first international comparative Study
Of language, mathematics, and associated factors for students in the third and fourth years of primary school

Second Report

Authors of the report:
Juan Casassus.
Sandra Cusato.
Juan Enrique Froemel.
Juan Carlos Palafox.

Specialists responsible for the analysis:
Douglas Willms and Anne Marie Sommers.
Department of Education of the University of New Brunswick, Canada.
Carlos Pardo. Instituto Colombiano de Fomento de la Educacion Superior, ICFES.
UNESCO

Report prepared by the Latin American Laboratory for Assessment of Quality in Education
Coordinator of the First Report:
Juan Casassus, Regional Specialist
in Educational Planning and Management
UNESCO-SANTIAGO

Permanent Consulting Staff:
(responsible for developing this report)
Sandra Cusato
Juan Enrique Froemel
Juan Carlos Palafox

Analysts:
Carlos Pardo
Anne Marie Sommers
Douglas Willms

Contributors:
María Inés Alvarez, National Assessment Coordinator (Chile); Asmara Anderson, General Special Projects Coordinator (Venezuela); Judith Barahona, General Director for Assessment of the Quality of Education (Honduras); Susana Barrera, Coordinator of the System for the Measurement and Assessment of Quality in Education (Bolivia); Héctor Fernández, Specialist in School Organization (Colombia); María Inés Gómez de Sá Pestana, Assessment Director of Basic Education (Brazil); Marta Lafuente, General Director of Educational Development (Paraguay); Leonte Ramírez, Director of National Testing (Dominican Republic); Alejandra Schulmeyer, Consultant for the National Institute of Education Research (Brazil); Héctor Valdés, Education System Researcher, Central Institute of Pedagogical Sciences (Cuba); Lucrecia Tulic, National Director of Assessment (Argentina); Julio Valeiron, Technical Director of National Testing Dominican Republic, Víctor M. Velázquez, General Director of Assessment (Mexico).

The opinions contained in this Study are not necessarily those of UNESCO, nor do they in any way effect the responsibilities of the organization. Geographic place-names used in this publication, and the presentation of data herein do not express any opinion of UNESCO regarding the judicial status of cities, territories, or zones, of that of their authorities, nor in regard to the delimitation of borders.

Published by the Latin American Laboratory for Assessment of Quality in Education, with the financial support of the Government of Spain.
UNESCO-SANTIAGO
Regional Office of Education for Latin America and the Caribbean
Printed by Andros Ltda.
Lay-out: Claudia O’Ryan
Original: Spanish
English Translation: William Gallagher
©UNESCO 2000
Santiago, Chile, June, 2002.
UNESCO
CONTENTS

Preface 4

Introduction 5

1 Implications of the Findings for Educational policies 7

2 The Study 9

Subject Matters Tested 11
Major Findings 13

3 Results of the Analysis of Associated Factors 15

1 Socio-Cultural Status (SCS) 15
2 Outcomes for Factors Subject to Modification by Education Policies 16
   2.1 At the Central Administration Level of the System 16
   2.2 School Principals and School Management 16
   2.3 Within-Classroom Teacher Related Factors 17
      Student/Teacher Ratio 17
      Initial and In-Service Teacher Training 17
      Teacher Experience 18
      Teacher Attitudes, Opinions, and Working Conditions 18
      Perceived Teachers Causal Attributions 19
      Classroom Strategies 21
   2.4 The domain of students and their family contexts 22
3 Achievement by Strata and Adjustment Variables 23

4 Complementary Analysis of Student Achievement 24

   1 Analysis by Topic 24
   2 Analysis by Achievement Level 26
      2.1 Achievement Levels in Language 27
      2.2 Achievement Levels in Mathematics 27
   3 Regional Outcomes by Demographic Strata 28
   4 Regional Outcomes in Public and Private Schools 30

5 Conclusions and Implications for Future Research 33

Acknowledgments 39

Appendix 1. Relation Between School Outcomes and Gender, Grade, and Socio-Cultural Status 41

Appendix 2. Description of the Variables 43
PREFACE

In 1998, UNESCO's Latin American Laboratory for the Assessment of Quality in Education published the First Comparative Study of Language, Mathematics, and Associated Factors for Students in the Third and Fourth Years of Primary School. That Study presented for the first time a comparative glance of educational achievement in countries which have many cultural elements in common. This is an important subject, since during the 1990s, education became the major public policy issue in Latin America.

This Second Report points toward other aspects of education in Latin America. How may we characterize student achievement in the region? How can the quality of education be improved? How can it be made more pertinent to the needs of the population? How can education improve the future prospects of millions of students? These are some of the questions addressed in this report through the study of factors associated with academic achievement.

First, the Study sounds an alert. For it shows that average achievement of students in the region, in terms of what they should learn in Language and Mathematics, is low. But besides serving as an alert, this report seeks to provide information on how to improve the current state of education. In so doing, it points in a number of directions. Much can be done. Nevertheless, the major challenge is how to learn to manage sets of factors that operate in synergy with one another.

The Study also highlights UNESCO's important role as a forum for the exchange of ideas, and as a facilitator in the common tasks faced by nations. To carry out this Study, thirteen countries and hundreds of researchers joined forces to produce more and better information. The results of this effort demonstrate how research can produce more solid and well-based interpretations of what can be done to improve the quality of schools in the region. It is our hope that it will become a useful tool in encouraging dialogue and in developing new educational policies.

Ana Luiza Machado
Director of the Regional Office of Education
for Latin American and the Caribbean
**Introduction**

In order to provide useful information for the formulation and execution of educational policy of countries in the region, in 1997 the Latin American Laboratory for the Assessment of Quality in Education – LLECE – carried out the First International Comparative Study in Language, Mathematics, and Associated Factors in the Third and Fourth Grades of Primary Education. The Laboratory, coordinated by the UNESCO Regional Office of Education for Latin America and the Caribbean, brings together in a network various national systems for the measurement and assessment of the quality of education.

A total of thirteen countries participated in the Study. The target population was all boys and girls enrolled in the third and fourth grades of primary schools in Argentina, Brazil, Chile, Colombia, Costa Rica, Cuba, Honduras, Mexico, Paraguay, Peru, the Dominican Republic, and Venezuela, as well as their parents or guardians, teachers, school principals, and the schools themselves. In 1996, the total population enrolled in both grades within these countries was 19,490, 590 students. The sample taken from this universe was approximately 55,000 - a number considered to be statistically appropriate.

The first results published at the end of 1998 provided some indications of a clear situation of low outcomes in terms of achievement, and made manifest the importance of giving priority to a systematic policy aimed at raising the academic achievement of students in the region. These and other conclusions of the Study made it possible to take the pulse of the education situation of more than sixty-four million children who make up the universe of the primary school population in Latin America.

The most significant finding was the dispersion of results between countries; so much so that they were divided into three groups: the first, consisting of one country that obtained scores far superior to the others; the other two groups had closer results, with generally low achievement levels. Moreover, besides comparisons between countries, the Study, from its inception was intended to carry out a more exhaustive analysis of outcomes in order to identify factors that could explain them.

Together with the tests in Language and Mathematics, a questionnaire was administered to students, parents and guardians, teachers, and school principals in order to collect more information regarding factors associated with achievement levels. All of this information comprises a valuable data base that allows both countries and the region as a whole to investigate the effect of a large number of school achievement variables.

This document contains the essential aspects of the Technical Report, which will be soon be made available to the general public. In that report, outcomes are detailed and interpreted through analyses of achievement levels in Language and Mathematics and the findings on the different factors that explain achievement. This Second Report focuses on discussion of implications for and recommendations regarding educational policies.
All of this background material substantiates the importance of the report, since it will allow decision-makers to have access to information that offers support and guidance for processes directed at focussing and making rational use of resources, and to move toward strategies that foster greater quality and equity in education. While it is true that the outcomes of the Study confirm many of the major concepts that have guided decision-making in recent years, it is also true that they modify others. This is very important for correcting certain viewpoints that have been current in education policy.

The in-depth analysis of outcomes in Language and Mathematics can contribute to the design, or re-design, of curricular programs, to instrumentation and focus of resource allocation strategies, and to establishing quality standards from the perspective of concrete results of a representative sample of students within the region. The Study of associated factors, for its part, makes possible the development of a suggested Latin American model for effective schools.

The latter is highly significant because it shows that crucial variables exist that compensate for the possible negative effect of adverse social-economic and socio-cultural conditions, and that despite coming from unfavorable contexts, students can achieve good results. Such conditions point toward the culture, attitudes, practices, and inter-relationships between teachers, students, administrators, and other actors within the school community. A good part of the variance in the outcomes – the measure of variability – is explained by factors linked to the school. This opens up significant opportunities to apply low-cost educational policies that can modify the present situation and substantially improve student achievement.

Social differences in Latin America are widening, while at the same time equity has become an on-going objective of social policy. This Study allows us to conclude that in Latin America, contrary to what has been argued by some specialists, schools do make a difference and can compensate for the effects of this lack of social justice.

