	—	4 (2.9)
	MAT	12 (2.7) ▲	—	11 (2.7) ▲	—	6 (2.5) ▲	—	5 (2.6)
	SCI	18 (3.8) ▲	—	16 (3.8) ▲	—	6 (2.9) ▲	—	4 (2.9)
Adequate Environment and Resources	REA	0 (4.6)	—	-1 (4.5)	—	-3 (2.8)	—	-3 (2.7)
	MAT	-1 (2.9)	—	-1 (2.8)	—	-2 (2.2)	—	-2 (2.1)
	SCI	2 (3.9)	—	2 (3.9)	—	0 (2.6)	—	0 (2.5)
School Instruction								
Early Emphasis on Reading Skills	REA	—	-2 (3.2)	-3 (2.7)	—	—	-2 (1.8)	-2 (1.7)
	MAT	—	-1 (2.2)	-3 (1.9)	—	—	-1 (1.6)	-2 (1.5)
	SCI	—	-1 (2.8)	-3 (2.4)	—	—	-2 (1.7)	-2 (1.7)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	47 (9.7) ▲	22 (8.1) ▲	—	—	30 (6.9) ▲	24 (6.3) ▲
	MAT	—	27 (6.8) ▲	10 (5.9)	—	—	17 (5.7) ▲	10 (5.5)
	SCI	—	36 (8.2) ▲	15 (7.1) ▲	—	—	21 (6.1) ▲	16 (6.1) ▲
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	24 (1.4) ▲	24 (1.4) ▲	24 (1.4) ▲	24 (1.4) ▲
	MAT	—	—	—	15 (1.1) ▲	15 (1.1) ▲	15 (1.1) ▲	15 (1.1) ▲
	SCI	—	—	—	23 (1.6) ▲	23 (1.6) ▲	23 (1.6) ▲	23 (1.6) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	12 (1.2) ▲	12 (1.2) ▲	12 (1.2) ▲	12 (1.2) ▲
	MAT	—	—	—	10 (1.0) ▲	10 (1.0) ▲	10 (1.0) ▲	10 (1.0) ▲
	SCI	—	—	—	8 (1.2) ▲	8 (1.2) ▲	8 (1.2) ▲	8 (1.2) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	65 (5.8) ▲	52 (6.9) ▲	64 (5.1) ▲	57 (6.3) ▲
	MAT	—	—	—	34 (4.5) ▲	24 (5.0) ▲	34 (4.1) ▲	25 (4.9) ▲
	SCI	—	—	—	55 (5.5) ▲	45 (6.2) ▲	55 (4.8) ▲	48 (5.8) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	41 (9.2) ▲	35 (9.4) ▲	22 (9.9) ▲	22 (9.9) ▲
	MAT	—	—	—	27 (8.0) ▲	21 (8.2) ▲	16 (8.6)	16 (8.8)
	SCI	—	—	—	32 (9.7) ▲	28 (9.6) ▲	19 (10.2)	20 (10.3)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (28%)	48	25	52	75	81	83	85
Within Schools (72%)	—	—	—	13	13	13	13
Total	13	7	14	30	32	33	33
Mathematics							
Between Schools (20%)	49	21	53	57	69	64	71
Within Schools (80%)	—	—	—	10	10	10	10
Total	10	4	10	19	22	21	22
Science							
Between Schools (24%)	44	20	48	74	78	80	81
Within Schools (76%)	—	—	—	13	13	13	13
Total	11	5	12	28	29	29	30

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
School Explanatory Variables								
School Environment								
Schools Are Safe and Orderly	REA	5 (5.0)	—	1 (4.7)	—	4 (4.6)	—	0 (4.3)
	MAT	4 (5.0)	—	0 (4.8)	—	5 (4.8)	—	1 (4.7)
	SCI	5 (5.9)	—	0 (5.6)	—	5 (5.9)	—	1 (5.7)
Schools Support Academic Success	REA	18 (3.7) ▲	—	12 (3.7) ▲	—	13 (4.2) ▲	—	8 (3.9)
	MAT	12 (4.1) ▲	—	7 (4.2)	—	12 (4.9) ▲	—	8 (4.6)
	SCI	17 (4.6) ▲	—	11 (4.4) ▲	—	15 (5.8) ▲	—	10 (5.4)
Adequate Environment and Resources	REA	8 (3.7) ▲	—	10 (3.5) ▲	—	10 (3.5) ▲	—	11 (3.2) ▲
	MAT	10 (3.8) ▲	—	11 (3.5) ▲	—	9 (3.9) ▲	—	10 (3.6) ▲
	SCI	10 (4.3) ▲	—	11 (3.8) ▲	—	10 (4.4) ▲	—	11 (3.9) ▲
School Instruction								
Early Emphasis on Reading Skills	REA	—	11 (3.2) ▲	7 (3.6)	—	—	8 (3.5) ▲	6 (3.7)
	MAT	—	5 (3.3)	3 (3.9)	—	—	5 (3.6)	4 (3.9)
	SCI	—	7 (3.4) ▲	4 (4.0)	—	—	6 (3.7)	4 (4.0)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	30 (6.6) ▲	26 (6.6) ▲	—	—	27 (6.5) ▲	24 (6.5) ▲
	MAT	—	28 (7.0) ▲	25 (6.9) ▲	—	—	27 (6.9) ▲	24 (6.7) ▲
	SCI	—	34 (7.7) ▲	30 (7.6) ▲	—	—	33 (7.5) ▲	30 (7.3) ▲
Home Background Control Variables								
Students within Schools								
Home Resources for Learning	REA	—	—	—	1 (1.1)	1 (1.1)	1 (1.1)	1 (1.1)
	MAT	—	—	—	0 (1.2)	0 (1.2)	0 (1.2)	0 (1.2)
	SCI	—	—	—	1 (1.5)	1 (1.5)	1 (1.5)	1 (1.5)
Early Literacy/Numeracy Tasks	REA	—	—	—	14 (1.5) ▲	14 (1.5) ▲	14 (1.5) ▲	14 (1.5) ▲
	MAT	—	—	—	10 (1.4) ▲	10 (1.4) ▲	10 (1.4) ▲	10 (1.4) ▲
	SCI	—	—	—	15 (1.8) ▲	15 (1.8) ▲	15 (1.8) ▲	15 (1.8) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	17 (8.4) ▲	8 (8.5)	14 (7.2)	8 (7.3)
	MAT	—	—	—	8 (8.6)	0 (8.8)	6 (7.4)	1 (7.8)
	SCI	—	—	—	12 (9.6)	2 (10.1)	9 (8.0)	3 (8.8)
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	8 (6.4)	10 (6.1)	5 (5.4)	7 (5.3)
	MAT	—	—	—	-5 (7.2)	-3 (6.9)	-8 (6.1)	-6 (6.1)
	SCI	—	—	—	-3 (8.5)	-1 (8.1)	-7 (7.0)	-4 (7.0)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (38%)	22	27	37	17	29	35	41
Within Schools (62%)	—	—	—	7	7	7	7
Total	8	10	14	11	15	18	20
Mathematics							
Between Schools (44%)	13	20	26	1	12	20	25
Within Schools (56%)	—	—	—	6	6	6	6
Total	6	9	11	4	9	12	14
Science							
Between Schools (36%)	17	25	33	4	16	25	32
Within Schools (64%)	—	—	—	6	6	6	6
Total	6	9	12	6	10	13	15

() Percentage of available variance shown in parentheses.

Exhibit 3.22: School Effectiveness Models for Reading, Mathematics, and Science – Northern Ireland

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	14 (4.0) ▲	—	14 (3.6) ▲	—	10 (3.4) ▲	—	10 (3.1) ▲
	MAT	20 (5.5) ▲	—	20 (5.0) ▲	—	14 (4.6) ▲	—	13 (4.3) ▲
	SCI	17 (5.4) ▲	—	16 (4.9) ▲	—	12 (5.1) ▲	—	11 (4.5) ▲
Schools Support Academic Success	REA	5 (2.2) ▲	—	5 (2.1) ▲	—	3 (1.6)	—	2 (1.6)
	MAT	4 (2.7)	—	3 (2.7)	—	0 (2.0)	—	0 (2.0)
	SCI	6 (2.3) ●	—	5 (2.3)	—	3 (1.9)	—	2 (1.9)
Adequate Environment and Resources	REA	2 (1.9)	—	2 (1.9)	—	0 (1.5)	—	0 (1.5)
	MAT	1 (2.5)	—	1 (2.5)	—	-1 (1.8)	—	-1 (1.9)
	SCI	0 (2.5)	—	0 (2.6)	—	-1 (2.1)	—	-1 (2.1)
School Instruction								
Early Emphasis on Reading Skills	REA	—	1 (2.4)	2 (2.1)	—	—	-1 (1.7)	0 (1.5)
	MAT	—	-1 (3.0)	1 (2.7)	—	—	-3 (2.4)	-2 (2.2)
	SCI	—	-1 (2.9)	1 (2.5)	—	—	-2 (2.4)	-1 (2.2)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	10 (4.7) ▲	6 (4.3)	—	—	3 (4.4)	1 (3.8)
	MAT	—	14 (5.4) ▲	10 (4.8) ▲	—	—	5 (5.1)	3 (4.4)
	SCI	—	14 (5.5) ▲	9 (5.0)	—	—	6 (5.9)	4 (5.1)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	16 (1.1) ▲	16 (1.1) ▲	16 (1.1) ▲	16 (1.1) ▲
	MAT	—	—	—	16 (1.5) ▲	16 (1.5) ▲	16 (1.5) ▲	16 (1.5) ▲
	SCI	—	—	—	15 (0.9) ▲	15 (0.9) ▲	15 (0.9) ▲	15 (0.9) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	9 (1.4) ▲	9 (1.4) ▲	9 (1.4) ▲	9 (1.4) ▲
	MAT	—	—	—	9 (1.4) ▲	9 (1.4) ▲	9 (1.4) ▲	9 (1.4) ▲
	SCI	—	—	—	6 (1.3) ▲	5 (1.3) ▲	5 (1.3) ▲	5 (1.3) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	37 (5.2) ▲	32 (5.0) ▲	37 (5.3) ▲	31 (5.1) ▲
	MAT	—	—	—	48 (5.9) ▲	42 (5.7) ▲	48 (6.1) ▲	43 (5.9) ▲
	SCI	—	—	—	40 (6.0) ▲	34 (5.9) ▲	39 (6.3) ▲	34 (6.2) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	7 (8.7)	10 (7.6)	6 (10.0)	9 (8.6)
	MAT	—	—	—	6 (8.7)	11 (8.2)	4 (10.1)	10 (9.2)
	SCI	—	—	—	5 (9.2)	9 (8.5)	3 (11.1)	7 (9.7)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ● Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (11%)	36	7	40	67	79	68	79
Within Schools (89%)	—	—	—	8	8	8	8
Total	4	1	4	14	16	14	16
Mathematics							
Between Schools (17%)	28	7	31	60	68	62	69
Within Schools (83%)	—	—	—	8	8	8	8
Total	5	1	5	17	18	17	19
Science							
Between Schools (22%)	27	7	30	46	56	49	57
Within Schools (78%)	—	—	—	10	10	10	10
Total	6	2	6	18	20	18	20