Furthermore, it is important to note that increased budgets alone do not necessarily imply achieving better education. The Study demonstrates that although budgetary resources have an impact, they are not sufficient in and by themselves. Current Latin American experience shows that effective schools do not require enormous investments in resources; they require, rather, the efficient and cumulative inter-relation of a number of variables that are examined in detail in this Study.

Finally, it should be noted that although the most modern and universally-recognized methodologies and procedures have been used in design, procedures, and data analysis, the Study possesses the limitation inherent to quantitative research of this kind – the application of instruments based on pencil and paper exams, using multiple choice questions with only one valid response; exams that were self-applied and administered to diverse populations distributed over a wide geographic area.
Implications of the findings for educational policies

In accordance with the purpose of this report, in terms of being more an explanatory than a comparative tool of the results of the First International Study, the present section – which deals with repercussions of the findings for educational policies – presents an initial explanation of outcomes in the region.

A number of implications for educational policies arise from a general analysis of the Study. These may be summarized as follows:

It is essential that a much greater effort be made in order to improve learning in Language and Mathematics. Special emphasis should be placed on raising learning levels in Language, since low achievement in this area affects other kinds of learning and for the future possibilities of students within the educational system. If things remain as they are, countries within the region will be poorly prepared to meet the challenges presented by the new information and knowledge society within a context of globalization.

The Study has made it possible to affirm what other research has detected as well: factors outside the school influence what happens within the classroom. However, the set of factors associated with schools explains more than two-thirds of the variation in outcomes between schools. This demonstrates that, although factors outside the school have an impact on achievement, effective teaching leads to successful learning processes.

The lack of equity may arise from the environment within which schools operate. Differences in achievement between schools are less than that observed in the Socio-Cultural Index (SCS), with its four indicators of family context. Actually, what schools in the region do is compensate for inequalities. They thus have the potential to alleviate the effects of social inequalities.

The Study makes it clear that a good education system, or a good school, need not be especially expensive. Among those schools studied, there are some that operate under unfavorable conditions. Yet compared to others of a higher socio-cultural level, they achieve remarkable results.

The way that different actors inter-relate within a school is a subject that deserves greater study, since a good part of student outcomes depend on the quality of such links. Intervention should be directed at those factors that generate a micro-climate favorable to learning in the classroom (in which students do not fight, do not interfere with each other, and among whom a climate of friendship exists) in order to improve the quality of education.

It should be noted that emotional factors, of which this factor is a part, are more complex than those related to investment in material inputs. Therefore, their impact on achievement is more uncertain, and may require more time for instrumentation.

The differences observed between the outcomes of demographic and administrative strata obey factors associated with families and school processes, and not the strata per se. This means that those children whose parents have similar education levels and who attend
schools sharing similar processes also have similar outcomes. The difference does not lie in whether a school is rural or urban; nor in whether it is public or private. It lies, rather, in other factors, some of which may be modified through appropriate policies. In improving the quality of education, more attention should be paid to what happens in education processes and to the characteristics that differentiate schools within each strata, rather than the characteristics of the strata themselves.

It has been noted that the Study provides value judgements in order to suggest a model of effective schools, understood as those which achieve what is expected of them; that is, that their students learn. Based on the results of the Study, it appears that the profile of such an ideal school one in which¹:

1. The library has instructional material and books of sufficient quantity and quality.
2. The initial training of teachers has taken place after their secondary schooling; the teachers feel that their pay is adequate, and they teach exclusively in this school.
3. Teachers believe that the positive results or failure of their students depend largely on the students themselves.
4. There is a formal student achievement assessment practice in place.
5. Heterogeneity is encouraged. Students are not grouped according to a single standard.
6. Attempts are made to provide a classroom atmosphere that favors mutual respect and harmony between students.
7. Parents are involved in the activities of the school community.

The following sections are intended to support the aforementioned repercussions, both in terms of the constituent characteristics of the Study, as well as the results of the analysis of Associated Factors. A country analysis by Language and Mathematics topics has been added that is a complement to the regional overview, but which looks this time within each country. Finally, we present an analysis of both Language and Mathematics by strata and achievement levels at the regional level.

¹ The elements presented in this profile are listed in the order in which they are analyzed in Chapter III: Results of the Analysis of Associated Factors, and not in terms of their relative importance.
Between June and November, 1997, third and fourth grade primary school students in 13 countries were tested in Language (54,589 students) and Mathematics (54,417 students). Questionnaires designed to obtain information on learning conditions were administered to 48,688 students, 41,088 parents and guardians, 3,675 teachers, and 1,387 school principals in 1,509 schools.

The size of the samples were similar in each country, with about 100 schools selected in each, and with 20 students at each grade level. The sampling process was adjusted to current international standards. Most of the countries complied with the general guidelines of the corresponding manual, with only two of them introducing changes into the agreed-upon procedure\(^2\), but always within acceptable standards for this kind of study.

The sample was demographically and administratively stratified. The first criterion made it possible to distinguish schools located in large cities (more than 1 million inhabitants), urban areas (cities with more than 2,500 and less than one million inhabitants) and rural areas (locales of 2,500 inhabitants or less). The second criterion distinguished between publicly-managed (federal, state, or municipal) and private schools in large cities and urban areas, without considering the source of resources of the latter.

The basic purpose of the Study was to provide useful information for the formulation and execution of educational policies within countries of the region. Three central issues were constantly present:

- Only a few countries in the region have participated in previous comparative measurements of the quality of education. When they have, consideration has not been given to their curricular and cultural roots.
- In recent years, several Latin American countries have put in place national education quality assessment systems, to which the present Study can supply comparative and reference information on common curricular issues.
- The Study coincides with the interest in many countries to:
  - give priority to the development of education;
  - move ahead with educational reform processes;
  - effect profound changes in management, objectives, content, skills, and methodologies of teaching; and
  - improve physical infrastructure and support materials used in schools, with strong emphasis on the quality of education offered and the equity of its distribution.

\(^2\) Argentina utilized a previously selected sample for its national survey. Brazil, due to its great dispersion, pre-selected three states, and within each of them three municipalities with high, middle, and low rates based on the United Nations Human Development Index. Mexico defined as “rural” those populations of up to 5,000 inhabitants.
The results of the Study, together with other educational indicators, will make it possible for authorities charged with the design and implementation of educational policies to have available a broad and documented view of the factors that most influence the quality of education in their countries, as well as to access database information that can be used in future studies on the impact of educational reforms.
Subject Matters Tested

The Study included two basic subjects – Language and Mathematics – as indicators of the quality of education in each country. With Language, students construct and develop knowledge and learning, giving meaning to their experiences and sense to the knowledge of others, as well as building the basis for development of the ability to reason and opening the doors of access to knowledge and critical thinking. Mathematics aids in organizing the bases for logical reasoning, develops the capacity to solve problems, and lends rigor to the analysis of data.

After analyzing and identifying curricular elements that define the educational process of students within the region, five topics in Language and another five in Mathematics were chosen, to be used as a basis for constructing the instruments and for subsequent interpretation of the results. These were:

**Language:** Identifying types of texts; distinguishing between the transmitter and the recipient of a text; identifying the message in a text; recognizing specific information within a text, and identifying vocabulary related to the meaning of a text.

**Mathematics:** Numbering, operations with natural numbers; common fractions; geometry and skills (the latter understood as the ability to read graphs, recognize trends, have a notion of probabilities, and discern relations among given data).

Student achievement in the various topics, and was analyzed in each country, and was also contrasted with their achievement in the test as a whole. This made it possible to produce a performance profile for each country that expresses the relative mastery that their students have of the different topics.

The results of both tests are expressed on an ad hoc (Rasch Model) Scale, with a Mean Score of 250 points and a Standard Deviation of 50 points.
With due regard for the complexity of educational processes and their close links to economic and social development, a basic model was defined that integrates four different factors that influence learning:

1) **Students and their family contexts** (characteristics, commitment, habits, and skills of students and of their immediate families);
2) **Teachers and the educational domain** (curriculum and teaching management variables utilized by teachers in the classroom);
3) **Principals and the school microcosm** (variables upon which institutional management processes of the school are supported);
4) **Public authorities and the macrocosm** (aspects related to public management of institutions at the national level).
MAJOR FINDINGS

The most significant findings of the Study may be summarized as follows:

Cuban students achieved the highest scores in Language and Mathematics, and take less time to complete a grade (Advancement Rate). This is the case in all of their schools. Differences in achievement for this country, in terms of gender and socio-cultural levels, are also reduced. The relationship between high scores in the two subjects and advancement rates also occurs in other countries.

With the aforementioned exception, achievement levels in Language in the region are quite low. Most students have only a fragmentary understanding of the texts that they read. They recognize the words of a text, but are not able to determine why they say what they do, or for what purpose they are said. **This may indicate that in the region, students are taught to decode; that is, to translate written words into oral language, but without understanding the meaning of the text. Nor do they interpret that which they read. They learn to read aloud, or to “enunciate” texts, but they do not learn through reading.**

Outcomes for Mathematics, with the exception noted above for the case of Cuba, were generally even lower and more unequal. **Students do not assimilate knowledge, nor do they develop skills in the subject. They recognize signs and structures, but have little ability to resolve simple mathematical problems encountered in daily life.**

Gender differences follow a pattern similar to that noted above for the case of Cuba, being significant only in some cases. Girls show better achievement in Language and slightly poorer achievement in Mathematics.

Although there are similarities between countries, there are complex differences as well. The way that different variables have an impact on school performance in each country deserves detailed study, inasmuch as their behavior is not consistent in all countries. The fact is that, as we shall see in detail for the selected variables below, for some countries such relations are positive, and for others they are negative.

“School-related factors” – input and processes – are responsible for nearly two-thirds of the variation in student achievement outcomes. This finding warrants the need for the study and development of policies aimed at changing the present situation and improving achievement.

There are differences in outcomes between schools, according to the strata to which they belong. But these disappear and, in some cases, reverse their direction, if an analysis is carried out controlling for family history variables and, even more so, when to such control we add education process variables. Thus, the importance of the family in student achievement becomes evident. Even more evident are school-related factors which, in some cases, even neutralize or compensate for the negative effects of other variables.

Rural schools in Colombia had higher than expected outcomes that were above those of the urban schools in that country. This indicates that, even in unfavorable contexts, the application of appropriate and consistent measures (“Escuela Nueva”) can significantly improve student outcomes.
Urban schools in Chile show better outcomes than those in large metropolitan areas. This may be due to the effect of the regionalization model put into practice in that country.

A last finding points toward the importance of schools themselves and to what happens within them. One of the most important findings of the Study is that student perception of a favorable classroom environment has more influence on learning than the combined effect of all the other factors.
Results of the analysis of associated factors

The Study included the analysis those factors that have an influence one way or another upon student learning in Language and Mathematics. The application of questionnaires to students, parents and guardians, teachers, principals, as well as the collection of information on the schools themselves provided a wealth of data that will make it possible for each country, and for the region, to work in the future toward intensifying research on the effects of these different pedagogical, economic, social, and cultural factors – to examine the interrelations and/or synergy that can take place between them.

The variables to be presented in this chapter have been chosen according to two categories. First, we will look at those that had a statistically significant effect on student scores; second, we will examine those that, in spite of not demonstrating a significant effect in the Study, have conceptual relevance that merits our attention.

In addition, in order to clarify understanding of the incidence of the variables considered in this Study, independent of student Socio-Cultural Status (SCS), the statistical analysis presents the difference of scores on each variable for a hypothetical group of students that corresponds to the Mean value of SCS in the region.

These variations in achievement in Language and Mathematics in regard to the variables included in the analytic model of the Study will be described in the following sections of this chapter, and may be found in detail in the table included in Appendix 1 of this document. Analytic descriptions of each of the variables considered are included in Appendix 2.

1. Socio-Cultural Status (SCS)

In order to study the incidence of variables related to the family contexts of students, a scale was created called “Socio-Cultural Status”. This index consists of four variables: 1) educational level of parents; 2) number of hours that parents are at home during working days; 3) reading resources available in the household, and 4) structure of the core family (whether it is or is not composed of two parents, irregardless of marital status).

The SCS index and its analysis using collected information shows that this variable changes within each school and between schools for each country. A first take on achievement gradients in Language and Mathematics shows that an increase in the Mean value of the schooling of parents (estimated to be 9.3 years in the Study) results in an increase in the achievement of their children. This is even more evident as the heterogeneity in levels of schooling of the countries increases.
2. Outcomes for Factors Subject to Modification by Education Policies

2.1 At the Central Administration Level of the System

Comparison of the outcomes of the Study with similar ones in developed countries shows that learning achievement in the thirteen countries (and, by extension, in Latin America) is – with the exception of one country – quite low. This finding reveals the disheartening situation of our countries within the international context; one which demands the formulation of educational policies that assure classroom learning and which raise the academic achievement of future generations.

These new educational policies, as we shall see below, do not necessarily involve more or less spending per student; nor do they imply questioning the need for investing in education. It is not so much a question of the volume of resources, but rather of the effectiveness of measures – many of low cost – that can guarantee quality within the learning and teaching process.

Independent of the outcomes of this Study, it should be noted within this domain that in the different educational systems analyzed, reforms are being carried out – highly productive innovative experiences and traditional practices that produce better outcomes. It is for this reason that the exchange of knowledge between countries is a key element for progress in the region.

The Study shows that within the region in general, those students with exposure to pre-school education show slightly better subsequent academic achievement than those students who have not had such experience. This is most evident in the case of Language achievement.

This fact notwithstanding, it is important to remember that such behavior was not statistically significant across the entire region, that there is no uniformity in these outcomes when the analysis is done by country, and that the data for this variable were very often invalid. For this reason, it is advisable that in-country analyses should be intensified in the future.

2.2 School principals and school management

Student academic achievement is multivariate. What happens within schools, with their multiple variables, is very important for learning. Knowing their influence on school achievement allows us to act upon them and – when appropriate – modify them through educational policy decisions.
The Study assessed school resources in terms of the availability of basic teaching materials (black boards, calculators, maps, and others), and found that at the regional level, an increase of an item in the number of such materials is associated with an almost two point increase in the Language test. Thus, an increase of five items would imply an approximate increase of ten points on the same test. The magnitude of the relationship in regard to achievement in Mathematics is lower.

This variable is also related to the availability of books in school libraries. We note that schools with libraries that have at least one thousand books are more associated with those that have higher achievement scores than those schools that have small libraries. It seems reasonable that children who have the support of materials and access to libraries learn more than those children who do not.

2.3 Within-classroom teacher related factors

Student/teacher ratio

Beyond intuitive approaches in regard to the subject, the outcomes of the present Study agree with the general trend revealed in other research, which point out that in terms of achievement, a larger number of students per classroom has a negative, but quite small effect.

Initial and in-service teacher training

We see from the Study that there is a positive relationship between post-secondary training of teachers and student achievement. On the other hand, if we observe the variable “in-service teacher training” (understood as that which takes place after initial
training has been completed, its influence on achievement, even when positive, is not statistically significant. For each additional year of post-secondary teacher training, students increase their scores by 2.44 points in Language and 2.06 points in Mathematics. This means that those students whose teachers possess four years of post-secondary training achieve between 4 and 5 points more than those students whose teachers have had only two years of similar training.

**Figure 3**

*Variations in Scores as a Function of Classroom-Associated Variables and Teacher Characteristics*

![Graph showing variations in scores as a function of classroom-associated variables and teacher characteristics.](image)

Figures in **bold** type are statistically significant at the .05% level

**Teacher Experience**

For its part, the Study did not detect the influence of teacher experience on student performance, being slightly positive for both Language and Mathematics. In this sense, it would seem necessary to revise the weight assigned to the factor of experience in the design of teacher promotion systems, in view of the fact that years of service have a strong influence on teacher salary increases and promotions.

As was stated, results of the research show that the education of teachers is an important issue to consider. Therefore, one could require that all teachers have at least a full secondary education, in view of the increase in student achievement related to one or more years of post-secondary teacher education.

**Teacher Attitudes, Opinions, and Working Conditions**

When teachers perceive that their pay is adequate for the work they perform, their performance results in an increase of between eight and ten points in their students’ achievement. The contrary is the case when teachers perform additional work in order to enhance their incomes. Those students whose teachers are in such a situation obtained a
Mean Score of ten points less in achievement compared to those who have a full-time teacher.

**Figure 4**

**Variations in Scores as a Function of Variables Associated with Teacher Attitudes and Opinions**

The fact of teachers not being able to carry out their professional activities with autonomy in order to determine the best strategies with which to deal with every-day classroom situations negatively (although not significantly) affects student achievement. Autonomy, in this case, is taken as the Mean value of four dichotomous variables: whether the teacher feels free to carry out his or her functions; whether he or she participates in work-related decisions; whether the teacher has a role in the selection of texts and in the selection of audio-visual materials to be used. Moreover, if lack of autonomy is combined with the fact that teachers are not satisfied with their salaries, and that they hold other jobs, this combination is related to a 27-point decrease in student achievement.

**Perceived Teacher Causal Attributions**

Based upon their experiences, teachers offer reasons to justify success or failure in achievements of their students. In the Study, seven of these reasons are considered: family support, skills of the students themselves, self-esteem, the school environment, school resources, teaching methods, and teacher expectations.
Teachers also attribute great importance to student skills (intelligence, aptitude, creativity, disposition). Both for Language and for Mathematics, the outcomes of the Study show that student achievement scores are nearly 21 points higher when teachers feel that these outcomes are due to the abilities of their students. Nevertheless, it is important to stress that similarly, teachers attribute the outcomes of their students to their own teaching methods. When the latter occurs, student achievement is also higher. This in itself calls for a change in mentality and for professional practices in which teachers assume a greater share of responsibility for the effect of their activity.