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	

School Explanatory Variables

School Environment

Schools Are Safe and Orderly	REA	7 (3.7)	—	7 (3.9)	—	7 (3.7) ▲	—	7 (3.4) ▲
	MAT	10 (4.7) ▲	—	11 (5.2) ▲	—	11 (5.0) ▲	—	10 (4.8) ▲
	SCI	7 (3.8)	—	7 (4.0)	—	7 (3.3) ▲	—	6 (3.2)
Schools Support Academic Success	REA	6 (2.3) ▲	—	5 (2.4) ▲	—	3 (2.2)	—	2 (2.2)
	MAT	7 (3.4)	—	6 (3.5)	—	4 (3.6)	—	3 (3.4)
	SCI	7 (2.4) ▲	—	7 (2.5) ▲	—	3 (2.2)	—	2 (2.2)
Adequate Environment and Resources	REA	-5 (2.5)	—	-4 (2.5)	—	-2 (2.6)	—	-1 (2.4)
	MAT	-4 (3.2)	—	-4 (3.2)	—	-2 (3.4)	—	-1 (3.3)
	SCI	-4 (2.4)	—	-4 (2.4)	—	-1 (2.2)	—	0 (2.1)

School Instruction

Early Emphasis on Reading Skills	REA	—	-1 (1.7)	-1 (1.6)	—	—	0 (1.6)	-1 (1.5)
	MAT	—	0 (2.2)	-1 (2.0)	—	—	0 (2.1)	-1 (1.9)
	SCI	—	-1 (1.5)	-1 (1.4)	—	—	0 (1.2)	-1 (1.1)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	8 (4.3)	4 (4.1)	—	—	9 (4.2) ▲	7 (3.9)
	MAT	—	8 (5.7)	4 (5.7)	—	—	11 (5.6)	7 (5.4)
	SCI	—	6 (4.4)	2 (4.3)	—	—	8 (4.3)	5 (4.0)

Home Background Control Variables

Students within Schools

Home Resources for Learning	REA	—	—	—	12 (1.1) ▲	12 (1.1) ▲	12 (1.1) ▲	12 (1.1) ▲
	MAT	—	—	—	9 (1.5) ▲	9 (1.5) ▲	9 (1.5) ▲	9 (1.5) ▲
	SCI	—	—	—	11 (1.2) ▲	11 (1.2) ▲	11 (1.2) ▲	11 (1.2) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	12 (0.9) ▲	12 (0.9) ▲	12 (0.9) ▲	12 (0.9) ▲
	MAT	—	—	—	13 (0.9) ▲	13 (0.9) ▲	13 (0.9) ▲	13 (0.9) ▲
	SCI	—	—	—	11 (1.0) ▲	11 (1.0) ▲	11 (1.0) ▲	11 (1.0) ▲

Between Schools

School Average of Home Resources for Learning	REA	—	—	—	20 (4.3) ▲	16 (4.9) ▲	21 (4.1) ▲	17 (4.5) ▲
	MAT	—	—	—	21 (5.6) ▲	15 (6.7) ▲	22 (5.3) ▲	17 (5.9) ▲
	SCI	—	—	—	21 (3.5) ▲	17 (4.3) ▲	21 (3.3) ▲	18 (3.8) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	5 (7.8)	11 (8.0)	6 (7.4)	10 (7.4)
	MAT	—	—	—	7 (10.1)	15 (10.4)	8 (9.9)	15 (10.1)
	SCI	—	—	—	4 (6.7)	9 (6.6)	5 (6.3)	9 (6.3)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (8%)	29	10	32	26	38	38	45
Within Schools (92%)	—	—	—	19	19	19	19
Total	2	1	3	19	20	20	21
Mathematics							
Between Schools (14%)	24	6	26	15	29	22	33
Within Schools (86%)	—	—	—	18	18	18	18
Total	3	1	3	18	20	19	20
Science							
Between Schools (9%)	32	6	33	29	43	37	47
Within Schools (91%)	—	—	—	21	21	21	21
Total	3	1	3	22	23	22	23

() Percentage of available variance shown in parentheses.

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	7 (3.7)	—	5 (3.5)	—	11 (3.3) ▲	—	9 (3.3) ▲
	MAT	8 (3.6) ▲	—	6 (3.5)	—	11 (3.4) ▲	—	8 (3.4) ▲
	SCI	10 (4.3) ▲	—	7 (4.0)	—	14 (4.0) ▲	—	9 (4.0) ▲
Schools Support Academic Success	REA	12 (2.7) ▲	—	9 (2.6) ▲	—	8 (2.5) ▲	—	7 (2.5) ▲
	MAT	12 (2.7) ▲	—	9 (2.7) ▲	—	8 (2.6) ▲	—	6 (2.6) ▲
	SCI	15 (3.1) ▲	—	11 (3.1) ▲	—	11 (2.9) ▲	—	8 (3.0) ▲
Adequate Environment and Resources	REA	3 (2.9)	—	4 (2.8)	—	0 (2.7)	—	1 (2.7)
	MAT	-1 (2.9)	—	1 (2.8)	—	-3 (2.8)	—	-1 (2.7)
	SCI	-2 (3.6)	—	0 (3.4)	—	-4 (3.4)	—	-2 (3.2)
School Instruction								
Early Emphasis on Reading Skills	REA	—	5 (2.0) ▲	4 (1.9)	—	—	2 (1.7)	2 (1.7)
	MAT	—	4 (2.0) ▲	3 (1.9)	—	—	2 (1.8)	2 (1.8)
	SCI	—	5 (2.3) ▲	3 (2.3)	—	—	2 (2.1)	2 (2.1)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	22 (4.2) ▲	19 (4.3) ▲	—	—	21 (4.4) ▲	17 (4.5) ▲
	MAT	—	24 (4.2) ▲	20 (4.5) ▲	—	—	23 (4.4) ▲	19 (4.7) ▲
	SCI	—	34 (5.3) ▲	30 (5.6) ▲	—	—	33 (5.5) ▲	29 (5.9) ▲
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	12 (1.0) ▲	12 (1.0) ▲	12 (1.0) ▲	12 (1.0) ▲
	MAT	—	—	—	13 (0.9) ▲	13 (0.9) ▲	13 (0.9) ▲	13 (0.9) ▲
	SCI	—	—	—	15 (1.3) ▲	15 (1.3) ▲	15 (1.3) ▲	15 (1.3) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	19 (1.0) ▲	19 (1.0) ▲	19 (1.0) ▲	19 (1.0) ▲
	MAT	—	—	—	18 (0.9) ▲	18 (0.9) ▲	18 (0.9) ▲	18 (0.9) ▲
	SCI	—	—	—	22 (1.2) ▲	22 (1.2) ▲	22 (1.2) ▲	22 (1.2) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	22 (3.5) ▲	19 (3.5) ▲	19 (3.5) ▲	18 (3.5) ▲
	MAT	—	—	—	18 (3.9) ▲	16 (3.8) ▲	15 (3.7) ▲	14 (3.8) ▲
	SCI	—	—	—	18 (4.6) ▲	17 (4.4) ▲	16 (4.4) ▲	14 (4.4) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	-9 (13.9)	-6 (13.1)	-10 (11.6)	-7 (11.4)
	MAT	—	—	—	-5 (11.7)	-4 (11.0)	-7 (9.3)	-5 (9.1)
	SCI	—	—	—	-6 (15.2)	-4 (14.2)	-7 (11.4)	-6 (11.2)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (18%)	18	16	28	17	29	28	36
Within Schools (82%)	—	—	—	15	15	15	15
Total	3	3	5	15	18	17	19
Mathematics							
Between Schools (20%)	13	16	24	10	20	22	28
Within Schools (80%)	—	—	—	16	16	16	16
Total	3	3	5	15	17	17	18
Science							
Between Schools (21%)	14	21	28	7	19	24	30
Within Schools (79%)	—	—	—	17	17	17	17
Total	3	4	6	15	17	18	20

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	-7 (4.5)	—	-5 (4.4)	—	3 (3.6)	—	2 (3.4)
	MAT	-8 (5.0)	—	-6 (4.8)	—	1 (4.0)	—	0 (3.9)
	SCI	-8 (4.8)	—	-6 (4.6)	—	1 (3.7)	—	1 (3.5)
Schools Support Academic Success	REA	9 (2.1) ▲	—	8 (2.1) ▲	—	3 (1.9)	—	3 (1.8)
	MAT	8 (2.1) ▲	—	8 (2.0) ▲	—	3 (1.8)	—	3 (1.8)
	SCI	8 (2.2) ▲	—	8 (2.2) ▲	—	3 (1.9)	—	3 (1.9)
Adequate Environment and Resources	REA	-3 (2.0)	—	-3 (2.0)	—	-2 (1.9)	—	-1 (1.8)
	MAT	-3 (2.2)	—	-3 (2.2)	—	-1 (2.1)	—	-1 (2.1)
	SCI	-4 (2.2)	—	-4 (2.1)	—	-2 (1.9)	—	-2 (1.8)
School Instruction								
Early Emphasis on Reading Skills	REA	—	-1 (2.4)	-2 (2.3)	—	—	0 (1.7)	-1 (1.7)
	MAT	—	-1 (2.5)	-2 (2.4)	—	—	-1 (1.8)	-1 (1.8)
	SCI	—	-1 (2.5)	-2 (2.3)	—	—	-1 (1.8)	-1 (1.8)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	-13 (6.1) ▼	-8 (5.5)	—	—	8 (5.5)	7 (5.3)
	MAT	—	-16 (6.5) ▼	-11 (5.7)	—	—	3 (6.1)	3 (5.8)
	SCI	—	-15 (6.0) ▼	-9 (5.5)	—	—	5 (5.5)	5 (5.4)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	18 (0.8) ▲	18 (0.8) ▲	18 (0.8) ▲	18 (0.8) ▲
	MAT	—	—	—	16 (0.8) ▲	16 (0.8) ▲	16 (0.8) ▲	16 (0.8) ▲
	SCI	—	—	—	18 (0.8) ▲	18 (0.8) ▲	18 (0.8) ▲	18 (0.8) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	13 (0.9) ▲	13 (0.9) ▲	13 (0.9) ▲	13 (0.9) ▲
	MAT	—	—	—	13 (0.8) ▲	13 (0.8) ▲	13 (0.8) ▲	13 (0.8) ▲
	SCI	—	—	—	11 (0.9) ▲	11 (0.9) ▲	11 (0.9) ▲	11 (0.9) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	21 (2.6) ▲	20 (2.5) ▲	22 (2.6) ▲	22 (2.5) ▲
	MAT	—	—	—	19 (2.8) ▲	19 (2.6) ▲	20 (2.8) ▲	19 (2.7) ▲
	SCI	—	—	—	20 (2.5) ▲	20 (2.3) ▲	22 (2.7) ▲	21 (2.5) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	7 (5.2)	6 (5.4)	8 (5.3)	7 (5.4)
	MAT	—	—	—	10 (5.1)	9 (5.3)	10 (5.3)	9 (5.4)
	SCI	—	—	—	9 (5.2)	8 (5.5)	9 (5.2)	7 (5.5)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (10%)	22	6	24	64	67	67	70
Within Schools (90%)	—	—	—	25	25	25	25
Total	2	1	2	29	29	29	30
Mathematics							
Between Schools (13%)	22	10	26	59	61	60	62
Within Schools (87%)	—	—	—	26	26	26	26
Total	3	1	3	30	30	30	30
Science							
Between Schools (11%)	23	9	27	68	70	70	72
Within Schools (89%)	—	—	—	24	24	24	24
Total	2	1	3	29	29	29	30

() Percentage of available variance shown in parentheses.