Students who achieved better academic performance have as teachers individuals who do not attribute poor student performance to “family conditions”. On the contrary, students whose teachers believe that success or failure is not their responsibility, but rather that of their students’ families have test scores 10 to 22 points below those of other students.
Classroom Strategies

The Study found that the existence of a formal assessment system of student work has positive effects on achievement. Those who attend schools in which teachers systematically control learning obtain outcomes between 4.5 and 5.5 points above those who do not receive on-going assessment. This calls for strategies that foster an assessment culture, either in initial teacher training courses or as a part of in-service training – communicating to teachers the evidence found in this and in other similar studies.

Nevertheless, of all the variables studied, that which has the largest impact on achievement is that in which, according to student perceptions, there is a favorable learning environment in the classroom. Students in classrooms in which they live together in harmony, do not quarrel among themselves, and in which they establish good friendships, attain between 92 and 115 points more than students in classrooms where such a climate does not exist. This is linked to other abilities or attitudes required by teaching that can condition the transmission of knowledge and the development of student skills.

Although in a limited way, the Study also treated the effect of the practice of grouping students according to a particular educational or socio-cultural variable. Such variables can be levels of previous achievement, gender, or cultural or ethnic characteristics. Here, however, only the first of this list was considered. In those schools in which students are grouped according to their achievement, students have nearly 11 points less than in those schools in which such grouping does not occur. A logical suggestion is to take advantage of the diversity that exists in each classroom, given the fact that the greater the heterogeneity, the better the achievement.

Figure 6
Score Variations as a Function of Variables Associated with Classroom Strategies

<table>
<thead>
<tr>
<th>Language</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-grade groups</td>
<td>-4.46</td>
</tr>
<tr>
<td>Systematic assessment</td>
<td>5.58</td>
</tr>
<tr>
<td>Students grouped by ability</td>
<td>92.07</td>
</tr>
<tr>
<td>Classroom climate</td>
<td>-11.64</td>
</tr>
</tbody>
</table>

Figures in bold type are statistically significant at the .05% level
THE COMBINED EFFECT OF FORMAL ASSESSMENT AND NON-GROUPING OF STUDENTS ACCORDING TO SOME EDUCATIONAL OR SOCIO-CULTURAL VARIABLE, ON THE ONE HAND, AND THE ACHIEVEMENT OF A POSITIVE CLASSROOM CLIMATE ON THE OTHER, RESULTS IN INCREASES OF 108 AND 131 POINTS MORE IN LANGUAGE AND MATHEMATICS, RESPECTIVELY. THIS, TOGETHER, IS THE MOST IMPORTANT VARIATION REVEALED BY THE STUDY.

2.4 The domain of students and their family contexts

The influence of the activities of parents on the achievement of their children is unquestionable. The Study shows, for example, that if parents read to their children, their achievement increases by between 3 and 6 points, especially in Language. The availability at home of ten or more books that students may consult is a factor associated with increases in Language scores (4.55) and slightly more in Mathematics (5.23). The combined effect of reading frequently to ones’ children and having books available at home is another powerful way to improve achievement in school.

Figure 7
Variations in Scores as a Function of Variables Associated with the Domain of Students

![Figure 7](image)

Parents helping their children with their homework apparently has a negative effect on achievement. This is open to varying interpretations, from supposing that greater help from parents is a consequence of poor student achievement, to the contrary that low achievement is a result of the lack of pedagogical skill of parents, which can in turn confuse the student. A different case is that in which parents are actively associated with school activities. In such cases, there is a noteworthy increase in student achievement.

Figures in bold type are statistically significant at the .05% level
3. Achievement by Strata and the Adjustment Variables

One of the first findings of the Study was that of the differences in Mean scores by strata. If, however, these are considered for a population group with schooling levels of parents or guardians and other family background factors equal to the regional Mean Score, the strata differences tend to diminish. If, moreover, one looks at a group of students with school processes equal to the regional Mean Score, the strata differences in scores not only disappear, but tend to be reversed.

**Figure 8**

**Differences in Mean Scores by Strata, where the Rural Strata = 0, without Adjustment, Adjusting for Family Background and Adjusting for School Processes.**

This means that low achievement levels detected in rural schools are not due to the fact that they are rural, but rather to the educational processes prevailing within them. Similarly, achievement differences between public schools and private schools tend to dissipate if we adjust simultaneously for context and process variables included in the model. This latter fact means that, beyond being different in the way they are managed, they are also different in the socio-cultural level of parents and in the way in which the educational process is carried out in the classroom.
Complementary Analysis of Student Achievement

This chapter presents two different analytic perspectives of student achievement in Language and Mathematics. The first corresponds to an analysis of outcomes within each country for the different topics or themes included in the tests. The second is an analysis by achievement level for the region as a whole, in order to identify the Mean student achievement for each of the different strata considered.

1. Analysis by Topic

Student performance within each country in each of the five topics selected in Language and the same number in Mathematics was assessed in relation to the performance of these same students for the test as a whole. This allows us to construct an achievement profile for each country that summarizes the relative mastery of students expressed in values as:

1 very high;
2 high;
3 fair;
4 low; and
5 very low.

The topics included in Language were: identifying kinds of text; distinguishing the transmitter and recipient of a text; identifying the message of a text; recognizing specific information in a text, and identifying vocabulary related to the meaning of a text. In Mathematics, topics included were: numbering; operations with natural numbers; common fractions; Geometry, and skills.

It is important to note that in this analysis, which is equivalent to content analysis, relations are established between achievements in different topics within each country, and that in this sense, it is not possible to generate comparisons between them. Thus, if achievement on a topic for a country is considered “high”, this means only that it is so in regard to the achievement of students of the same country on other topics. Nothing can be said, however, regarding whether such achievement can or cannot be considered “high” in regard to that of students in other countries.
For example, the low outcome for the language topic (distinguish between the transmitter and the recipient of a text) does not mean the same in Cuba (with the highest Mean Score) as in Paraguay (with a Mean Score of 250). This is to say that it is evident that in Cuba, in absolute terms, student achievement on this topic is superior to the achievement in absolute terms of students in Paraguay. But in both countries, the outcome shows that, of all topics assessed on the Language test, this is particularly the one to which attention should be given in the educational process. The outcome for Mexico on the same topic is “Very Low”, while for Venezuela it is “High”. But it is possible that Mexico has higher student achievement in absolute terms, given that its Mean Score is higher. Nevertheless, Mexico should pay more attention in its educational process to this topic than to any other. In other words, the real meaning of the outcomes are found when a country analyzes them for itself.
The outcomes permit us to conclude that treatment of the five Language and five Mathematics topics does not obey standards that one may consider common for the region as a whole, nor for most country groups. Although there is obvious heterogeneity in the outcomes, in Language there are certain identifiable commonalties. On the one hand, in most countries, students tend to exhibit relatively low or very low achievement for the topics Identify Types of Text and Distinguish the Transmitter and Recipient, thus revealing problems with these skills. On the other, in most countries, the ability to Recognize Specific Information of a Text appear as a high-achievement topic.

In Mathematics, the only topic that shows a degree of homogeneity is Operations with Natural Numbers, although no country shows its performances to be located at any of the two significant categories, high and low. The greatest discrepancies among countries are seen in Common Fractions and Geometry. This may be explained by the differences in emphasis given to these topics in the first years of schooling in each participating country.

2. Analysis by performance levels

The analysis of outcomes in Language and Mathematics concentrated on skills attained by students through the study of performance levels.
In the area of **Language**, the areas explored centered on skills developed to *understand through written language*. In **Mathematics**, the test measured skills attained to *resolve problems* that required students to use levels and types of mathematical reasoning, and demanding the employment of mathematical reasoning with growing degrees of complexity.

Similar to the analysis of skills, the analysis by performance levels allows us to identify the trends of what a student, or a group of students, can or cannot perform, and shows how the various degrees of competency that are taught to children are manifested, giving us a view of the state of education in terms of both quality and equity. In order to carry out this part of the Study, items from each test were examined in terms of their degree of difficulty and the kind of skill they require of students. This allowed us to define three levels in each test:

### 2.1 language performance levels

**Level I.**

**SIMPLE LITERAL READING.** This is the most basic and simple level of reading, and requires the recognition of explicit local-level structures: to identify actors of a story, the key parts of the argument, and explicitly stated relations.

**Level II**

**PARAPHRASING OF LITERAL READING.** Here we have a greater degree of reading complexity that requires a translation of words regulated by the literal meaning of the text. There are questions that ask that the text be described in other words, without a in-depth interpretation being necessary.

**Level III**

**READING USING INFERENCE.** On this level, students fill empty spaces of the text, explain assumptions about structure, link propositions at the micro and macro-textual levels, and identify different forms of relations implicit in the text. Here, questions require the reader to relate part of the text to a partial theme and to recognize textual outlines.