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	2 (3.5)	—	-2 (3.4)	—	4 (3.2)	—	1 (2.9)
	MAT	0 (5.6)	—	-4 (5.4)	—	6 (5.3)	—	1 (4.9)
	SCI	0 (5.1)	—	-4 (4.8)	—	3 (5.1)	—	-1 (4.7)
Schools Support Academic Success	REA	9 (2.8) ▲	—	8 (2.6) ▲	—	5 (2.3) ▲	—	4 (2.1)
	MAT	12 (4.3) ▲	—	9 (4.1) ▲	—	6 (3.3)	—	4 (3.1)
	SCI	12 (4.2) ▲	—	10 (3.9) ▲	—	8 (3.5) ▲	—	6 (3.2)
Adequate Environment and Resources	REA	-5 (2.6)	—	-5 (2.4) ▼	—	-7 (2.4) ▼	—	-7 (2.2) ▼
	MAT	-4 (3.8)	—	-4 (3.6)	—	-8 (3.3) ▼	—	-8 (3.2) ▼
	SCI	-5 (3.2)	—	-5 (3.0)	—	-7 (3.0) ▼	—	-7 (2.9) ▼
School Instruction								
Early Emphasis on Reading Skills	REA	—	-4 (2.4)	-4 (2.3)	—	—	-2 (2.0)	-2 (1.8)
	MAT	—	-6 (3.9)	-6 (3.8)	—	—	-5 (3.5)	-5 (3.3)
	SCI	—	-6 (3.5)	-6 (3.3)	—	—	-5 (3.4)	-5 (3.3)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	21 (4.7) ▲	17 (5.1) ▲	—	—	19 (4.8) ▲	17 (5.0) ▲
	MAT	—	25 (6.6) ▲	22 (7.5) ▲	—	—	23 (6.8) ▲	21 (7.4) ▲
	SCI	—	26 (6.7) ▲	23 (7.2) ▲	—	—	24 (7.2) ▲	22 (7.7) ▲
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	12 (1.2) ▲	12 (1.2) ▲	12 (1.2) ▲	12 (1.2) ▲
	MAT	—	—	—	10 (1.0) ▲	10 (1.0) ▲	10 (1.0) ▲	10 (1.0) ▲
	SCI	—	—	—	11 (1.1) ▲	11 (1.1) ▲	11 (1.1) ▲	11 (1.1) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲
	MAT	—	—	—	9 (0.9) ▲	9 (0.9) ▲	9 (0.9) ▲	9 (0.9) ▲
	SCI	—	—	—	8 (1.0) ▲	8 (1.1) ▲	8 (1.0) ▲	8 (1.1) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	15 (3.8) ▲	14 (3.6) ▲	13 (3.2) ▲	13 (3.0) ▲
	MAT	—	—	—	17 (5.9) ▲	16 (5.6) ▲	15 (5.0) ▲	15 (4.8) ▲
	SCI	—	—	—	14 (5.7) ▲	12 (5.3) ▲	13 (4.7) ▲	12 (4.5) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	5 (4.6)	3 (5.0)	3 (4.6)	2 (4.6)
	MAT	—	—	—	-13 (8.8)	-14 (8.7)	-15 (8.7)	-16 (8.4)
	SCI	—	—	—	-7 (6.3)	-7 (6.5)	-9 (6.5)	-9 (6.2)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (18%)	26	26	40	28	44	50	57
Within Schools (82%)	—	—	—	15	15	15	15
Total	4	5	7	17	20	21	22
Mathematics							
Between Schools (38%)	15	21	29	15	24	33	37
Within Schools (62%)	—	—	—	15	15	15	15
Total	6	8	11	15	18	22	23
Science							
Between Schools (34%)	19	23	33	11	23	31	37
Within Schools (66%)	—	—	—	14	14	14	14
Total	6	8	11	13	17	20	22

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
School Explanatory Variables								
School Environment								
Schools Are Safe and Orderly	REA	25 (6.6) ▲	—	18 (6.4) ▲	—	19 (4.4) ▲	—	17 (4.5) ▲
	MAT	18 (6.8) ▲	—	12 (6.7)	—	12 (4.5) ▲	—	11 (4.6) ▲
	SCI	26 (7.9) ▲	—	20 (7.9) ▲	—	19 (6.1) ▲	—	19 (6.1) ▲
Schools Support Academic Success	REA	12 (4.2) ▲	—	10 (4.0) ▲	—	5 (3.3)	—	4 (3.2)
	MAT	10 (4.6) ▲	—	9 (4.5) ▲	—	3 (3.5)	—	2 (3.5)
	SCI	12 (5.1) ▲	—	10 (5.1)	—	4 (4.3)	—	3 (4.3)
Adequate Environment and Resources	REA	8 (2.7) ▲	—	8 (2.5) ▲	—	4 (1.7) ▲	—	4 (1.6) ▲
	MAT	11 (3.0) ▲	—	10 (2.9) ▲	—	5 (2.0) ▲	—	5 (1.9) ▲
	SCI	8 (3.2) ▲	—	8 (3.1) ▲	—	4 (2.4)	—	4 (2.3)
School Instruction								
Early Emphasis on Reading Skills	REA	—	7 (2.9) ▲	3 (2.2)	—	—	1 (2.1)	-1 (1.8)
	MAT	—	7 (3.1) ▲	4 (2.4)	—	—	0 (2.2)	-1 (2.0)
	SCI	—	5 (3.6)	2 (2.9)	—	—	-1 (3.1)	-3 (2.7)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	47 (8.5) ▲	30 (7.8) ▲	—	—	29 (7.5) ▲	19 (6.8) ▲
	MAT	—	36 (8.7) ▲	22 (8.2) ▲	—	—	20 (7.5) ▲	12 (7.2)
	SCI	—	49 (10.9) ▲	31 (9.7) ▲	—	—	27 (10.3) ▲	16 (9.6)
Home Background Control Variables								
Students within Schools								
Home Resources for Learning	REA	—	—	—	14 (1.4) ▲	14 (1.4) ▲	14 (1.4) ▲	14 (1.4) ▲
	MAT	—	—	—	11 (1.4) ▲	11 (1.4) ▲	11 (1.4) ▲	11 (1.4) ▲
	SCI	—	—	—	15 (1.3) ▲	15 (1.3) ▲	15 (1.3) ▲	15 (1.3) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	16 (1.3) ▲	16 (1.3) ▲	16 (1.3) ▲	16 (1.3) ▲
	MAT	—	—	—	13 (1.3) ▲	13 (1.3) ▲	13 (1.3) ▲	13 (1.3) ▲
	SCI	—	—	—	18 (1.4) ▲	18 (1.4) ▲	18 (1.4) ▲	18 (1.4) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	69 (5.9) ▲	57 (5.2) ▲	64 (6.1) ▲	56 (5.4) ▲
	MAT	—	—	—	71 (5.1) ▲	61 (5.4) ▲	68 (5.5) ▲	61 (5.5) ▲
	SCI	—	—	—	70 (6.8) ▲	58 (6.7) ▲	67 (7.5) ▲	59 (7.2) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	31 (11.2) ▲	28 (9.5) ▲	16 (10.2)	18 (9.5)
	MAT	—	—	—	18 (11.0)	17 (9.8)	8 (10.1)	11 (9.7)
	SCI	—	—	—	48 (14.2) ▲	45 (12.2) ▲	33 (12.7) ▲	36 (12.0) ▲

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (38%)	37	22	44	60	71	65	73
Within Schools (62%)	—	—	—	11	11	11	11
Total	14	8	17	29	34	31	35
Mathematics							
Between Schools (45%)	30	15	35	61	68	63	69
Within Schools (55%)	—	—	—	9	9	9	9
Total	14	7	16	32	36	34	36
Science							
Between Schools (42%)	29	16	34	50	59	53	60
Within Schools (58%)	—	—	—	12	12	12	12
Total	12	7	14	28	32	29	32

() Percentage of available variance shown in parentheses.

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	11 (7.5)	—	6 (8.0)	—	9 (7.4)	—	7 (7.5)
	MAT	11 (9.9)	—	10 (10.7)	—	11 (10.0)	—	12 (10.3)
	SCI	13 (9.5)	—	8 (10.2)	—	10 (9.1)	—	9 (9.1)
Schools Support Academic Success	REA	10 (4.8)	—	11 (5.2) ▲	—	2 (5.2)	—	2 (5.3)
	MAT	12 (6.4)	—	13 (6.7)	—	8 (7.2)	—	7 (6.9)
	SCI	12 (5.8) ●	—	13 (6.2) ▲	—	6 (6.8)	—	7 (6.6)
Adequate Environment and Resources	REA	1 (4.3)	—	1 (4.1)	—	-3 (4.0)	—	-3 (4.1)
	MAT	1 (5.0)	—	1 (5.0)	—	-3 (4.7)	—	-3 (4.8)
	SCI	1 (4.8)	—	1 (4.6)	—	-3 (4.5)	—	-3 (4.6)
School Instruction								
Early Emphasis on Reading Skills	REA	—	3 (6.3)	5 (6.0)	—	—	-2 (4.9)	-1 (5.1)
	MAT	—	0 (7.2)	2 (6.9)	—	—	-4 (6.0)	-2 (6.0)
	SCI	—	3 (7.0)	5 (6.6)	—	—	0 (5.5)	1 (5.2)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	19 (7.8) ▲	15 (8.4)	—	—	8 (7.7)	4 (7.4)
	MAT	—	12 (9.8)	6 (10.2)	—	—	2 (11.0)	-4 (9.9)
	SCI	—	19 (9.7) ●	14 (10.2)	—	—	8 (9.5)	4 (8.6)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	16 (1.6) ▲	16 (1.6) ▲	16 (1.5) ▲	16 (1.6) ▲
	MAT	—	—	—	14 (2.1) ▲	14 (2.1) ▲	14 (2.1) ▲	14 (2.1) ▲
	SCI	—	—	—	16 (1.8) ▲	16 (1.8) ▲	16 (1.8) ▲	16 (1.8) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	9 (1.5) ▲	9 (1.5) ▲	9 (1.5) ▲	9 (1.5) ▲
	MAT	—	—	—	10 (2.5) ▲	10 (2.4) ▲	10 (2.5) ▲	10 (2.4) ▲
	SCI	—	—	—	10 (1.7) ▲	10 (1.7) ▲	10 (1.7) ▲	10 (1.7) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	25 (4.8) ▲	25 (4.9) ▲	24 (4.8) ▲	25 (4.7) ▲
	MAT	—	—	—	21 (6.6) ▲	19 (7.1) ▲	21 (6.7) ▲	20 (6.7) ▲
	SCI	—	—	—	23 (5.7) ▲	21 (6.3) ▲	21 (5.5) ▲	20 (5.9) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	3 (7.0)	1 (7.1)	4 (7.2)	2 (7.4)
	MAT	—	—	—	-1 (10.2)	-3 (10.0)	1 (9.8)	-2 (9.9)
	SCI	—	—	—	-1 (9.3)	-3 (9.0)	0 (9.1)	-3 (9.0)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ● Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (35%)	14	10	20	41	45	43	46
Within Schools (65%)	—	—	—	21	21	21	21
Total	5	3	7	28	30	29	30
Mathematics							
Between Schools (38%)	14	3	16	13	20	14	20
Within Schools (62%)	—	—	—	24	24	24	24
Total	6	1	6	19	22	20	22
Science							
Between Schools (37%)	15	8	20	23	30	25	30
Within Schools (63%)	—	—	—	23	23	23	23
Total	6	3	7	23	25	24	25

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
School Explanatory Variables								
School Environment								
Schools Are Safe and Orderly	REA	3 (4.2)	—	4 (4.5)	—	6 (3.7)	—	5 (4.1)
	MAT	6 (5.3)	—	8 (5.5)	—	8 (4.6)	—	8 (4.6)
	SCI	5 (5.2)	—	5 (5.4)	—	7 (4.6)	—	6 (4.7)
Schools Support Academic Success	REA	3 (3.2)	—	3 (3.3)	—	-2 (2.9)	—	-3 (2.8)
	MAT	0 (3.3)	—	0 (3.4)	—	-5 (2.9)	—	-5 (2.9)
	SCI	2 (3.6)	—	1 (3.6)	—	-4 (3.2)	—	-4 (3.2)
Adequate Environment and Resources	REA	3 (2.2)	—	3 (2.3)	—	1 (2.1)	—	2 (2.1)
	MAT	1 (2.3)	—	2 (2.4)	—	0 (2.3)	—	1 (2.3)
	SCI	3 (2.5)	—	3 (2.5)	—	2 (2.4)	—	2 (2.5)
School Instruction								
Early Emphasis on Reading Skills	REA	—	-1 (1.7)	-2 (1.8)	—	—	-2 (1.6)	-2 (1.6)
	MAT	—	-2 (2.4)	-4 (2.4)	—	—	-2 (2.2)	-3 (2.2)
	SCI	—	-1 (2.3)	-2 (2.4)	—	—	-1 (2.1)	-2 (2.2)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	1 (3.4)	0 (3.6)	—	—	5 (3.0)	4 (3.2)
	MAT	—	1 (4.2)	-1 (4.4)	—	—	4 (3.8)	2 (4.0)
	SCI	—	2 (4.4)	1 (4.7)	—	—	5 (3.9)	3 (4.1)
Home Background Control Variables								
Students within Schools								
Home Resources for Learning	REA	—	—	—	10 (1.2) ▲	10 (1.2) ▲	10 (1.2) ▲	10 (1.2) ▲
	MAT	—	—	—	8 (1.0) ▲	8 (1.0) ▲	8 (1.0) ▲	8 (1.0) ▲
	SCI	—	—	—	8 (1.0) ▲	8 (1.0) ▲	8 (1.0) ▲	8 (1.0) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	11 (0.8) ▲	11 (0.8) ▲	11 (0.8) ▲	11 (0.8) ▲
	MAT	—	—	—	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲
	SCI	—	—	—	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	24 (4.2) ▲	25 (4.2) ▲	24 (4.1) ▲	25 (4.1) ▲
	MAT	—	—	—	23 (5.4) ▲	25 (5.2) ▲	22 (5.4) ▲	24 (5.2) ▲
	SCI	—	—	—	24 (5.0) ▲	25 (5.0) ▲	23 (5.0) ▲	25 (5.0) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	2 (4.8)	2 (4.6)	4 (4.8)	3 (4.7)
	MAT	—	—	—	4 (7.2)	3 (6.9)	5 (7.3)	4 (7.0)
	SCI	—	—	—	2 (6.7)	1 (6.4)	3 (6.6)	3 (6.4)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (25%)	4	0	5	40	42	42	43
Within Schools (75%)	—	—	—	16	16	16	16
Total	1	0	1	22	22	22	22
Mathematics							
Between Schools (34%)	2	1	4	20	22	21	24
Within Schools (66%)	—	—	—	12	12	12	12
Total	1	0	1	15	16	16	16
Science							
Between Schools (33%)	3	0	4	25	27	26	28
Within Schools (67%)	—	—	—	13	13	13	13
Total	1	0	1	16	17	17	18

() Percentage of available variance shown in parentheses.

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	5 (4.1)	—	-1 (3.7)	—	5 (3.8)	—	0 (3.6)
	MAT	2 (5.1)	—	-1 (5.2)	—	1 (5.1)	—	0 (5.3)
	SCI	4 (4.8)	—	-1 (4.6)	—	5 (4.4)	—	1 (4.5)
Schools Support Academic Success	REA	18 (3.2) ▲	—	15 (3.2) ▲	—	14 (3.4) ▲	—	12 (3.4) ▲
	MAT	13 (4.7) ▲	—	12 (4.7) ▲	—	10 (4.6) ▲	—	9 (4.7)
	SCI	18 (4.1) ▲	—	15 (4.1) ▲	—	13 (3.9) ▲	—	12 (3.9) ▲
Adequate Environment and Resources	REA	5 (4.5)	—	5 (3.8)	—	3 (4.1)	—	4 (3.7)
	MAT	0 (5.6)	—	0 (5.5)	—	-1 (5.8)	—	-1 (5.7)
	SCI	4 (5.4)	—	3 (5.1)	—	1 (5.4)	—	2 (5.2)
School Instruction								
Early Emphasis on Reading Skills	REA	—	3 (2.8)	1 (2.4)	—	—	0 (2.6)	0 (2.4)
	MAT	—	1 (3.6)	0 (3.5)	—	—	-1 (3.4)	-1 (3.3)
	SCI	—	3 (3.3)	1 (3.0)	—	—	-1 (3.1)	-1 (2.8)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	41 (7.4) ▲	31 (7.4) ▲	—	—	33 (6.4) ▲	26 (6.8) ▲
	MAT	—	21 (7.6) ▲	14 (7.6)	—	—	14 (7.3)	10 (7.9)
	SCI	—	38 (7.1) ▲	28 (7.0) ▲	—	—	30 (6.9) ▲	23 (7.5) ▲
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	5 (1.1) ▲	5 (1.1) ▲	5 (1.1) ▲	5 (1.1) ▲
	MAT	—	—	—	5 (1.4) ▲	5 (1.4) ▲	5 (1.4) ▲	5 (1.4) ▲
	SCI	—	—	—	8 (1.4) ▲	8 (1.4) ▲	8 (1.4) ▲	8 (1.4) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	11 (1.1) ▲	11 (1.1) ▲	11 (1.1) ▲	11 (1.1) ▲
	MAT	—	—	—	10 (1.1) ▲	10 (1.1) ▲	10 (1.1) ▲	10 (1.1) ▲
	SCI	—	—	—	10 (1.4) ▲	10 (1.4) ▲	10 (1.3) ▲	10 (1.3) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	18 (5.6) ▲	9 (6.0)	16 (5.1) ▲	9 (5.7)
	MAT	—	—	—	11 (6.7)	6 (7.2)	10 (6.8)	6 (7.2)
	SCI	—	—	—	19 (6.4) ▲	10 (6.8)	17 (6.2) ▲	11 (6.6)
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	18 (6.4) ▲	16 (6.0) ▲	9 (5.3)	9 (5.2)
	MAT	—	—	—	15 (6.9) ▲	13 (6.6)	11 (6.9)	11 (6.9)
	SCI	—	—	—	20 (6.3) ▲	17 (5.8) ▲	11 (5.7) ▲	11 (5.6)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (36%)	34	31	47	27	44	41	51
Within Schools (64%)	—	—	—	6	6	6	6
Total	12	11	17	13	20	19	22
Mathematics							
Between Schools (37%)	13	7	15	9	17	12	17
Within Schools (63%)	—	—	—	6	6	6	6
Total	5	3	6	7	10	8	10
Science							
Between Schools (37%)	26	21	35	19	33	28	38
Within Schools (63%)	—	—	—	8	7	8	8
Total	10	8	13	12	17	15	19