### 2.2 mathematics performance levels

**Level I.**

**RECOGNITION AND EMPLOYMENT OF BASIC MATHEMATICAL FACTS AND RELATIONS.** Students are able to complete customary exercises which require them to superficially recognize mathematical structures. This level requires working in elementary mathematical language and abilities linked to reading and writing numbers, recognizing geometric figures, identifying simple patterns and carrying out elementary operations.
Level II.

**RECOGNITION AND USE OF SIMPLE MATHEMATICAL STRUCTURES.** Here we place those students who are able to recognize simple mathematical structures. They can carry out both routine classroom exercises as well as simple problem situations that require them to carry out the four basic operations.

Level III.

**RECOGNITION AND USE OF COMPLEX MATHEMATICAL STRUCTURES.** On this level are those who are able to recognize complex mathematical structures. They can carry out common, as well as solve more elaborate procedures, and are able to solve more complex problems that require knowledge of the structure of the decimal system and handling positional values in order to establish equivalencies.

As a criterion for carrying out the analysis, a base-line was established that represents the percentage of students who should have attained each Performance level in order to consider that the Level in question was adequately reached.

Determination of the base-line was not a statistical decision; rather, it is the result of expert judgement of the following elements: a complete analysis of the state of the art in the teaching of Language and Mathematics, empirical information, (use of Item Response Theory [IRT] models, a performance index for different level data, and consistency analysis), the current state of Latin American education, as well as aspects related to the tests themselves. Accordingly, it was decided to establish base-lines of 90%, 75%, and 50% for levels I, II, and III, respectively. This means that if skills that the test assesses are developing adequately, 90% of students will attain Level I, 75% Level II, and 50% Level III. Thus, if a country achieves these outcomes, one may conclude that the performance of its students is satisfactory.

3. Regional Outcomes by Demographic Strata

**Language.** Regional Mean scores met satisfactory levels on the three Performance Levels only in *mega-city* schools. It is felt that in such schools, a satisfactory percentage of children read, recognize meanings, and understand and interpret information. In *urban* schools, achievement in reading comprehension skills can be considered satisfactory only on the first level, while at the two other levels that demand mastery of more complex skills the situation is 5% to 10% below the percentage considered satisfactory.

*Rural schools* exhibit deficiencies on the three levels, especially on the last two, where the difference in regard to the value considered satisfactory is 26% and 19%, respectively.
OVERALL, ONE NOTES THAT A HIGH NUMBER OF STUDENTS READ WITH ONLY FRAGMENTARY AND LOCALIZED COMPREHENSION OF TEXTS. THEY IDENTIFY PARTS OF THE INFORMATION CONTAINED IN TEXTS, BUT LACK READING COMPREHENSION BECAUSE THEY HAVE DIFFICULTY IN ESTABLISHING WHY THE TEXT SAYS WHAT IT DOES. RATHER THAN UNDERSTANDING THE MEANING AND INTERPRETING TEXTS, THEY LEARN MORE TO PRONOUNCE THE WORDS ALOUD, OR DECODIFY. THE CHILDREN DECODE, BUT DO NOT KNOW HOW TO LEARN THROUGH READING.

**Mathematics.** Insufficiencies here are greater, since in no strata are minimum expected levels attained on Performance Levels II and III, while on Level I satisfactory levels are achieved only in schools located in mega-cities and urban areas. For Level II, the deficiency varies between 21% for the mega-city strata and 35% for the rural strata. Deficiencies for Level III reach 32% for the mega-city strata and 38% for the rural strata.
OUTCOMES INDICATE THAT STUDENTS CAN RECOGNIZE NUMBERS, MATHEMATICAL SIGNS, AND NUMERICAL AND ORDER RELATIONS AT AN ELEMENTARY LEVEL, BUT THE MAJORITY DO NOT POSSESS SATISFACTORY MASTERY IN ORDER TO SOLVE MATHEMATICAL PROBLEMS, WHETHER SIMPLE OR COMPLEX

4. Regional outcomes for public and private schools

Comparing schools by type of administration again reveals differences, with a slight advantage for the private sector. Both in Language and in Mathematics performance is relatively similar for both strata on Level I, with achievement above the level considered to be satisfactory. In Language, for Performance Levels II and II, students attending private schools achieve performance rates that are approximately 10% above those for public schools.

In Mathematics, the difference in favor of private school students is near 8% for Level II items (recognition and use of simple mathematical structures). Nevertheless, both public and private schools are well below the minimum expected percentages. The same is true for the case of Performance Level III (recognition and use of complex mathematical structures), where student achievement in both types of schools is 35% below the minimum expected percentage.
Figure 13
Language – Regional Level
Percentages of Students Reaching Each Performance Level, by Administrative Strata

Figure 14
Mathematics – Regional Level
Percentages of Students Reaching Each Performance Level, by Demographic Strata
In short, the analysis of learning outcomes in both Language and Mathematics reveals a clearly deficient situation. Except for Cuba, most third and fourth grade students who participated in the Study have not developed skills according to expectations, remaining on a basic level of recognition of signs and structures of Language and Mathematics. This shows, in varying degrees, a deficient development of communication and problem-solving skills.

In other words, students learn to read, but have difficulties understanding the meaning of what they read and interpreting texts. They learn numbers, numerical relations, signs and structures, but are unable to solve simple problems. Nor can they extrapolate the application of mathematics to every-day situations.
Conclusions and Implications for Future Research

This chapter has two basic objectives. The first is to offer a final synthesis of the conclusions of the Study, this time presented hierarchically, according to the magnitude of the relative individual effect that each associated factor proved to have upon achievement in Language and Mathematics in the third and fourth grades, and with a statistical significance level of at least 0.05%.

It should be emphasized here that the analytic statistical instrument employed was that of Hierarchical Linear Models (HLM) which is based, in turn, upon general regression models, but incorporates the condition of carrying out analysis on more than one level of aggregation at once. In the present case, the aggregation levels were basically two: students and schools. The outcomes presented below correspond to the latter. Finally, it is important to note that the analysis presented here, as an expression of multiple regression models, simultaneously incorporates all the variables of the regression equation simultaneously. Thus, we repeat that this analysis presents score differences in each variable for a hypothetical group of students that corresponds to the Mean Socio-Cultural Status in the region.

The second objective of this chapter is to treat questions that, due to its design, scope, or non-availability of resources, the present Study was unable to answer, and which thus remain themes for future research.

1. CONCLUSIONS

The magnitude of the relation between Associated Factors and Achievement in Language and Mathematics is operationally defined in this chapter as the number of units in the standardized scale adopted for achievement (Mean=250 points; Standard Deviation=50 points) of increase or reduction due to the effect of the presence of a specific variable (associated factor), corresponding to the increment of one unit on the scale of that variable. For greater clarity, operational definitions (form of measurement) of most of the variables mentioned in this chapter are presented in Appendix 2 – Analysis of Variables.

It should be mentioned beforehand that the total percentages of variance explained by the model, within schools, are discreet, and reach 13.5% for Language and 15.6% for Mathematics. In contrast, total percentages of variance explained between schools are notably higher, reaching 68.3% in Language and 61.3% in Mathematics.

- **Classroom Climate** is the single variable that demonstrates the greatest positive effect upon achievement, both in Language and in Mathematics. In fact, a value of 1 for this variable, meaning a student appraisal of the climate as “satisfactory”, corresponds to a 92.07 point increase in Language and 115.03 points for Mathematics. It is interesting to note that, in this case, the effect corresponds to almost exactly two (2) standard deviations of increase in achievement.
• The variable that has the second greatest effect, also positive, is **Student Ability as a Causal Attribution for Score Outcomes, as Perceived by Teachers.** Analysis shows that each additional score point in which teachers attribute student achievement to Student Ability corresponds to a 21.01 point increase in Language achievement and a 21.59 point increase in Mathematics achievement.

• Next is the variable, **Involvement of Parents or Guardians (school level).** Analysis reveals that for each additional point in the scale in which parents say that they are involved in the school in which their children study, student achievement increases by 21.11 points in Language and by 14.98 points in Mathematics.

• Next in importance in terms of its effect on achievement is **Family Support as a Cause Attributed for Student Outcomes, as Perceived by Teachers.** In this case, the outcome is the opposite direction from those seen to date for the rest of the variables. It is interesting to note that each point in which teachers see student outcomes as attributable to family support corresponds to a decrease of 10.09 points in Language and 22.30 in Mathematics.

• The effect of **Grade Level** as an Associated Factor shows that being in the fourth grade is related to 18.80 more points in Language, and 15.30 more points in Mathematics than being in the third grade.

• We next have the variable **Teacher Has an Additional Job.** In this case, for teachers who exercise another professional activity besides that of teaching in the school in which they were interviewed, student achievement is 11.20 points less in Language and 9.71 points less in Mathematics than for those students whose teachers work exclusively in the school in which they were interviewed.