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	7 (4.8)	—	8 (4.7)	—	1 (1.9)	—	2 (1.9)
	MAT	6 (4.4)	—	6 (4.3)	—	1 (2.2)	—	1 (2.2)
	SCI	6 (4.8)	—	6 (4.7)	—	0 (2.1)	—	0 (2.1)
Schools Support Academic Success	REA	13 (2.8) ▲	—	14 (2.8) ▲	—	1 (1.4)	—	2 (1.4)
	MAT	12 (2.7) ▲	—	12 (2.6) ▲	—	1 (1.5)	—	2 (1.5)
	SCI	14 (2.9) ▲	—	15 (2.8) ▲	—	2 (1.4)	—	2 (1.4)
Adequate Environment and Resources	REA	-5 (2.5)	—	-4 (2.4)	—	1 (1.0)	—	1 (1.0)
	MAT	-5 (2.2) ▼	—	-4 (2.2)	—	0 (1.0)	—	0 (1.0)
	SCI	-5 (2.4) ▼	—	-4 (2.4)	—	1 (0.9)	—	1 (1.0)
School Instruction								
Early Emphasis on Reading Skills	REA	—	0 (2.3)	-2 (2.0)	—	—	-1 (0.8)	-1 (0.8)
	MAT	—	0 (2.0)	-1 (1.8)	—	—	-1 (0.9)	-1 (0.9)
	SCI	—	0 (2.3)	-2 (2.0)	—	—	-1 (0.8)	-1 (0.8)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	9 (7.7)	12 (6.9)	—	—	6 (3.4)	6 (3.4)
	MAT	—	10 (6.9)	13 (6.2) ▲	—	—	7 (3.5) ▲	7 (3.5) ▲
	SCI	—	7 (7.6)	10 (6.8)	—	—	4 (3.4)	5 (3.4)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	15 (0.7) ▲	15 (0.7) ▲	15 (0.7) ▲	15 (0.7) ▲
	MAT	—	—	—	12 (0.8) ▲	12 (0.8) ▲	12 (0.8) ▲	12 (0.8) ▲
	SCI	—	—	—	17 (0.8) ▲	17 (0.8) ▲	17 (0.8) ▲	17 (0.8) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	16 (1.1) ▲	16 (1.1) ▲	16 (1.1) ▲	16 (1.1) ▲
	MAT	—	—	—	15 (1.1) ▲	15 (1.1) ▲	15 (1.1) ▲	15 (1.1) ▲
	SCI	—	—	—	16 (1.1) ▲	16 (1.1) ▲	16 (1.1) ▲	16 (1.1) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	29 (2.6) ▲	27 (3.1) ▲	30 (2.7) ▲	28 (3.1) ▲
	MAT	—	—	—	25 (2.6) ▲	23 (3.2) ▲	26 (2.6) ▲	23 (3.2) ▲
	SCI	—	—	—	32 (2.5) ▲	30 (3.0) ▲	32 (2.5) ▲	30 (3.0) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	51 (4.4) ▲	52 (4.5) ▲	50 (4.5) ▲	51 (4.6) ▲
	MAT	—	—	—	48 (4.4) ▲	49 (4.6) ▲	46 (4.5) ▲	48 (4.6) ▲
	SCI	—	—	—	47 (4.3) ▲	48 (4.5) ▲	46 (4.4) ▲	47 (4.6) ▲

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (25%)	23	1	25	88	88	88	89
Within Schools (75%)	—	—	—	22	22	22	22
Total	6	0	6	38	38	38	38
Mathematics							
Between Schools (25%)	22	1	24	84	84	84	85
Within Schools (75%)	—	—	—	21	21	21	21
Total	5	0	6	37	37	37	37
Science							
Between Schools (25%)	24	1	25	88	88	88	89
Within Schools (75%)	—	—	—	24	24	24	24
Total	6	0	6	40	41	41	41

() Percentage of available variance shown in parentheses.

Exhibit 3.32: School Effectiveness Models for Reading, Mathematics, and Science – Slovak Republic

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	8 (3.8) ▲	—	8 (3.7) ▲	—	8 (4.0)	—	7 (3.7)
	MAT	14 (5.0) ▲	—	13 (4.9) ▲	—	13 (5.2) ▲	—	12 (4.9) ▲
	SCI	12 (4.6) ▲	—	11 (4.6) ▲	—	12 (4.9) ▲	—	10 (4.6) ▲
Schools Support Academic Success	REA	9 (3.1) ▲	—	9 (3.2) ▲	—	3 (2.6)	—	3 (2.7)
	MAT	10 (4.3) ▲	—	11 (4.3) ▲	—	5 (3.6)	—	5 (3.4)
	SCI	9 (4.0) ▲	—	10 (4.0) ▲	—	4 (3.3)	—	4 (3.2)
Adequate Environment and Resources	REA	-2 (2.8)	—	-2 (2.8)	—	-2 (2.6)	—	-2 (2.6)
	MAT	-4 (3.2)	—	-4 (3.1)	—	-4 (3.2)	—	-4 (3.1)
	SCI	-4 (3.4)	—	-4 (3.3)	—	-3 (3.2)	—	-4 (3.1)
School Instruction								
Early Emphasis on Reading Skills	REA	—	1 (2.2)	1 (1.9)	—	—	0 (1.8)	0 (1.6)
	MAT	—	2 (2.7)	1 (2.4)	—	—	2 (2.4)	2 (2.2)
	SCI	—	1 (2.6)	1 (2.3)	—	—	1 (2.2)	1 (2.1)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	0 (4.6)	0 (4.1)	—	—	3 (5.1)	2 (4.7)
	MAT	—	4 (6.2)	5 (5.6)	—	—	9 (6.5)	8 (5.9)
	SCI	—	3 (5.2)	4 (4.7)	—	—	7 (5.8)	6 (5.2)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	16 (0.8) ▲	16 (0.8) ▲	16 (0.8) ▲	16 (0.8) ▲
	MAT	—	—	—	17 (0.9) ▲	17 (0.9) ▲	17 (0.9) ▲	17 (0.9) ▲
	SCI	—	—	—	17 (1.0) ▲	17 (1.0) ▲	17 (1.0) ▲	17 (1.0) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	8 (0.7) ▲	8 (0.7) ▲	8 (0.7) ▲	8 (0.7) ▲
	MAT	—	—	—	8 (0.9) ▲	8 (0.9) ▲	8 (0.9) ▲	8 (0.9) ▲
	SCI	—	—	—	7 (0.8) ▲	7 (0.8) ▲	7 (0.8) ▲	7 (0.8) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	17 (4.7) ▲	15 (4.6) ▲	18 (4.6) ▲	15 (4.5) ▲
	MAT	—	—	—	19 (5.7) ▲	15 (5.4) ▲	20 (5.5) ▲	16 (5.2) ▲
	SCI	—	—	—	18 (5.2) ▲	15 (5.0) ▲	19 (4.9) ▲	16 (4.8) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	-6 (7.5)	-5 (6.7)	-7 (7.2)	-6 (6.6)
	MAT	—	—	—	-13 (9.4)	-12 (8.1)	-16 (8.8)	-14 (7.8)
	SCI	—	—	—	-12 (8.7)	-11 (7.5)	-14 (8.2)	-12 (7.2)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (18%)	19	0	20	29	35	30	35
Within Schools (82%)	—	—	—	18	18	18	18
Total	4	0	4	20	21	20	21
Mathematics							
Between Schools (27%)	20	1	21	16	26	19	29
Within Schools (73%)	—	—	—	20	20	20	20
Total	5	0	6	19	21	19	22
Science							
Between Schools (26%)	17	1	18	17	25	20	27
Within Schools (74%)	—	—	—	19	19	19	19
Total	4	0	5	18	20	19	21

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
School Explanatory Variables								
School Environment								
Schools Are Safe and Orderly	REA	1 (2.8)	—	2 (3.0)	—	1 (2.6)	—	2 (2.5)
	MAT	1 (2.4)	—	2 (2.6)	—	1 (2.2)	—	1 (2.2)
	SCI	2 (2.9)	—	3 (2.9)	—	1 (2.6)	—	2 (2.5)
Schools Support Academic Success	REA	3 (1.9)	—	4 (1.8) ▲	—	0 (1.8)	—	0 (1.8)
	MAT	4 (1.7) ▲	—	4 (1.7) ▲	—	0 (1.7)	—	1 (1.8)
	SCI	3 (2.0)	—	3 (1.9)	—	-1 (1.9)	—	-1 (2.0)
Adequate Environment and Resources	REA	0 (1.5)	—	0 (1.5)	—	2 (1.2)	—	2 (1.2)
	MAT	0 (1.5)	—	-1 (1.6)	—	1 (1.2)	—	1 (1.3)
	SCI	0 (1.7)	—	0 (1.7)	—	1 (1.4)	—	1 (1.5)
School Instruction								
Early Emphasis on Reading Skills	REA	—	-1 (1.2)	-1 (1.3)	—	—	0 (1.2)	0 (1.2)
	MAT	—	-1 (1.4)	-2 (1.4)	—	—	-1 (1.3)	-1 (1.3)
	SCI	—	-1 (1.6)	-2 (1.7)	—	—	-1 (1.5)	-1 (1.5)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	-3 (3.9)	-4 (3.8)	—	—	-1 (3.7)	-2 (3.6)
	MAT	—	-5 (4.7)	-6 (4.7)	—	—	-4 (4.6)	-4 (4.6)
	SCI	—	-5 (4.5)	-6 (4.4)	—	—	-4 (4.5)	-4 (4.5)
Home Background Control Variables								
Students within Schools								
Home Resources for Learning	REA	—	—	—	21 (0.9) ▲	21 (0.9) ▲	21 (0.9) ▲	21 (0.9) ▲
	MAT	—	—	—	19 (1.2) ▲	19 (1.2) ▲	19 (1.2) ▲	19 (1.2) ▲
	SCI	—	—	—	22 (1.3) ▲	22 (1.3) ▲	22 (1.3) ▲	22 (1.3) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	11 (0.8) ▲	11 (0.8) ▲	11 (0.8) ▲	11 (0.8) ▲
	MAT	—	—	—	11 (0.8) ▲	11 (0.8) ▲	11 (0.8) ▲	11 (0.7) ▲
	SCI	—	—	—	9 (0.9) ▲	9 (0.9) ▲	9 (0.9) ▲	9 (0.9) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	26 (2.9) ▲	26 (3.1) ▲	26 (2.8) ▲	25 (3.1) ▲
	MAT	—	—	—	26 (3.0) ▲	25 (3.2) ▲	25 (2.9) ▲	25 (3.1) ▲
	SCI	—	—	—	29 (3.5) ▲	29 (3.8) ▲	28 (3.4) ▲	28 (3.7) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	7 (3.8)	8 (3.9)	7 (3.8)	8 (3.9)
	MAT	—	—	—	8 (4.6)	9 (4.6)	8 (4.5)	9 (4.6)
	SCI	—	—	—	2 (5.2)	3 (5.2)	2 (5.2)	3 (5.2)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (5%)	5	1	8	52	54	52	55
Within Schools (95%)	—	—	—	23	23	23	23
Total	0	0	0	25	25	25	25
Mathematics							
Between Schools (8%)	4	3	10	44	45	46	47
Within Schools (92%)	—	—	—	26	26	26	26
Total	0	0	1	28	28	28	28
Science							
Between Schools (8%)	3	3	8	44	45	45	46
Within Schools (92%)	—	—	—	24	24	24	24
Total	0	0	1	26	26	26	26

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	5 (3.3)	—	5 (3.1)	—	5 (2.9)	—	5 (2.8)
	MAT	7 (3.5) ▲	—	6 (3.3) ▲	—	7 (2.8) ▲	—	6 (2.7) ▲
	SCI	6 (3.6)	—	5 (3.5)	—	6 (3.2)	—	5 (3.1)
Schools Support Academic Success	REA	8 (3.0) ▲	—	8 (2.6) ▲	—	0 (2.9)	—	1 (2.6)
	MAT	9 (2.7) ▲	—	10 (2.4) ▲	—	1 (2.2)	—	2 (2.1)
	SCI	8 (2.9) ▲	—	8 (2.6) ▲	—	1 (2.7)	—	1 (2.5)
Adequate Environment and Resources	REA	-2 (2.0)	—	-2 (1.9)	—	0 (1.7)	—	0 (1.7)
	MAT	-3 (2.0)	—	-3 (1.9)	—	-1 (1.7)	—	0 (1.6)
	SCI	-3 (2.2)	—	-2 (2.2)	—	0 (2.0)	—	0 (2.0)
School Instruction								
Early Emphasis on Reading Skills	REA	—	-3 (1.6)	-4 (1.6) ▼	—	—	-1 (1.3)	-2 (1.3)
	MAT	—	-1 (1.5)	-3 (1.5) ▼	—	—	0 (1.2)	-1 (1.4)
	SCI	—	-2 (1.7)	-3 (1.7)	—	—	-1 (1.4)	-1 (1.5)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	9 (4.6)	7 (3.7)	—	—	6 (3.9)	5 (3.7)
	MAT	—	10 (4.3) ▲	8 (3.3) ▲	—	—	8 (3.2) ▲	6 (2.8) ▲
	SCI	—	8 (4.7)	5 (3.9)	—	—	5 (4.0)	4 (3.7)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	11 (1.0) ▲	11 (1.0) ▲	11 (1.0) ▲	11 (1.0) ▲
	MAT	—	—	—	11 (0.9) ▲	11 (0.9) ▲	11 (0.9) ▲	11 (0.9) ▲
	SCI	—	—	—	13 (1.0) ▲	13 (1.0) ▲	13 (1.0) ▲	13 (1.0) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	12 (1.0) ▲	12 (1.0) ▲	12 (1.0) ▲	12 (1.0) ▲
	MAT	—	—	—	12 (1.0) ▲	12 (1.0) ▲	12 (1.0) ▲	12 (1.0) ▲
	SCI	—	—	—	12 (1.1) ▲	12 (1.1) ▲	12 (1.1) ▲	12 (1.1) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	17 (2.7) ▲	16 (3.0) ▲	17 (2.8) ▲	15 (3.0) ▲
	MAT	—	—	—	21 (2.9) ▲	19 (2.9) ▲	20 (2.8) ▲	18 (2.9) ▲
	SCI	—	—	—	17 (3.1) ▲	15 (3.1) ▲	16 (3.1) ▲	14 (3.1) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	22 (5.3) ▲	20 (5.7) ▲	22 (5.2) ▲	20 (5.5) ▲
	MAT	—	—	—	22 (4.8) ▲	19 (4.7) ▲	23 (4.6) ▲	19 (4.4) ▲
	SCI	—	—	—	25 (5.2) ▲	22 (5.8) ▲	25 (5.1) ▲	23 (5.7) ▲

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (18%)	23	6	29	40	45	44	48
Within Schools (82%)	—	—	—	15	15	15	15
Total	4	1	5	20	21	20	21
Mathematics							
Between Schools (21%)	34	7	39	55	62	58	64
Within Schools (79%)	—	—	—	18	18	18	18
Total	7	1	8	26	27	26	28
Science							
Between Schools (19%)	24	4	28	42	47	44	49
Within Schools (81%)	—	—	—	18	18	18	18
Total	5	1	5	23	24	23	24

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
School Explanatory Variables								
School Environment								
Schools Are Safe and Orderly	REA	11 (2.7) ▲	—	11 (2.8) ▲	—	2 (2.1)	—	2 (2.2)
	MAT	9 (2.4) ▲	—	9 (2.3) ▲	—	2 (1.9)	—	2 (1.9)
	SCI	14 (3.1) ▲	—	14 (3.1) ▲	—	4 (2.4)	—	4 (2.5)
Schools Support Academic Success	REA	2 (2.1)	—	2 (2.1)	—	-1 (1.6)	—	-1 (1.6)
	MAT	5 (1.7) ▲	—	5 (1.7) ▲	—	3 (1.3)	—	2 (1.4)
	SCI	3 (2.1)	—	3 (2.2)	—	0 (1.5)	—	0 (1.6)
Adequate Environment and Resources	REA	3 (2.0)	—	3 (2.0)	—	1 (1.6)	—	1 (1.5)
	MAT	1 (1.9)	—	1 (1.9)	—	0 (1.5)	—	0 (1.5)
	SCI	2 (2.1)	—	2 (2.1)	—	1 (1.7)	—	1 (1.7)
School Instruction								
Early Emphasis on Reading Skills	REA	—	1 (1.7)	0 (1.6)	—	—	1 (1.1)	1 (1.2)
	MAT	—	2 (1.4)	0 (1.2)	—	—	2 (1.0)	1 (0.9)
	SCI	—	2 (1.8)	0 (1.9)	—	—	1 (1.2)	1 (1.3)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	-3 (4.6)	-3 (3.7)	—	—	1 (3.0)	1 (3.0)
	MAT	—	-5 (3.9)	-5 (3.0)	—	—	-2 (3.0)	-2 (2.8)
	SCI	—	-5 (5.6)	-5 (4.4)	—	—	1 (3.6)	0 (3.5)
Home Background Control Variables								
Students within Schools								
Home Resources for Learning	REA	—	—	—	12 (0.9) ▲	12 (0.9) ▲	12 (0.9) ▲	12 (0.9) ▲
	MAT	—	—	—	11 (0.9) ▲	11 (0.9) ▲	11 (0.9) ▲	11 (0.9) ▲
	SCI	—	—	—	15 (1.1) ▲	15 (1.1) ▲	15 (1.1) ▲	15 (1.1) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	12 (0.9) ▲	12 (0.9) ▲	12 (0.9) ▲	12 (0.9) ▲
	MAT	—	—	—	14 (1.1) ▲	14 (1.1) ▲	14 (1.1) ▲	14 (1.1) ▲
	SCI	—	—	—	10 (1.1) ▲	10 (1.1) ▲	10 (1.1) ▲	10 (1.1) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	29 (2.2) ▲	28 (2.6) ▲	29 (2.3) ▲	28 (2.8) ▲
	MAT	—	—	—	24 (1.9) ▲	21 (2.0) ▲	24 (1.9) ▲	21 (2.1) ▲
	SCI	—	—	—	35 (2.6) ▲	32 (2.8) ▲	35 (2.7) ▲	32 (2.9) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	0 (5.0)	0 (5.0)	-1 (4.9)	-1 (5.0)
	MAT	—	—	—	9 (4.0) ▲	8 (4.0) ▲	9 (4.0) ▲	9 (4.1) ▲
	SCI	—	—	—	-7 (5.3)	-8 (5.6)	-8 (5.1)	-8 (5.5)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (13%)	29	2	29	76	77	76	77
Within Schools (87%)	—	—	—	18	18	18	18
Total	4	0	4	25	25	25	25
Mathematics							
Between Schools (12%)	39	4	41	77	80	79	81
Within Schools (88%)	—	—	—	21	21	21	21
Total	4	0	5	28	28	28	28
Science							
Between Schools (15%)	35	2	37	78	80	78	80
Within Schools (85%)	—	—	—	19	19	19	19
Total	5	0	5	28	28	28	28

() Percentage of available variance shown in parentheses.

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	17 (3.6) ▲	—	10 (3.4) ▲	—	12 (3.1) ▲	—	6 (2.9) ▲
	MAT	12 (3.5) ▲	—	7 (3.4)	—	7 (3.2) ▲	—	3 (3.1)
	SCI	14 (3.7) ▲	—	7 (3.5)	—	9 (3.4) ▲	—	3 (3.1)
Schools Support Academic Success	REA	12 (3.1) ▲	—	9 (2.9) ▲	—	6 (2.4) ▲	—	5 (2.3) ▲
	MAT	10 (2.9) ▲	—	8 (2.7) ▲	—	6 (2.4) ▲	—	4 (2.3)
	SCI	13 (3.1) ▲	—	11 (2.9) ▲	—	8 (2.7) ▲	—	7 (2.5) ▲
Adequate Environment and Resources	REA	7 (2.4) ▲	—	6 (2.4) ▲	—	-1 (2.1)	—	-1 (2.2)
	MAT	6 (2.2) ▲	—	5 (2.3)	—	-1 (2.1)	—	-1 (2.2)
	SCI	6 (2.3) ▲	—	4 (2.4)	—	-1 (2.2)	—	-1 (2.3)
School Instruction								
Early Emphasis on Reading Skills	REA	—	13 (1.6) ▲	10 (1.6) ▲	—	—	5 (1.4) ▲	4 (1.3) ▲
	MAT	—	12 (1.5) ▲	10 (1.5) ▲	—	—	5 (1.5) ▲	5 (1.4) ▲
	SCI	—	11 (1.6) ▲	9 (1.6) ▲	—	—	4 (1.6) ▲	4 (1.5) ▲
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	28 (5.6) ▲	20 (5.6) ▲	—	—	26 (5.0) ▲	22 (5.0) ▲
	MAT	—	20 (5.2) ▲	15 (5.3) ▲	—	—	19 (4.8) ▲	16 (4.9) ▲
	SCI	—	30 (5.5) ▲	24 (5.5) ▲	—	—	27 (5.0) ▲	24 (5.1) ▲
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	13 (0.8) ▲	13 (0.8) ▲	13 (0.8) ▲	13 (0.8) ▲
	MAT	—	—	—	9 (0.7) ▲	9 (0.7) ▲	9 (0.7) ▲	9 (0.7) ▲
	SCI	—	—	—	13 (1.0) ▲	13 (1.0) ▲	13 (1.0) ▲	13 (1.0) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	12 (0.6) ▲	11 (0.6) ▲	11 (0.6) ▲	11 (0.6) ▲
	MAT	—	—	—	10 (0.6) ▲	10 (0.6) ▲	10 (0.6) ▲	10 (0.6) ▲
	SCI	—	—	—	13 (0.8) ▲	13 (0.8) ▲	13 (0.8) ▲	13 (0.8) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	48 (2.8) ▲	44 (2.9) ▲	43 (2.8) ▲	42 (3.0) ▲
	MAT	—	—	—	42 (2.6) ▲	39 (2.9) ▲	37 (2.7) ▲	36 (3.0) ▲
	SCI	—	—	—	41 (2.8) ▲	37 (3.1) ▲	37 (3.0) ▲	36 (3.3) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	17 (6.1) ▲	16 (6.5) ▲	11 (6.3)	11 (6.7)
	MAT	—	—	—	9 (6.3)	8 (6.6)	6 (6.5)	6 (6.8)
	SCI	—	—	—	22 (6.4) ▲	20 (6.8) ▲	15 (6.6) ▲	13 (6.9)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (43%)	21	25	34	48	54	58	60
Within Schools (57%)	—	—	—	10	10	10	10
Total	9	10	14	26	29	30	31
Mathematics							
Between Schools (45%)	16	21	28	40	44	48	49
Within Schools (55%)	—	—	—	9	9	9	9
Total	7	9	12	23	24	26	27
Science							
Between Schools (41%)	19	23	31	38	44	49	51
Within Schools (59%)	—	—	—	11	11	11	11
Total	8	9	13	22	24	26	27