• The next in this listing of effects of variables on achievement is that called **Students Grouped by Ability.** This points to the practice of segregating students in school according to some variable – in this case their own abilities. Analysis shows that, as the variable moves toward greater homogeneity of groups of students in the classroom, for each 0.5 point in this direction there are reductions of 10.35 points in Language achievement and 11.64 points in Mathematics for students under these conditions.

• We next have the variable, **Size of Library.** The results show that students enrolled in schools that have more than 1,000 books in their libraries earn 10.40 more points in Language and 9.90 more points in Mathematics than those attending schools that have less than this number of books in their libraries.

• In the case of the variable **Adequate Salary,** which reflects the judgement of teachers regarding whether their salaries are sufficient. Where teachers judge their salaries to be sufficient, student achievement is 7.63 points higher in Language and 9.59 points higher in Mathematics than for students whose teachers do not so indicate when asked about their salaries.

• The variable, **Gender,** also has an impact. Being a girl is related to obtaining 6.04 more points more than boys in Language, and 1.79 points less than boys in Mathematics.
• Another achievement-related variable is **Parents or Guardians Read Frequently**. This refers to cases in which parents or guardians read to children every day. In the case of parents who do so, their children have 5.88 more points in Language, and 4.31 more points in Mathematics than the children of those parents or guardians who do not.

• The variable denominated **Teacher Over-burdened** is scaled according to how the teacher responds when asked if he or she has or does not have arduous working hours. Students of teachers who do not report arduous hours achieve 5.78 more points in Mathematics than students of teachers who do so report. There is no significant relationship in the case of Language outcomes for any of the alternatives.

• The next variable in terms of influence on achievement is **Socio-economic Level of the School**. This is an estimated variable of the Social-economic Level of the School as perceived by the school’s Principal. A one-unit increase in this variable is related to increases of 5.64 points in student Language achievement and of 5.88 points in Mathematics.

• Similarly, the variable, **10 or More Books** has an impact on achievement. In this case, we consider households that have 10 or more books. Achievement of children who live in households which have this number of books is 4.54 points higher in Language and 5.20 points higher in Mathematics than for those from households not having this number of books.

• Another variable that shows a significant effect is **Graduated from Grade 12**, which identifies the education level of parents of a particular student as being at grade 12 or higher. The effect of parents of students having completed at least 12 grades of school is related to a student achievement of 3.87 points higher in Language and 3.63 points higher in Mathematics than those students whose parents do not have this level of schooling.

• Next is the impact of the variable entitled **Parents or Guardians Sometimes Read**, defined as a child being read to more than once per month. For those students whose parents sometimes read to them, achievement is 3.14 points higher in Language and 2.96 points higher in Mathematics than those students whose parents do not do so.

• Another variable that shows a relationship with achievement is **Teacher Training**. This variable is defined as the number of years of post-secondary training of teachers. Each year of training that teachers have corresponds to an increase in scores of their students of 2.44 points in Language and 2.06 points in Mathematics.

• A variable that exhibits a peculiar relationship with achievement is that entitled **Parents or Guardians Help With Homework**. For those students whose parents help them with their homework there is a reduction of 2.21 points in Language and 2.73 points in Mathematics, as compared to those students who do not receive help with homework from their parents.

• Another variable is **Involvement of Parents or Guardians (classroom level)**. Here we see that each unitary increase in the involvement of parents at this level
corresponds to an additional 1.82 points in Language achievement and 2.22 points in Mathematics achievement for their children.

- The next variable is **At Home 3 to 4 Hours**, which receives a maximum score if the parent or guardian stays at home for 3 or 4 hours during working days. A positive unit for this variable corresponds to an increase of 2.00 points in Language achievement, with no corresponding significant increase for Mathematics scores.

- Next is the variable, **Instructional Materials**. Outcomes show that for each additional element of equipment, there is an increase in Language achievement of 1.96 points for those students enrolled in schools that offer these conditions. There is not significant relationship in the case of Mathematics.

- The next variable is that termed **Bi-parental**. This describes whether the family has one or two parental figures in the household. The presence of two parents is related to an increase of 1.89 points in student Language achievement. There is no significant relationship in the case of Mathematics.

- The next variable, listed in order of relative impact, is **Education of Parents or Guardians**, defined as the Mean value of the number of years of schooling of parents and guardians. Each year of increase in this variable corresponds to an increase of 0.97 points in Language achievement, and 0.81 points in Mathematics achievement.

- The variable entitled **Student-Teacher Ratio** shows an inverse relationship with achievement. The data show that an increase in the number of students per teacher corresponds to a decrease of 0.49 points in Language achievement and of 0.53 points in Mathematics achievement.

### 2. IMPLICATIONS FOR FUTURE RESEARCH

As is the case in studies of this nature, its findings can form the basis for new investigations, whether of the same themes or on other themes based on new information furnished by the Study. Although the Laboratory is currently committed to the development of a Qualitative Study of Schools with Outstanding Outcomes, in seven countries of the region, thanks to the support of the Ford Foundation, in order to partially fill the need for answers to such questions, a large number of these will require research to be undertaken by other entities. It is for this reason that the present chapter has sought to identify questions that seem most relevant and which are presented as suggestions.

- A first aspect arises from findings in regard to variations in achievement in Language and Mathematics in different strata, particularly demographic strata (mega-cities, urban, and rural areas). These seem to suggest that achievement is not necessarily linked directly to strata characteristics *per se*, as had been suggested in the literature, but rather that achievement is related to other variables, or through others such as social-economic characteristics of students, school pedagogy, classroom practices, or the interactions between these variables. It would be interesting to explore the
relation of other strata, especially those of a demographic nature, and the characteristics and practices cited above.

• A theme of key importance is to look more deeply into the relationship between achievement and the chronological age of students. This was touched upon in the Study by the variable “Rate of Progress”. Moreover, this is a subject that reveals a great heterogeneity of behavior between different countries and which has implications as well for education policy.

• An additional important aspect to investigate is that related to the quality of library materials. The present Study looked only at the quantity of materials in school libraries, and only in a dichotomous sense (more or less than 1,000 books). It would be interesting to examine the effect of the quality of such materials on achievement, since the independent variable, in this case, is sensitive to education policy decisions in the Region and is, moreover, one of the few input variables that the Study identified as significant.

• Another theme worth exploring is that of the differential effect of initial and in-service teacher training on the product variables. According to the findings of the Study, there is a significant, positive relationship between student achievement and post-secondary training of their teachers. This is not the case, however, for in-service teacher training. It would be interesting to look simultaneously at the relation between both independent variables and achievement in order to clarify doubts in regard to individual effects, as well as to possible effects that their interactions may have on student achievement.

• Furthermore, there is a need to study the contribution of in-service teacher training toward explaining student achievement from the perspective of the quality of different types of such training. This topic is extremely relevant, given the fact that the only thing the present Study concludes here is that the usual in-service training currently utilized in the different countries is not significantly related to student achievement scores. To this we should note that in-service teacher training is an education improvement tool that is widely used in the Region, and one that is certainly susceptible to education policy decisions.

• Two lines of questioning naturally emerge from results on the indicator entitled “Classroom Climate”. The first concerns confirming the percentages of explained variance, which, given their magnitudes, certainly warrant confirmation, both in terms of the contribution of the indicator as a whole, as well as those of individual variables. The second line of questioning concerns exploration of the relationships between School Achievement and other variables, or combinations of variables, that operationalize the “construct” School Climate. It seems important that such variables be chosen both from those that stem from the perceptions of students as well as from the perceptions of teachers or principals.

• It is important to look closely at examples of outstanding achievement. This is the principal subject of an investigation already underway by the Laboratory. At least three areas seem to be of particular interest. The first of these is Cuba, which, given the magnitude of student performance in its case, may represent a model for the rest
of the Region. The second is that of rural schools in Colombia, which in some cases showed better performances than urban schools in that country. These may serve as an important example of putting learning-focused educational policies into practice. The third area is that of Urban Strata schools in Chile, which in some cases demonstrated better achievement than schools in mega-cities, and which may be an example of the effects of administrative policies on education variables.

- The Study provides some evidence that school and classroom-related variables seem to have a greater effect on Achievement than those linked to the macro level of the system. It also appears that process variables explain a higher percentage of test score variance than input variables. Both focused and general research are necessary in order to confirm, reject, or complement the findings of this Study.

- The theme of the relation between financial investment in education in the presence of other process variables would seem to be an area for future research. The present Study, although treating the effect of those variables that are closely related to what normally constitutes a large part of spending on education, does not include the theme of economic resources in a direct and deliberate manner. The subject of financing is undoubtedly central in education policy decision-making.

- Although variables related to the pre-school education of students did not reveal a significant relation to achievement in this Study, the effects of pre-school experience, according to relevant literature in the field, appear to be considerable. For this reason, the contribution of these variables to school achievement needs to be studied, particularly considering the implications they have for education policy.
Acknowledgements

Governments, institutions, and individuals have made this Second Report possible.