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	

School Explanatory Variables

School Environment

Schools Are Safe and Orderly	REA	15 (4.8) ▲	—	7 (4.7)	—	12 (3.1) ▲	—	7 (3.3) ▲
	MAT	15 (3.7) ▲	—	8 (3.6) ▲	—	13 (3.0) ▲	—	8 (3.1) ▲
	SCI	20 (5.7) ▲	—	9 (5.4)	—	17 (4.1) ▲	—	9 (4.1) ▲
Schools Support Academic Success	REA	19 (2.4) ▲	—	15 (2.6) ▲	—	7 (2.1) ▲	—	5 (1.9) ▲
	MAT	14 (2.1) ▲	—	11 (2.1) ▲	—	7 (2.2) ▲	—	5 (1.9) ▲
	SCI	22 (2.8) ▲	—	17 (2.9) ▲	—	10 (2.9) ▲	—	7 (2.3) ▲
Adequate Environment and Resources	REA	2 (3.3)	—	3 (2.6)	—	0 (2.5)	—	2 (1.9)
	MAT	1 (2.7)	—	3 (1.9)	—	1 (2.4)	—	2 (1.9)
	SCI	2 (4.1)	—	4 (2.9)	—	1 (3.5)	—	3 (2.5)

School Instruction

Early Emphasis on Reading Skills	REA	—	0 (2.2)	0 (1.9)	—	—	2 (1.2)	2 (1.2)
	MAT	—	0 (1.7)	0 (1.5)	—	—	1 (1.2)	1 (1.1)
	SCI	—	0 (2.5)	0 (2.2)	—	—	2 (1.5)	2 (1.5)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	55 (7.6) ▲	37 (6.5) ▲	—	—	34 (5.0) ▲	28 (4.8) ▲
	MAT	—	47 (5.9) ▲	32 (5.0) ▲	—	—	34 (4.4) ▲	27 (4.1) ▲
	SCI	—	75 (8.5) ▲	54 (7.6) ▲	—	—	52 (6.0) ▲	44 (5.6) ▲

Home Background Control Variables

Students within Schools

Home Resources for Learning	REA	—	—	—	6 (1.0) ▲	6 (1.0) ▲	6 (1.0) ▲	6 (1.0) ▲
	MAT	—	—	—	3 (0.9) ▲	3 (0.9) ▲	3 (0.9) ▲	3 (0.9) ▲
	SCI	—	—	—	6 (1.2) ▲	6 (1.2) ▲	6 (1.2) ▲	6 (1.2) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲	10 (0.9) ▲
	MAT	—	—	—	9 (1.0) ▲	9 (1.0) ▲	9 (1.0) ▲	9 (1.0) ▲
	SCI	—	—	—	14 (1.1) ▲	14 (1.1) ▲	14 (1.1) ▲	14 (1.1) ▲

Between Schools

School Average of Home Resources for Learning	REA	—	—	—	37 (4.8) ▲	30 (5.2) ▲	37 (5.0) ▲	32 (5.2) ▲
	MAT	—	—	—	26 (4.9) ▲	19 (5.3) ▲	27 (4.8) ▲	21 (5.1) ▲
	SCI	—	—	—	39 (6.4) ▲	30 (6.9) ▲	40 (6.4) ▲	33 (6.6) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	9 (6.7)	9 (5.4)	-1 (5.6)	1 (4.7)
	MAT	—	—	—	9 (6.4)	8 (5.5)	-2 (4.8)	-1 (4.5)
	SCI	—	—	—	19 (8.8) ▲	17 (7.3) ▲	2 (6.4)	4 (5.6)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (38%)	44	36	58	68	77	80	84
Within Schools (62%)	—	—	—	7	7	7	7
Total	17	13	22	30	33	35	36
Mathematics							
Between Schools (31%)	46	40	62	56	70	74	80
Within Schools (69%)	—	—	—	4	4	4	4
Total	14	12	19	20	25	26	28
Science							
Between Schools (35%)	44	43	63	62	72	79	84
Within Schools (65%)	—	—	—	6	6	6	6
Total	15	15	22	25	29	31	33

() Percentage of available variance shown in parentheses.

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	7 (5.2)	—	6 (5.0)	—	8 (4.5)	—	6 (4.4)
	MAT	4 (5.1)	—	4 (5.2)	—	4 (5.0)	—	3 (5.0)
	SCI	6 (5.3)	—	6 (5.3)	—	6 (4.9)	—	5 (4.9)
Schools Support Academic Success	REA	-3 (3.7)	—	-5 (3.7)	—	-5 (3.2)	—	-5 (3.1)
	MAT	-2 (3.9)	—	-3 (3.9)	—	-4 (3.6)	—	-4 (3.5)
	SCI	-2 (4.1)	—	-4 (4.1)	—	-5 (3.7)	—	-5 (3.7)
Adequate Environment and Resources	REA	6 (4.1)	—	5 (3.8)	—	1 (3.4)	—	0 (3.4)
	MAT	8 (4.0)	—	7 (3.8)	—	3 (3.3)	—	2 (3.4)
	SCI	6 (4.2)	—	5 (3.9)	—	0 (3.5)	—	0 (3.5)
School Instruction								
Early Emphasis on Reading Skills	REA	—	9 (4.0) ▲	8 (3.8) ▲	—	—	4 (3.1)	4 (3.1)
	MAT	—	6 (4.3)	5 (4.0)	—	—	1 (3.3)	1 (3.3)
	SCI	—	8 (4.0)	7 (4.0)	—	—	2 (3.2)	2 (3.3)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	-6 (8.2)	-8 (8.0)	—	—	12 (7.8)	10 (7.5)
	MAT	—	-4 (9.3)	-5 (9.3)	—	—	9 (8.0)	8 (8.0)
	SCI	—	-9 (9.2)	-11 (9.0)	—	—	9 (8.7)	7 (8.4)

Home Background Control Variables

Students within Schools								
Home Resources for Learning	REA	—	—	—	-2 (1.2)	-2 (1.3)	-2 (1.2)	-2 (1.2)
	MAT	—	—	—	-3 (1.4) ▼	-3 (1.4) ▼	-3 (1.4) ▼	-3 (1.4) ▼
	SCI	—	—	—	-2 (1.3)	-2 (1.4)	-2 (1.3)	-2 (1.4)
Early Literacy/Numeracy Tasks	REA	—	—	—	8 (1.8) ▲	8 (1.8) ▲	8 (1.8) ▲	8 (1.8) ▲
	MAT	—	—	—	5 (1.6) ▲	5 (1.6) ▲	5 (1.6) ▲	5 (1.6) ▲
	SCI	—	—	—	4 (1.4) ▲	4 (1.4) ▲	4 (1.4) ▲	4 (1.3) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	22 (4.3) ▲	22 (4.5) ▲	22 (4.4) ▲	22 (4.6) ▲
	MAT	—	—	—	17 (4.8) ▲	16 (4.9) ▲	18 (4.9) ▲	17 (5.0) ▲
	SCI	—	—	—	22 (4.2) ▲	22 (4.4) ▲	23 (4.3) ▲	23 (4.5) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	7 (6.5)	8 (6.0)	8 (6.4)	9 (6.0)
	MAT	—	—	—	9 (7.8)	10 (7.6)	10 (7.8)	11 (7.6)
	SCI	—	—	—	13 (7.2)	13 (6.9)	14 (7.1)	14 (6.8) ▲

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (43%)	6	8	12	32	35	35	37
Within Schools (57%)	—	—	—	7	7	7	7
Total	3	3	5	18	19	19	20
Mathematics							
Between Schools (47%)	6	4	9	23	25	26	27
Within Schools (53%)	—	—	—	6	6	6	6
Total	3	2	4	14	15	15	16
Science							
Between Schools (52%)	4	6	9	32	33	34	35
Within Schools (48%)	—	—	—	5	5	5	5
Total	2	3	5	19	20	20	21

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	4 (2.4)	—	3 (2.3)	—	3 (2.0)	—	3 (2.0)
	MAT	4 (2.6)	—	4 (2.5)	—	3 (2.3)	—	3 (2.3)
	SCI	3 (3.0)	—	3 (2.9)	—	2 (2.6)	—	2 (2.6)
Schools Support Academic Success	REA	7 (1.9) ▲	—	7 (1.9) ▲	—	2 (1.7)	—	2 (1.6)
	MAT	8 (1.9) ▲	—	8 (1.9) ▲	—	4 (1.8) ▲	—	5 (1.8) ▲
	SCI	8 (1.9) ▲	—	8 (1.9) ▲	—	3 (1.7)	—	3 (1.7)
Adequate Environment and Resources	REA	1 (2.0)	—	2 (1.9)	—	1 (1.6)	—	1 (1.5)
	MAT	1 (2.2)	—	1 (2.2)	—	1 (2.0)	—	1 (2.0)
	SCI	0 (1.9)	—	0 (1.8)	—	0 (1.6)	—	0 (1.6)
School Instruction								
Early Emphasis on Reading Skills	REA	—	0 (1.1)	-1 (0.9)	—	—	0 (0.8)	-1 (0.7)
	MAT	—	-1 (1.5)	-2 (1.3)	—	—	-1 (1.2)	-1 (1.2)
	SCI	—	-1 (1.3)	-2 (1.1)	—	—	-1 (0.9)	-1 (0.9)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	11 (3.9) ▲	8 (3.8) ▲	—	—	6 (3.0) ▲	5 (3.0)
	MAT	—	5 (4.4)	2 (3.9)	—	—	2 (3.8)	0 (3.6)
	SCI	—	10 (3.7) ▲	7 (3.5)	—	—	6 (2.8) ▲	5 (2.8)
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	12 (0.9) ▲	12 (0.9) ▲	12 (0.9) ▲	12 (0.9) ▲
	MAT	—	—	—	10 (1.0) ▲	10 (1.0) ▲	10 (1.0) ▲	10 (1.0) ▲
	SCI	—	—	—	12 (1.1) ▲	12 (1.1) ▲	12 (1.1) ▲	12 (1.1) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	9 (0.9) ▲	9 (0.9) ▲	9 (0.9) ▲	9 (0.9) ▲
	MAT	—	—	—	8 (1.0) ▲	8 (1.0) ▲	8 (1.0) ▲	8 (1.0) ▲
	SCI	—	—	—	8 (0.7) ▲	8 (0.7) ▲	8 (0.7) ▲	8 (0.7) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	25 (3.1) ▲	21 (3.1) ▲	25 (3.0) ▲	21 (3.0) ▲
	MAT	—	—	—	22 (3.5) ▲	16 (3.4) ▲	22 (3.5) ▲	15 (3.3) ▲
	SCI	—	—	—	26 (3.3) ▲	22 (3.4) ▲	26 (3.2) ▲	22 (3.3) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	13 (4.8) ▲	13 (4.8) ▲	10 (4.9)	10 (5.0) ▲
	MAT	—	—	—	6 (5.9)	5 (5.7)	5 (6.1)	5 (5.9)
	SCI	—	—	—	7 (5.4)	6 (5.4)	4 (5.5)	4 (5.5)

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (11%)	31	7	35	58	62	60	64
Within Schools (89%)	—	—	—	12	12	12	12
Total	3	1	4	17	17	17	17
Mathematics							
Between Schools (15%)	29	2	31	32	40	33	41
Within Schools (85%)	—	—	—	10	10	10	10
Total	4	0	5	14	15	14	15
Science							
Between Schools (14%)	29	6	33	53	57	55	59
Within Schools (86%)	—	—	—	13	13	13	13
Total	4	1	5	19	19	19	19

() Percentage of available variance shown in parentheses.