Among the first are the Ministries and Departments of Education of the countries that comprise the Latin American Laboratory for Assessment of Quality in Education (Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Panama, Paraguay, and Venezuela) and in particular those who participated in the Study and which have assumed the most important part of its financing. The generosity of Brazil and Chile merits special mention for having become underwriters of the Laboratory.

Among international organizations, the Laboratory has benefited from the financial and technical support of UNESCO, the Inter-American Development Bank, the Ford Foundation, the Andrés Bello Agreement Secretariat, Government of Spain and Fundación Andes. In the last part of the Study, we recognize the decided support given by the Senior Technical Committee of the Laboratory itself, composed of some of the above institutions, as well as the OECD, IEA, ETS, and the World Bank.

The Measurement and Assessment Systems of the countries that participated in the Study generously placed their experience, resources, intelligence, and good-will at the disposal of the Laboratory, and were the key element of the research.

National Coordinating Groups were led by Hilda Lanza and Lucrecia Tulic (Argentina); María Inés Gómez de Sá Pestana (Brazil); Susana Barrera (Bolivia); María Inés Álvarez, Josefina Olivares, and Iván Ortiz (Chile); Héctor Fernández (Colombia); Héctor Valdés (Cuba); Leonte Ramírez and Julio Valeiron (Dominican Republic), Judith Barahona and Cristián Rodríguez (Honduras); Marta Lafuente and Juana Delmás (Paraguay); Víctor M. Velázquez (Mexico); and Yamila Nadales, Asmara Anderson, and Nelly Chacón (Venezuela).

This Second Report of the International Study received the support of a number of officials, specialists and consultants. Among these were Nigel Brookes, Lesbia Cánovas, Rolando Castañeda, Rubén Cervini, Gustavo Cuadra, María Helena Guimaraes De Castro, Claudio De Moura Castro, María del Carmen Díaz, Viola Espinola, Martha Grijalva, Sandy Gutkowski, Yetilú Lunge de Baessa, Ricardo Hevia, Noel McGinn, Héctor Muñoz, Scott Murray, Sergio Prenafeta, Pedro Ravela, Wilma Santa María, María Alejandra Schulmayer, and Larry Wolff.

Very special thanks to Doug Willms, for the development of the Hierarchical Linear Analysis; Richard Wolfe, for his support in the areas of sampling and statistical analysis; Carlos Pardo, for his participation in the analysis by Topics and by Achievement Levels; Martha Castillo and Gloria Inostroza in Language, and Claudia Salazar and Irene Villarroel in Mathematics.

The Study was carried out by the Latin American Laboratory for Assessment of Quality in Education. It was directed by the Regional Coordinating Group of the Laboratory and by its National Coordinators.
The Regional Coordinating Group, with headquarters at OREALC/UNESCO in Santiago, Chile, was composed of Juan Casassus, Coordinator of the Study, Sandra Cusato, Juan Enrique Froemel, Maite González, and Juan Carlos Palafox.

Data were processed in-country and by the Regional Coordinating Group. The analysis benefited from the support of the Department of Statistics of the University of Ontario, Canada, the School of Education of the University of New Brunswick, and the Colombian Institute for Support of Higher Education (ICFES).

The authors express their gratitude to those who made valuable contributions to the Report, while making it clear that responsibility for what is expressed therein is entirely their own.
Appendix 1  \textbf{RELATION BETWEEN SCHOOL OUTCOMES AND GENDER, GRADE, SOCIO-CULTURAL STATUS, PREVIOUS EDUCATIONAL EXPERIENCE, IN-SCHOOL RESOURCES, SCHOOL CULTURE, TEACHER-ATTRIBUTED CAUSES OF STUDENT ACHIEVEMENT, CLASSROOM PRACTICES, AND SCHOOL SOCIO-ECONOMIC LEVEL.}

<table>
<thead>
<tr>
<th></th>
<th>Language</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjusted Mean Scores</td>
<td>262</td>
<td>261</td>
</tr>
<tr>
<td>Gender (M-F)</td>
<td>6.04</td>
<td>-1.79</td>
</tr>
<tr>
<td>Grade Level (Grade 4 – Grade 3)</td>
<td>18.80</td>
<td>15.30</td>
</tr>
<tr>
<td>Socio-Cultural Status</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education Level of Parents or Guardians</td>
<td>0.97</td>
<td>0.81</td>
</tr>
<tr>
<td>Graduated from Grade 12</td>
<td>3.87</td>
<td>3.63</td>
</tr>
<tr>
<td>Two Parents</td>
<td>0.75</td>
<td>1.89</td>
</tr>
<tr>
<td>At Home 3 to 4 Hours</td>
<td>2.00</td>
<td>1.36</td>
</tr>
<tr>
<td>Ten or More Books</td>
<td>4.54</td>
<td>5.20</td>
</tr>
<tr>
<td>Previous Educational Experience</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attended Pre-School</td>
<td>1.71</td>
<td>0.75</td>
</tr>
<tr>
<td>Pre-School Not Available</td>
<td>-2.58</td>
<td>-0.79</td>
</tr>
<tr>
<td>Non-Valid Data</td>
<td>-8.20</td>
<td>-7.29</td>
</tr>
<tr>
<td>Parents or Guardians Read Often</td>
<td>5.88</td>
<td>4.31</td>
</tr>
<tr>
<td>Parents or Guardians Read Occasionally</td>
<td>3.14</td>
<td>2.96</td>
</tr>
<tr>
<td>Parents or Guardians Help With Homework</td>
<td>-2.12</td>
<td>-2.73</td>
</tr>
<tr>
<td>In-School Resources</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teacher/Student Ratio</td>
<td>-0.49</td>
<td>-0.53</td>
</tr>
<tr>
<td>TSR Squared</td>
<td>0.01</td>
<td>0.00</td>
</tr>
<tr>
<td>Infrastructure</td>
<td>0.66</td>
<td>0.56</td>
</tr>
<tr>
<td>Instructional Materials</td>
<td>1.96</td>
<td>0.22</td>
</tr>
<tr>
<td>Size of School Library (&gt;1,000 Books)</td>
<td>10.40</td>
<td>9.90</td>
</tr>
<tr>
<td>Teacher Experience</td>
<td>0.02</td>
<td>0.21</td>
</tr>
<tr>
<td>Teacher Education</td>
<td>2.44</td>
<td>2.06</td>
</tr>
<tr>
<td>In-Service Teacher Training</td>
<td>0.22</td>
<td>0.55</td>
</tr>
</tbody>
</table>

Note: figures in bold type are statistically significant at the .05 level
### School Culture

<table>
<thead>
<tr>
<th></th>
<th>Language</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Teachers Hold Other Jobs</td>
<td>-11.20</td>
<td>-9.71</td>
</tr>
<tr>
<td>Teacher Attitudes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate Salary</td>
<td>7.63</td>
<td>9.59</td>
</tr>
<tr>
<td>Leadership of Principal</td>
<td>5.61</td>
<td>4.07</td>
</tr>
<tr>
<td>Working Conditions</td>
<td>-7.71</td>
<td>0.03</td>
</tr>
<tr>
<td>Job Satisfaction</td>
<td>-0.90</td>
<td>-3.57</td>
</tr>
<tr>
<td>Teacher Not Over-burdened</td>
<td>-4.31</td>
<td>-5.78</td>
</tr>
<tr>
<td>Autonomy of Teacher</td>
<td>-9.30</td>
<td>-9.32</td>
</tr>
<tr>
<td>Autonomy of Principal</td>
<td>-3.13</td>
<td>-4.80</td>
</tr>
</tbody>
</table>

### Teacher-Attributed Causes of Student Achievement

<table>
<thead>
<tr>
<th></th>
<th>Language</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Family Support</td>
<td>-10.09</td>
<td>-22.30</td>
</tr>
<tr>
<td>Student Ability</td>
<td>21.10</td>
<td>21.59</td>
</tr>
<tr>
<td>Student Self-Esteem</td>
<td>-0.31</td>
<td>-5.84</td>
</tr>
<tr>
<td>School Climate</td>
<td>-8.96</td>
<td>-1.40</td>
</tr>
<tr>
<td>School Resources</td>
<td>-0.93</td>
<td>5.54</td>
</tr>
<tr>
<td>Teaching Methods</td>
<td>3.85</td>
<td>3.99</td>
</tr>
<tr>
<td>Teacher Expectations</td>
<td>1.61</td>
<td>0.39</td>
</tr>
</tbody>
</table>

### Classroom Practices

<table>
<thead>
<tr>
<th></th>
<th>Language</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multi-grade Groups</td>
<td>-4.46</td>
<td>-5.49</td>
</tr>
<tr>
<td>Systematic Assessment</td>
<td>5.58</td>
<td>4.59</td>
</tr>
<tr>
<td>Students Grouped by Ability</td>
<td>-10.35</td>
<td>-11.64</td>
</tr>
<tr>
<td>Parents and Guardians Involved</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(classroom level)</td>
<td>1.82</td>
<td>2.22</td>
</tr>
<tr>
<td>(school level)</td>
<td>21.11</td>
<td>14.98</td>
</tr>
<tr>
<td>Classroom Climate</td>
<td>92.07</td>
<td>115.03</td>
</tr>
</tbody>
</table>

### Socio-Economic Level of School

<table>
<thead>
<tr>
<th></th>
<th>Language</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>5.64</td>
<td>5.88</td>
</tr>
</tbody>
</table>

### Percentage of Variance Explained

<table>
<thead>
<tr>
<th></th>
<th>Language</th>
<th>Mathematics</th>
</tr>
</thead>
<tbody>
<tr>
<td>In-school</td>
<td>13.6</td>
<td>15.6</td>
</tr>
<tr>
<td>Between Schools</td>
<td>68.3</td>
<td>61.3</td>
</tr>
</tbody>
</table>

Note: figures in bold type are statistically significant at the .05 level
Appendix 2  DESCRIPTION OF THE VARIABLES

We describe in detail below the constructs or indices and the variables used in the analysis of Associated Factors.