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
<i>School Explanatory Variables</i>								
School Environment								
Schools Are Safe and Orderly	REA	14 (5.8) ▲	—	7 (6.0)	—	13 (5.0) ▲	—	8 (5.0)
	MAT	12 (6.0) ▲	—	7 (6.1)	—	11 (5.2) ▲	—	8 (5.1)
	SCI	13 (6.2) ▲	—	6 (6.3)	—	11 (5.4) ▲	—	7 (5.3)
Schools Support Academic Success	REA	15 (4.9) ▲	—	16 (4.7) ▲	—	7 (4.1)	—	8 (4.0)
	MAT	13 (4.5) ▲	—	13 (4.3) ▲	—	5 (3.9)	—	6 (3.9)
	SCI	16 (4.7) ▲	—	16 (4.5) ▲	—	8 (4.4)	—	9 (4.2) ▲
Adequate Environment and Resources	REA	7 (3.5)	—	6 (3.8)	—	-1 (3.5)	—	-1 (3.5)
	MAT	6 (3.3)	—	5 (3.6)	—	-1 (3.5)	—	-1 (3.5)
	SCI	6 (3.3)	—	6 (3.4)	—	-1 (3.5)	—	0 (3.4)
School Instruction								
Early Emphasis on Reading Skills	REA	—	7 (2.8) ▲	6 (2.5) ▲	—	—	2 (2.3)	3 (2.1)
	MAT	—	7 (2.5) ▲	6 (2.3) ▲	—	—	3 (2.0)	3 (1.9)
	SCI	—	7 (2.7) ▲	6 (2.4) ▲	—	—	2 (2.2)	3 (2.0)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	26 (7.8) ▲	21 (7.5) ▲	—	—	21 (6.3) ▲	17 (6.1) ▲
	MAT	—	17 (7.7) ▲	13 (7.4)	—	—	12 (6.4)	9 (6.2)
	SCI	—	28 (7.8) ▲	23 (7.4) ▲	—	—	21 (6.6) ▲	18 (6.3) ▲
<i>Home Background Control Variables</i>								
Students within Schools								
Home Resources for Learning	REA	—	—	—	11 (1.5) ▲	11 (1.5) ▲	11 (1.5) ▲	11 (1.5) ▲
	MAT	—	—	—	8 (1.4) ▲	8 (1.4) ▲	8 (1.3) ▲	8 (1.3) ▲
	SCI	—	—	—	10 (1.8) ▲	10 (1.8) ▲	10 (1.8) ▲	10 (1.8) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	12 (1.2) ▲	12 (1.2) ▲	12 (1.2) ▲	12 (1.2) ▲
	MAT	—	—	—	11 (1.2) ▲	11 (1.2) ▲	11 (1.2) ▲	11 (1.2) ▲
	SCI	—	—	—	14 (1.3) ▲	14 (1.3) ▲	14 (1.3) ▲	14 (1.3) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	44 (5.3) ▲	40 (5.8) ▲	43 (5.7) ▲	39 (6.1) ▲
	MAT	—	—	—	40 (4.6) ▲	37 (5.5) ▲	38 (4.7) ▲	35 (5.6) ▲
	SCI	—	—	—	38 (5.3) ▲	33 (6.2) ▲	37 (5.5) ▲	32 (6.3) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	32 (9.9) ▲	29 (10.3) ▲	24 (10.4) ▲	24 (10.6) ▲
	MAT	—	—	—	25 (9.7) ▲	24 (10.0) ▲	22 (9.9) ▲	22 (10.0) ▲
	SCI	—	—	—	39 (9.8) ▲	36 (10.2) ▲	31 (10.1) ▲	30 (10.3) ▲

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics j Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (40%)	23	14	32	49	55	55	59
Within Schools (60%)	—	—	—	10	10	10	10
Total	9	6	13	25	28	28	30
Mathematics							
Between Schools (42%)	19	11	26	44	49	48	51
Within Schools (58%)	—	—	—	9	9	9	9
Total	8	5	11	24	26	26	27
Science							
Between Schools (38%)	23	15	32	43	50	50	55
Within Schools (62%)	—	—	—	10	10	10	10
Total	8	6	12	22	25	25	27

() Percentage of available variance shown in parentheses.

SOURCE: IEA's Trends in International Mathematics and Science Study and Progress in International Reading Literacy Study – TIMSS and PIRLS 2011

Variables	HLM Regression Coefficients							
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models			
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction	
School Explanatory Variables								
School Environment								
Schools Are Safe and Orderly	REA	27 (7.6) ▲	—	17 (6.2) ▲	—	9 (4.9)	—	2 (5.1)
	MAT	23 (6.7) ▲	—	14 (5.5) ▲	—	7 (4.2)	—	1 (4.7)
	SCI	26 (7.5) ▲	—	14 (6.0) ▲	—	9 (4.8)	—	1 (5.2)
Schools Support Academic Success	REA	8 (4.7)	—	4 (4.4)	—	6 (2.6) ▲	—	6 (2.7) ▲
	MAT	7 (4.2)	—	4 (4.0)	—	6 (2.3) ▲	—	5 (2.4)
	SCI	8 (4.6)	—	5 (4.2)	—	7 (2.6) ▲	—	6 (2.7) ▲
Adequate Environment and Resources	REA	9 (3.9) ▲	—	10 (3.3) ▲	—	3 (2.5)	—	5 (2.7)
	MAT	8 (3.6) ▲	—	9 (3.1) ▲	—	3 (2.4)	—	4 (2.6)
	SCI	8 (4.0) ▲	—	10 (3.4) ▲	—	3 (2.8)	—	5 (2.9)
School Instruction								
Early Emphasis on Reading Skills	REA	—	17 (2.4) ▲	15 (2.3) ▲	—	—	3 (1.8)	3 (1.8)
	MAT	—	15 (2.2) ▲	14 (2.2) ▲	—	—	3 (1.7)	3 (1.7)
	SCI	—	16 (2.4) ▲	15 (2.4) ▲	—	—	3 (1.9)	3 (1.9)
Students Engaged in Reading, Mathematics, and Science Lessons	REA	—	48 (13.4) ▲	35 (10.0) ▲	—	—	36 (8.3) ▲	33 (7.1) ▲
	MAT	—	39 (12.2) ▲	29 (9.7) ▲	—	—	30 (7.8) ▲	27 (7.4) ▲
	SCI	—	50 (13.1) ▲	39 (10.2) ▲	—	—	40 (8.6) ▲	36 (7.9) ▲
Home Background Control Variables								
Students within Schools								
Home Resources for Learning	REA	—	—	—	15 (1.2) ▲	15 (1.2) ▲	15 (1.2) ▲	15 (1.2) ▲
	MAT	—	—	—	11 (1.0) ▲	11 (1.0) ▲	11 (1.0) ▲	11 (1.0) ▲
	SCI	—	—	—	15 (1.1) ▲	15 (1.1) ▲	15 (1.1) ▲	15 (1.1) ▲
Early Literacy/Numeracy Tasks	REA	—	—	—	10 (0.8) ▲	10 (0.8) ▲	10 (0.8) ▲	10 (0.8) ▲
	MAT	—	—	—	9 (0.8) ▲	9 (0.8) ▲	9 (0.8) ▲	9 (0.8) ▲
	SCI	—	—	—	10 (1.1) ▲	10 (1.1) ▲	10 (1.1) ▲	10 (1.1) ▲
Between Schools								
School Average of Home Resources for Learning	REA	—	—	—	67 (3.3) ▲	61 (3.3) ▲	61 (4.0) ▲	56 (4.1) ▲
	MAT	—	—	—	60 (3.2) ▲	54 (3.2) ▲	54 (3.9) ▲	50 (4.0) ▲
	SCI	—	—	—	64 (3.5) ▲	57 (3.6) ▲	57 (4.2) ▲	52 (4.3) ▲
School Average of Early Literacy/Numeracy Tasks	REA	—	—	—	32 (10.8) ▲	33 (10.7) ▲	22 (10.5) ▲	24 (10.3) ▲
	MAT	—	—	—	23 (10.2) ▲	24 (10.3) ▲	14 (9.9)	16 (10.0)
	SCI	—	—	—	35 (11.9) ▲	37 (11.9) ▲	25 (11.3) ▲	27 (11.3) ▲

() Standard errors appear in parentheses. REA - Reading ▲ Coefficient significantly greater than zero.
 MAT - Mathematics ▼ Coefficient significantly less than zero.
 SCI - Science

Source of Variance	Percentage of Variance Explained						
	School Explanatory Models			Home Background Control Model	School Explanatory with Home Background Control Models		
	School Environment	School Instruction	School Environment and Instruction		School Environment	School Instruction	School Environment and Instruction
Reading							
Between Schools (51%)	25	35	49	70	74	76	79
Within Schools (49%)	—	—	—	9	9	9	9
Total	13	18	25	40	42	43	44
Mathematics							
Between Schools (52%)	24	33	46	68	72	73	76
Within Schools (48%)	—	—	—	8	8	8	8
Total	12	17	24	39	41	41	43
Science							
Between Schools (49%)	25	36	49	65	70	73	76
Within Schools (51%)	—	—	—	9	9	9	9
Total	12	18	24	37	39	41	42

() Percentage of available variance shown in parentheses.

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