**Gender**  Coded 0 for boys and 1 for girls, with a Mean Score of 0.5

**Grade**  Coded –0.5 for Grade 3 and 0.5 for Grade 4

**Education of Parents**  Created from a question that asked for the education level of the guardian and spouse, rather than the years of education. A continuous variable was created for each parent, and then the variable was created from the Mean Scores of the two. The Regional Mean Score of this variable is 9.3 years of education.

**Complete Secondary**  Coded 1 if the education of the parents of a given child was 12 years or more (graduated from secondary school) and 0 if it was not. The Regional Mean Score is 0.2277.

**Two Parents**  Coded 1 if the child has two parental figures at home, independently of whether they are married or not, and 0 for any other case. The Regional Mean Score is 0.7789.

**3 or 4 Hours in the Household**  Coded 1 if the responding parent or guardian spends 3 to 4 hours in the household during work days of the week (not considering hours of sleep) or only time between shifts, and 0 if the case is otherwise. The Regional Mean Score is 0.2258.

**10 or More Books**  Coded 1 if there are 10 or more books in the child’s household and 0 if there are not. The Regional Mean Score is 0.4200.

**SCS (Socio-Cultural Status)**  A compound measure of the socio-cultural level of children, coded from Parents’ Education, Two Parents, 3 or 4 Hours in the Household, and 10 or More Books using factor analysis. It was then standardized in order to obtain a Mean Score of 0 and a standard deviation of 1.

**Mega-City, Public; Mega-City, Private; Urban, Public; and Urban, Private**  Coded 1 if the school fell within the relevant classification, and 0 if it did not, with rural schools being the reference category. Regional mean scores were then calculated for these variables. They are, respectively, 0.1252, 0.0878, 0.3195, and 0.1189.

**Student Attended Pre-School**  Coded 1 if the student was in some form of pre-school program before the first grade, and 0 if this was not the case. The Regional Mean Score is 0.7412.

There was, however, much missing in this variable. Therefore, following the procedure recommended by Cohen and Cohen (1982), missing data for Student Attended Pre-school were placed at the variable’s Mean Score (0.7460) and a dummy variable was constructed which identified respondents with missing data for this variable (missing = 1 and 0 for the contrary). Using this technique, the analysis produced estimates of the effect of pre-school for those who did not have valid data, and estimates of the differences in achievement scores between those who had data and those who did not.
**Parent/Guardian Reads Frequently** Coded 1 if the guardian read to his or her children almost every day when they were young and 0 if the contrary was the case. The Regional Mean Score is 0.3641.

**Parent/Guardian Reads Sometimes** Coded 1 if the guardian read to his or her children more than once per month but not every day, and 0 if the contrary was the case. The Regional Mean Score is 0.2813.

**Student/Teacher Ratio** Constructed by dividing a school’s enrollment by the number of teachers in the school. The Regional Mean Score is 27.3196.

**Infrastructure** Constructed by counting the number of infrastructure resources found in the school. The Regional Mean Score is 3.5860.

**20 to 999 Books in the Library and More than 1,000 Books** Coded 1 if the school library had the relevant number of books in the corresponding range, and 0 if it did not, with the reference category fewer than 20 books. Regional averages are 0.2725 and 0.3375.

**Teacher Experience** Expressed as the number of years. The Regional Mean Score is 13.1571.

**Initial Teacher Training** Expressed in years. The Regional Mean Score is 3.4587.

**In-Service Teacher Training** The number of training courses taken within the last three years. The Regional Mean Score is 4.799.

**Teacher Has an Additional Job** Coded 1 if the teacher has a job other than teaching in the school, and 0 if the contrary is the case. The Regional Mean Score is 0.2034.

**Adequate Salary** Coded 1 if the teacher is satisfied with his or her salary, and 0 if not. The Regional Mean Score is 0.2052.

**Leadership of the School Principal** Constructed from the Mean values of five dichotomous (yes=1, no=0) variables, indicating whether principals (a) motivate the work of teachers, (b) value the work of teachers, (c) create a flexible educational environment, (d) if teachers have confidence in the principal’s expertise, and (e) if teachers feel involved in the school. The Regional Mean Score is 0.8119.

**Working Conditions** Constructed using the Mean values of three dichotomous (yes=1, no=0) variables, indicating if the school provides a safe working environment, if there is a clear definition of the roles of teachers and principals, and if the teacher feels isolated from his or her colleagues. The Regional Mean Score is 0.6486.

**Job Satisfaction** Constructed using the Means scores of four dichotomous (yes=1, no=0) variables indicating if the teacher’s initiatives are supported by colleagues, if the teacher is respected by his or her students, if colleagues consult the teacher regarding teaching materials, and if the teacher enjoys teaching. The Regional Mean Score is 0.8616.

**Teacher Over-burdened** Coded 1 if the teacher does not have an arduous schedule, and 0 if he or she does. The Regional Mean Score was 0.3660.

**Autonomy** Constructed from the Mean values of four dichotomous (yes=1, no=0) variables, denoting if the teacher feels free to carry out his or her functions, if the teacher
participates in work decisions, in the selection of texts, and in the selection of the audio-visual materials that he or she uses. The Regional Mean Score is 2.4053.

**Autonomy of Principal** Constructed from the Mean values of nine other variables. The first indicates if the school has complete (=3), partial (=2), or no (=1) autonomy. The others indicate if the principal has complete (=3), partial (=2), or no (=1) autonomy in various administrative tasks he or she carries out, such as budgeting, discipline, and text selection. The compound construct has a Regional Mean Score of 2.4053.

**Attribution of Cause of Results** Constructed using two questions. One asked teachers to which of five factors they attributed the academic problems of their worst students. The other asked about the success of their best students. A variable was first created for each one of the response alternatives of the questions, counting the number of times that each response was given by the teacher. Factor analysis was then used to determine the best way to group the multiple responses into a few more general variables that indicate family support, student ability, student self-esteem, school climate, school resources, and teaching methods. A Mean Score was calculated for each one of these six more general constructs. Regional averages were then calculated. They are 0.4734, 0.3544, 0.3193, 0.2839, 0.1922, and 0.4561, respectively.

**Teacher Expectations** Coded from 1 to 5, denoting the different levels of education that teachers believe that their students will reach. The Regional Mean Score is 2.8762.

**Multi-grade Classroom** Coded 1 if the instructor teaches with many grades present in the same classroom, and 0 if this is not the case. The Regional Mean Score is 0.1372.

**Students Examined** Coded 1 if the teachers assesses students using tests, and 0 if he or she does not. The Regional Mean Score is 0.3767.

**Students Grouped by Ability** Coded 1 if the teacher groups students in a uniform manner according to learning ability, gender, age, or ethnicity; 0.5 if students are not grouped or if an unspecified criterion is used; and 0 if students are grouped uniformly by learning ability, gender, and age. The Regional Mean Score is 0.2464.

**Parental Involvement** Constructed from the Mean values of other parental variables: if the parent participates in school-related activities (1=rarely, 2=sometimes, 3=always), if the parent knows the teacher of his or her child (1=no, 2=a little, 3=very well), and if the parent participates in parent and guardian meetings (1=never or rarely, 2=almost always, 3=always). Parent involvement was calculated for each school. The Regional Mean Score is 2.5352.

**Classroom Climate** Constructed from the Mean values of three other variables denoting: whether there are students in the class who bother others (1=no, 0=yes), if quarrels occur frequently (1=no, 0=yes), and if students in the class are good friends (1=yes, 0=no). This discipline-related construct was then calculated for each school. The Regional Mean Score is 0.5995.

**Instruction Time Devoted to Language** and **Instruction Time Devoted to Mathematics** Constructed by multiplying the number of sessions of mathematics or language taught by the teacher during the school week by the duration (in minutes) of the class or session. The Regional Averages of the variables are 293.2590 and 269.4816, respectively.